United States Patent [19]

Sakakura et al.

[11] **3,779,185**

[45] **Dec. 18, 1973**

[54] **APPARATUS FOR JOINING TOGETHER TWO PIECES OF WORK FABRIC OR SIMILAR MATERIALS**

[75] Inventors: **Shiro Sakakura,** Nagoya; **Naotake Ito,** Chiryu, both of Japan

[73] Assignee: **Brother Kogyo Kabushiki Kaisha,** Horita-dori, Mizuho-ku, Japan

[22] Filed: **Nov. 4, 1971**

[21] Appl. No.: **195,789**

[30] **Foreign Application Priority Data**

Nov. 5, 1970 Japan 45/97644

[52] **U.S. Cl.** **112/121.12,** 223/2, 112/260

[51] **Int. Cl.** **D05b 21/00**

[58] **Field of Search** 112/121.11, 121.12, 112/121.15, 121.27, 104, 203, 155, 211, 102, 262, 144, 2, 132, 144, 260, 63, 270, 57, 58

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1,855,590	4/1932	Stein	2/123
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3,329,110	7/1967	Bergeron	112/121.11
3,611,959	10/1971	Parlatore	112/104
3,613,610	10/1971	Hinerfeld	112/262
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Primary Examiner—James R. Boler
Assistant Examiner—Peter Nerbun
Attorney—George B. Oujevolk

[57] **ABSTRACT**

An apparatus for joining together two pieces of work fabric or similar materials which comprises a first support for setting a first piece of work fabric and a second support for setting a second piece of work fabric and causes the edges of the first and second pieces to be superposed one on the other by the movement of at least one of said supports so as to have said superposed edges later joined together by suitable joining means such as stitch forming means.

25 Claims, 35 Drawing Figures

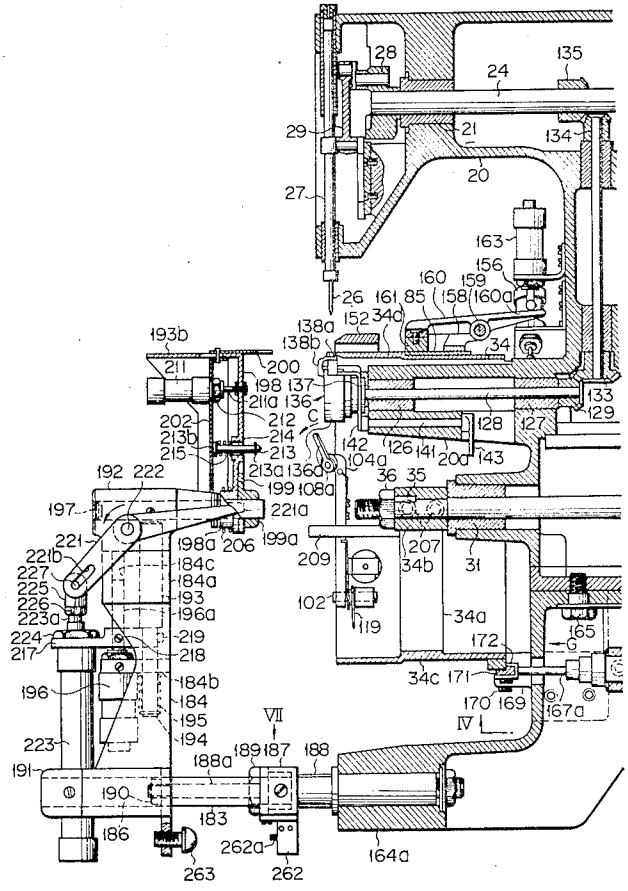
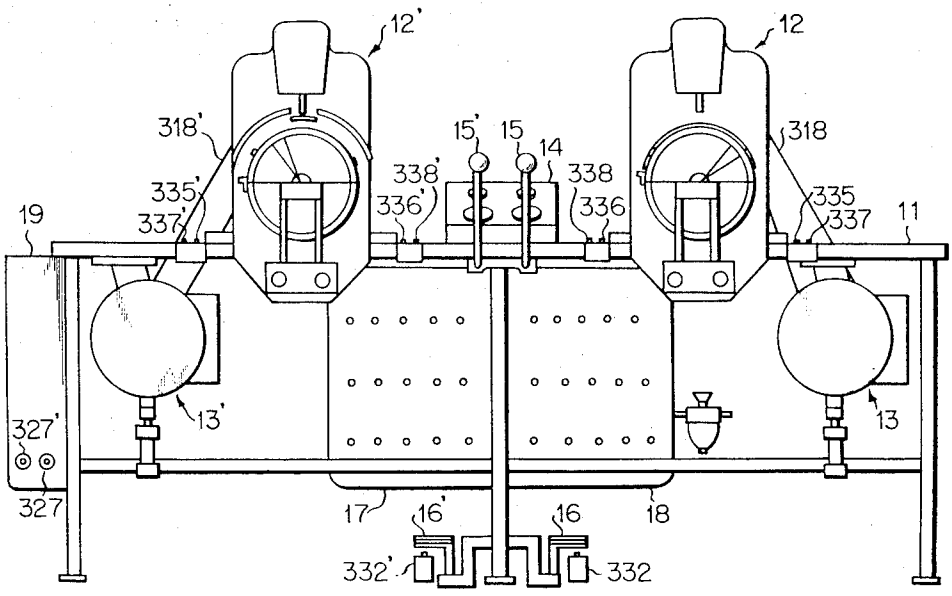


FIG. 1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15'
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335'
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13'
13
327'
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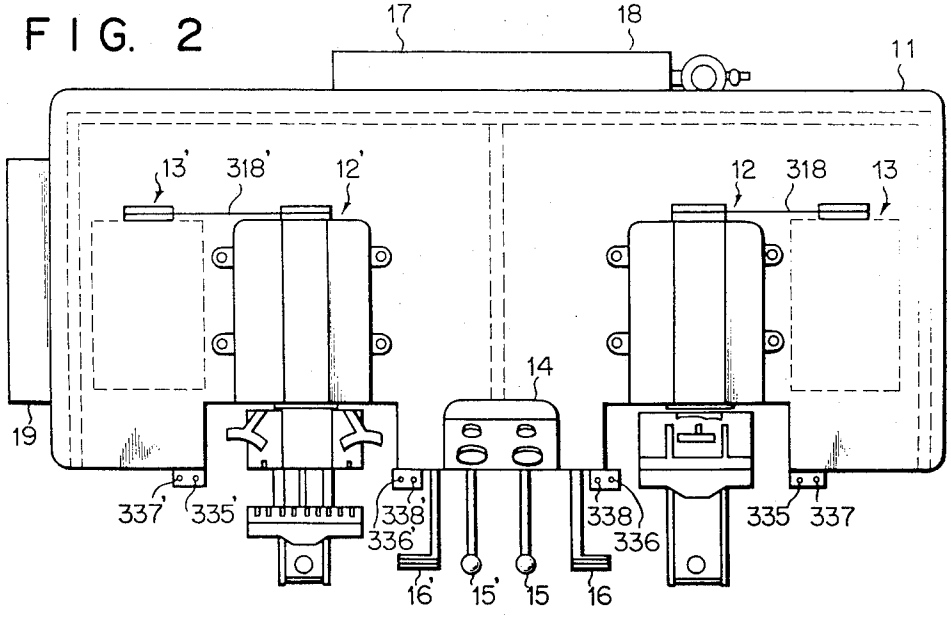
17
16'
16
18
332'
332

FIG. 2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13'
318'
12'
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337'
335'
338'
336'
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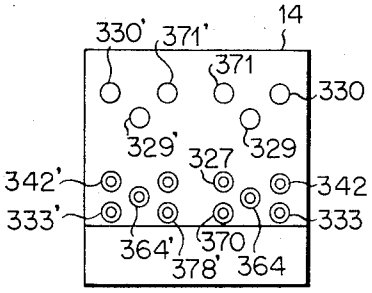
335
337
16'
15'
15
16

FIG. 3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329'
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342'
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333'
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378'
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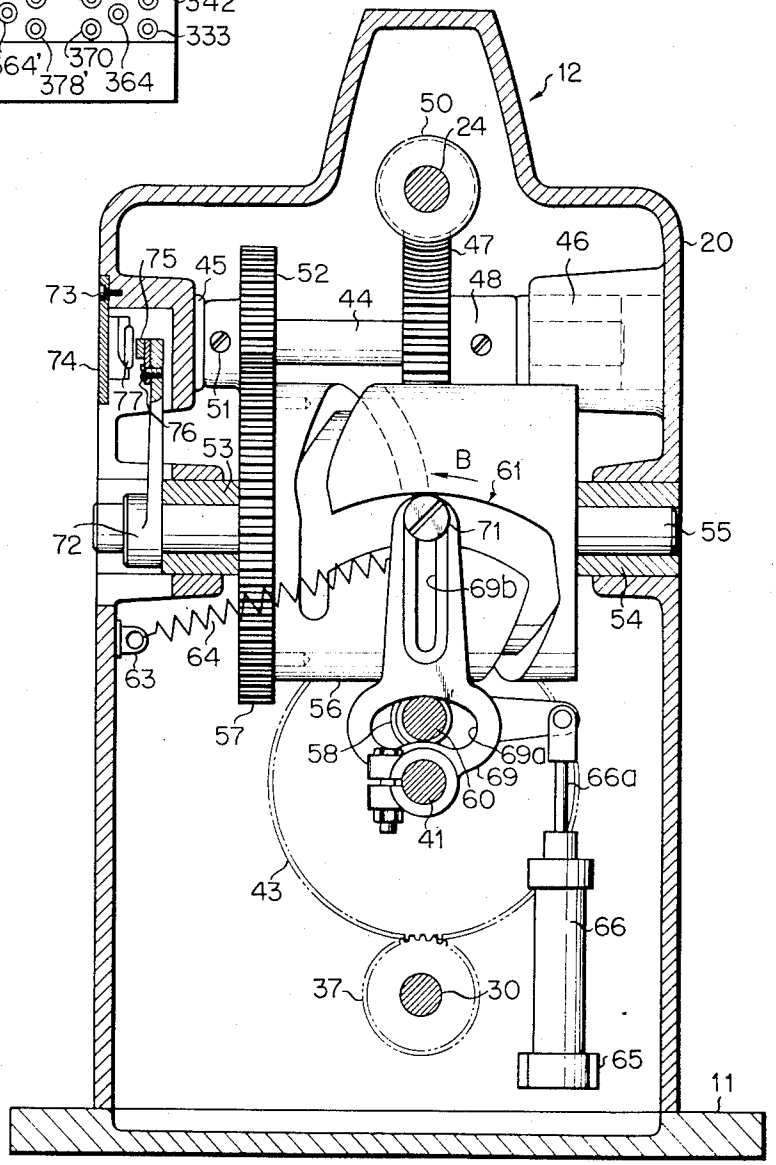
FIG. 6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B
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69b
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56
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69a
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66a
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30
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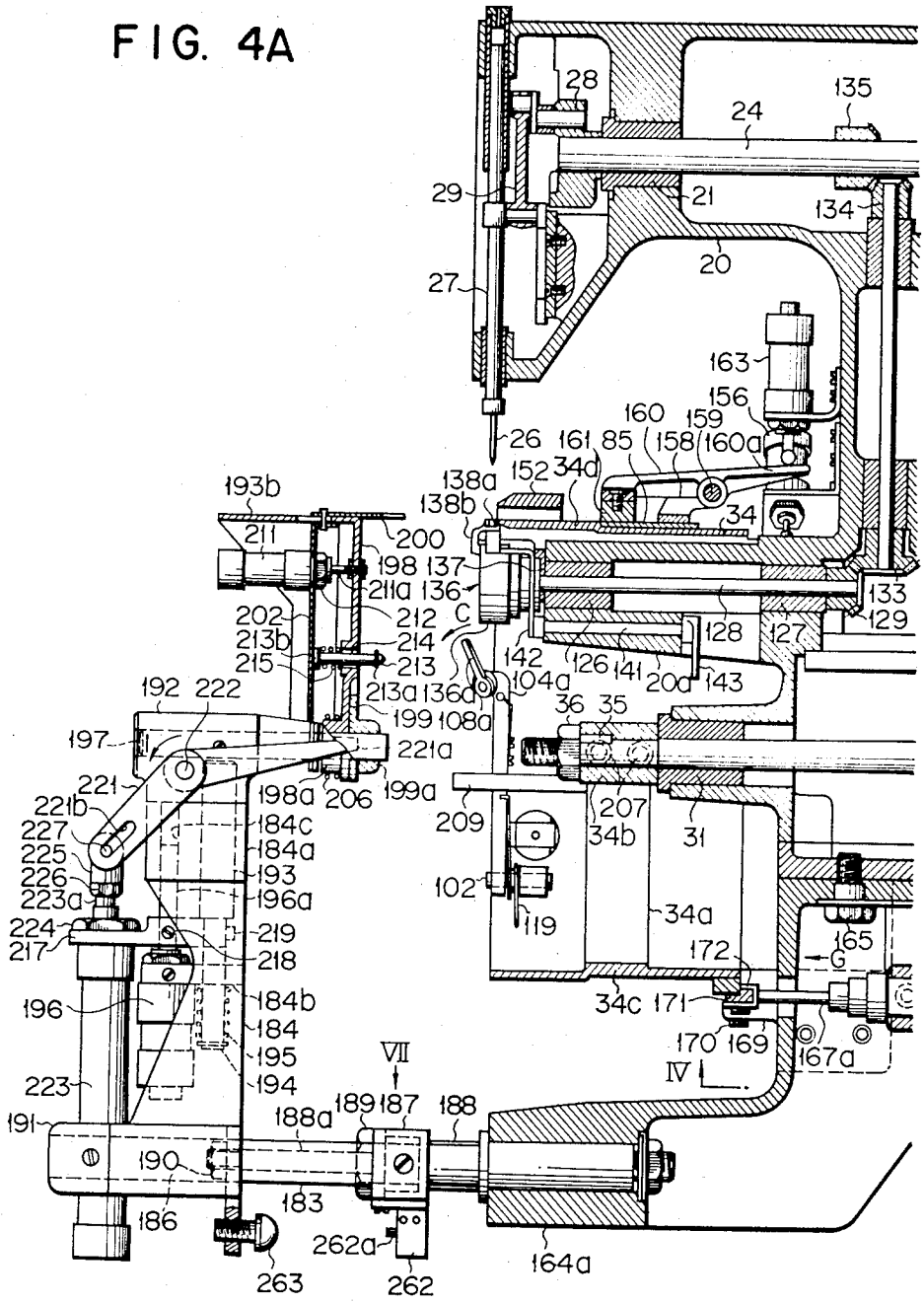
11

FIG. 4A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26
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158
160a
138a
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34d
193b
138b
34
211
200
198
137
211a
136
133
202
212
C
129
213b
214
128
127
215
213
142
126
141
20d
143
213a
136d
104a
192
222
36
35
199
108a
197
221a
221
198a
206
199a
209
207
221b
34b
31
227
184c
225
184a
102
193
226
196a
119
34a
223a
165
224
219
172
G
217
218
34c
171
184b
196
170
169
167a
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VII
IV
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223
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187
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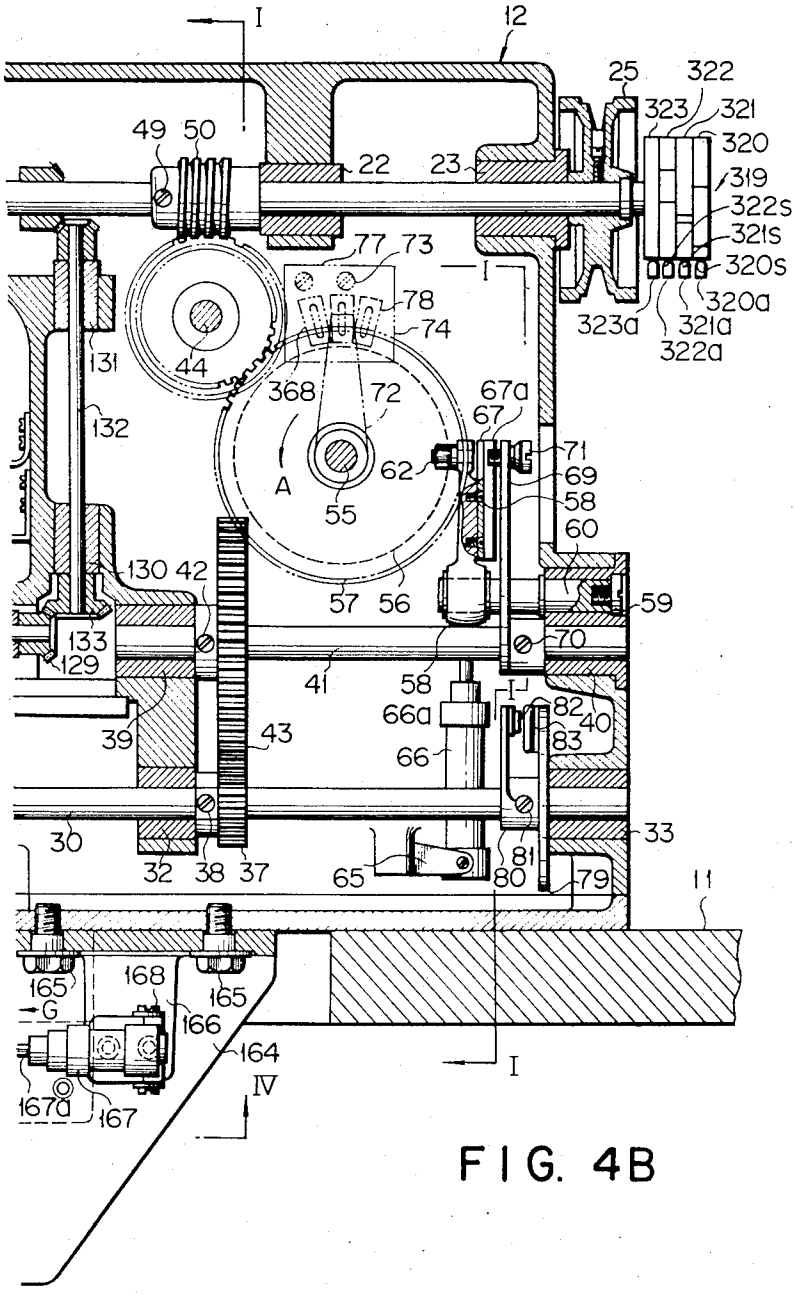
188a
191
190
183
186
262a
164a
263
262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320
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322s
321s
320s
320a
321a
322a
323a
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77
73
78
74
131
44
368
72
67a
67
71
69
58
60
62
A
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132
130
42
57
56
59
133
129
70
41
58
66a
82
40
83
39
43
66
30
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38
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80
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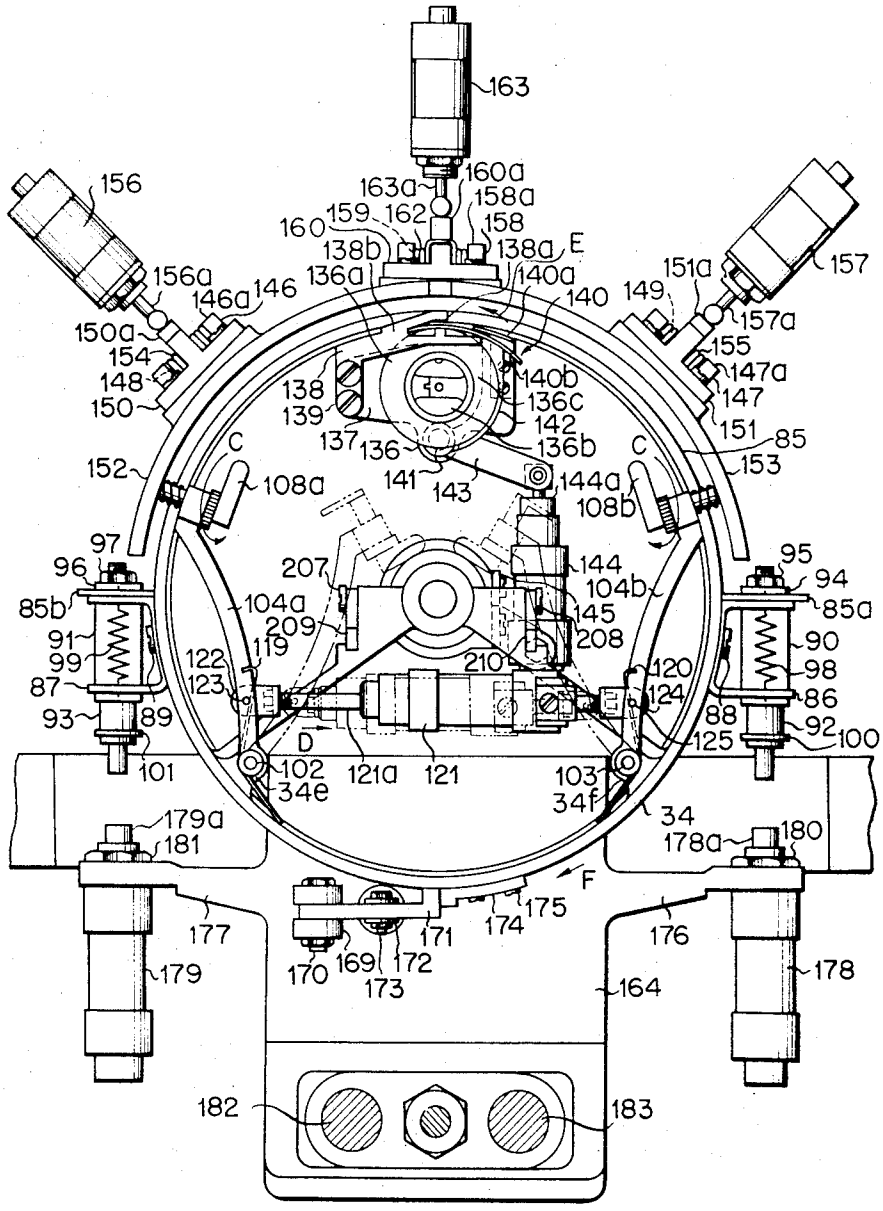
11
165
168
166
164
165
G
IV
167a
167

FIG. 4B

FIG. 5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158a
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162
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158
138b
138a
E
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140a
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151a
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156a
146a
146
157a
150a
155
154
147a
148
147
138
140b
150
139
136c
142
137
136
136b
151
85
C
C
152
153
141
143
144a
108a
108b
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95
96
144
207
94
104b
104a
85b
145
209
85a
91
208
90
119
99
210
98
122
120
87
123
124
86
93
89
88
92
D
125
100
101
102
121a
121
103
34e
34f
34
179a
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F
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175
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164
182
183

FIG. 7

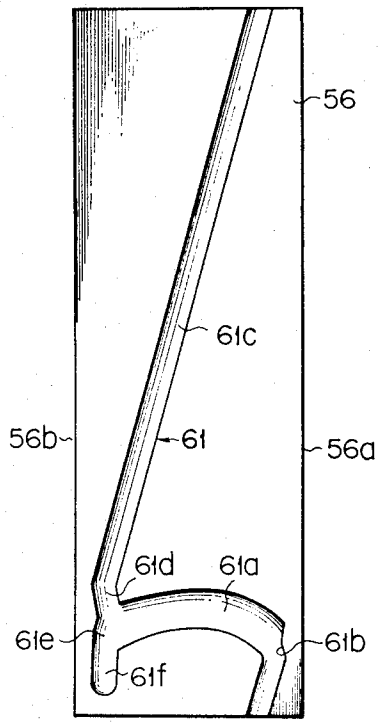


FIG. 9

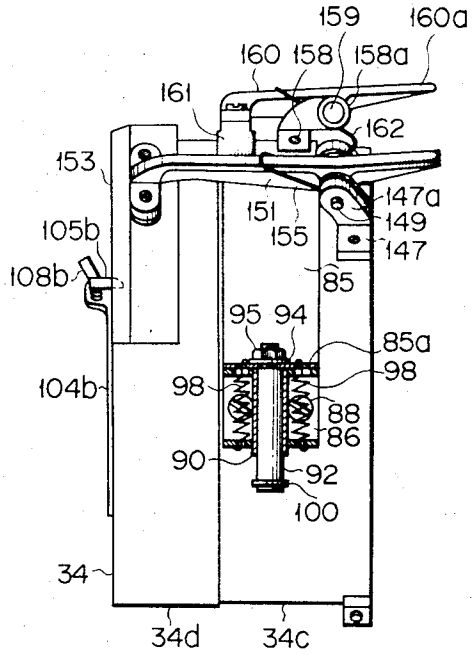


FIG. 8

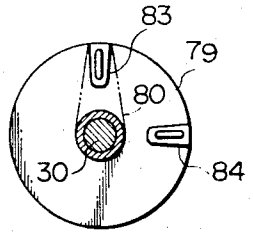


FIG. 10

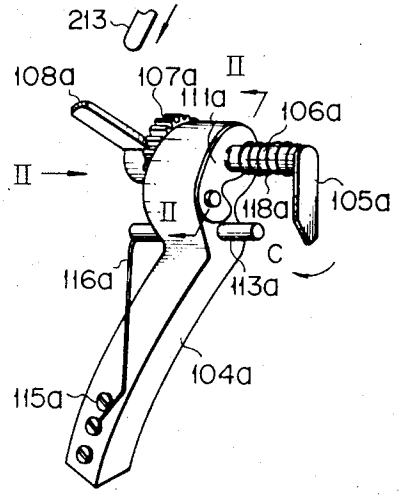


FIG. 12

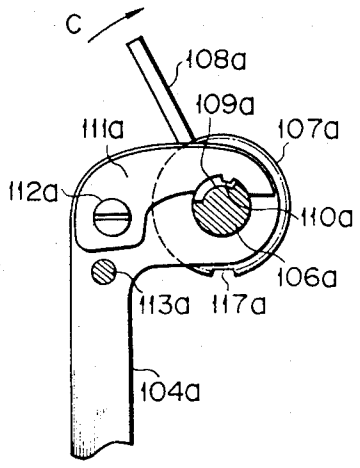


FIG. 11

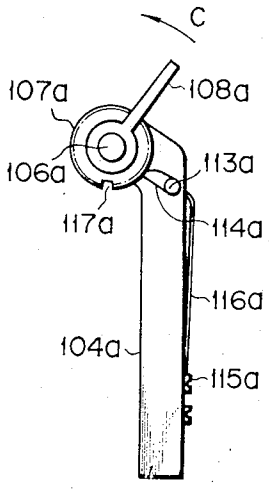


FIG. 13

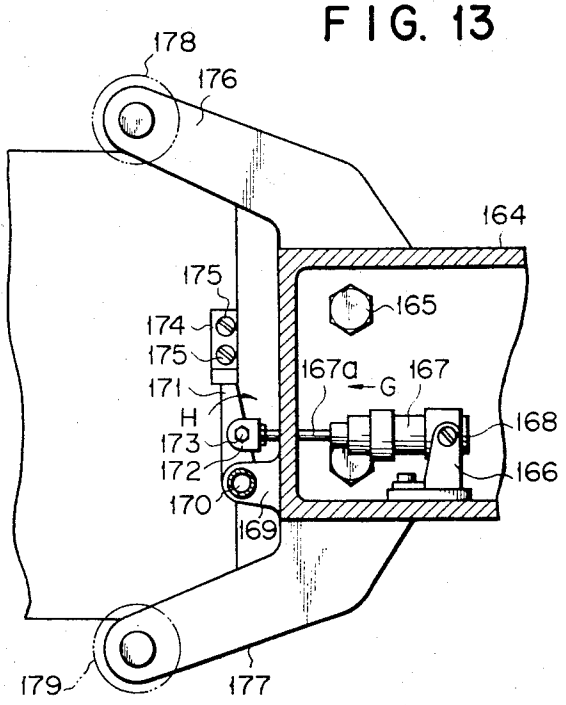
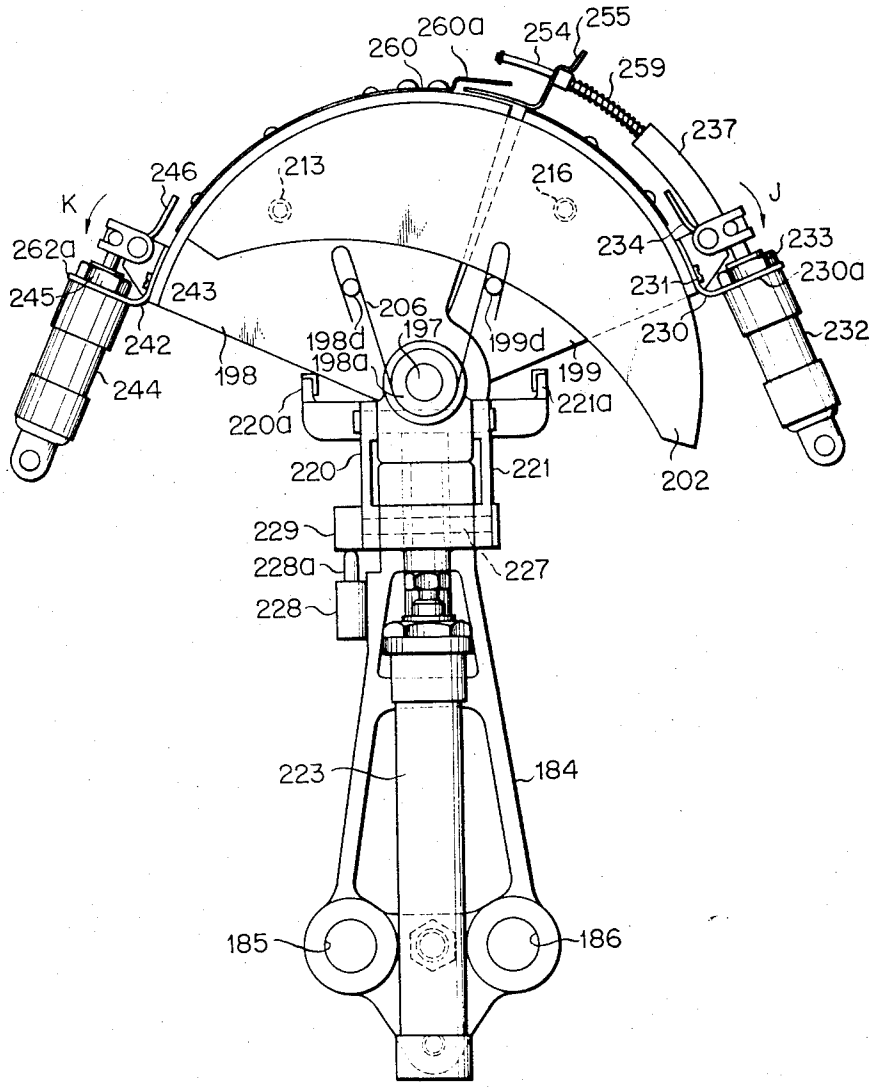


FIG. 14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246
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216
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J
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233
230a
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243
231
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230
232
242
198d
199d
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198a
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220a
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221
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228a
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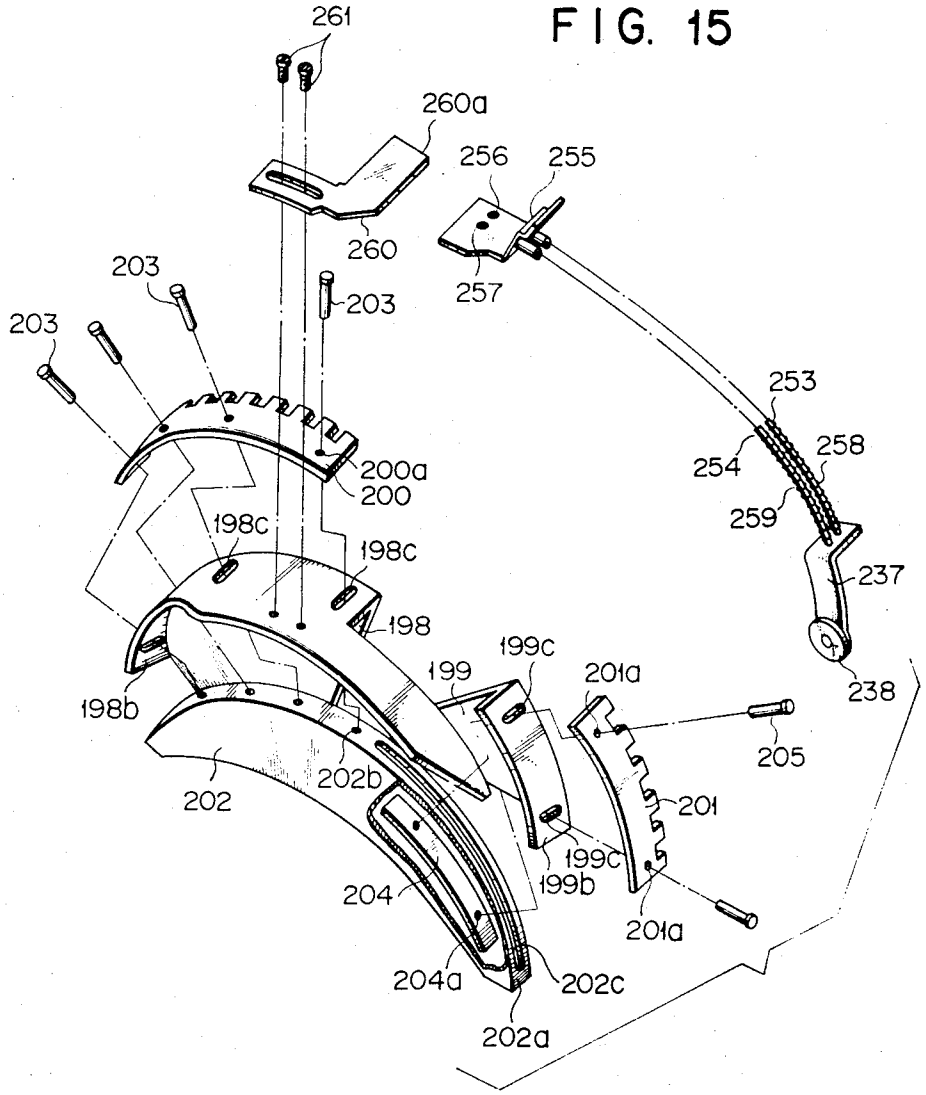
185
186

FIG. 15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200
198c
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199c
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201a
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199c
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201a
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202c
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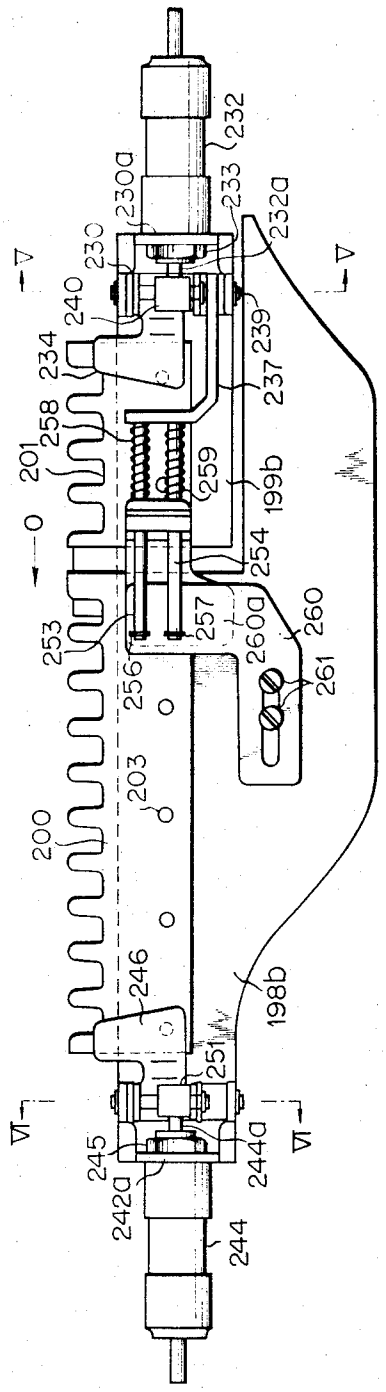
FIG. 16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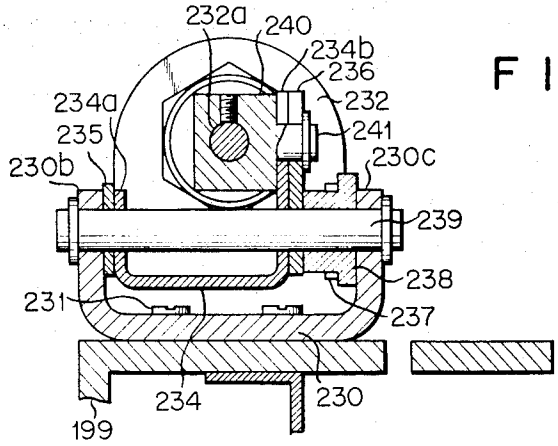


FIG. 17

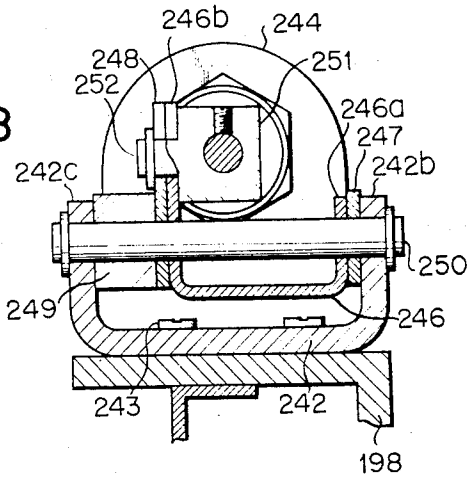


FIG. 18

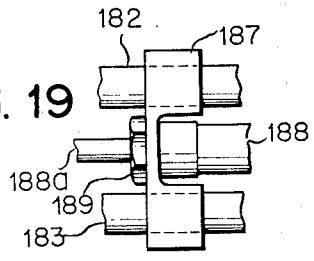
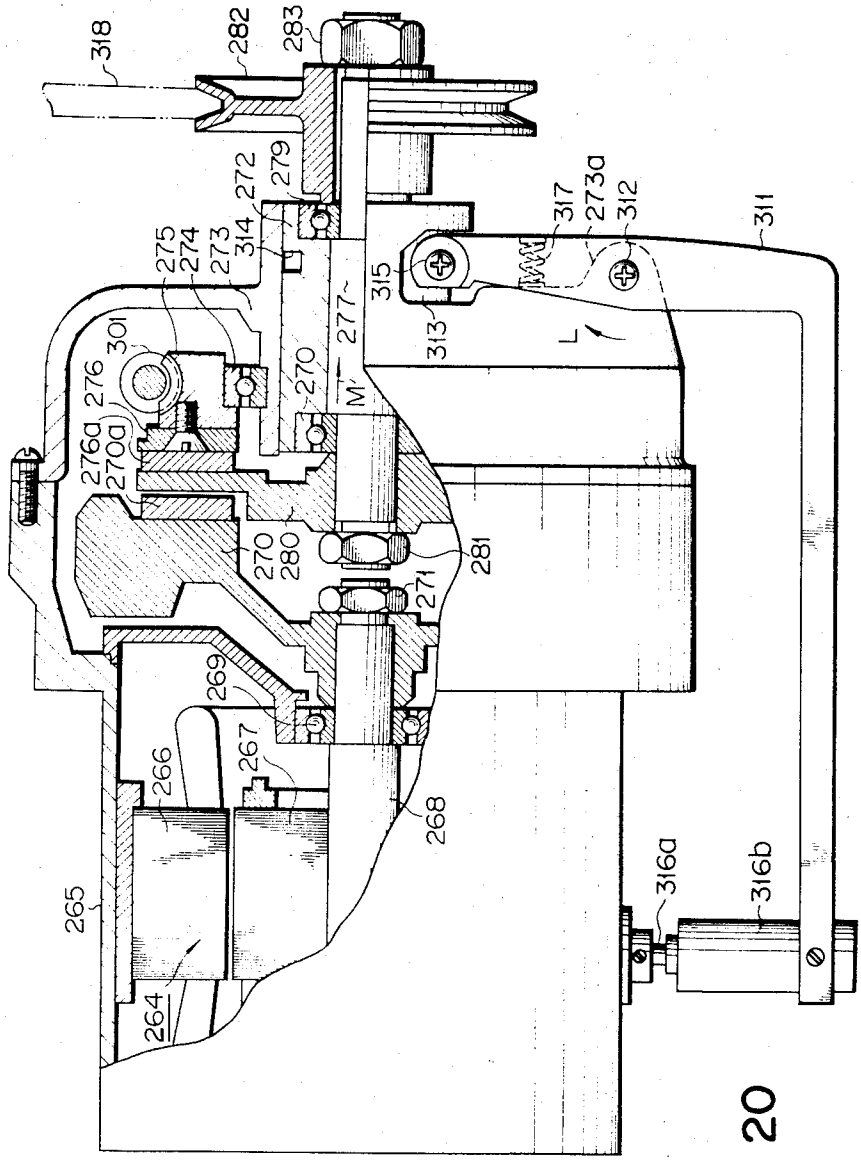


FIG. 19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273a
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L
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316b

FIG. 20

FIG. 21

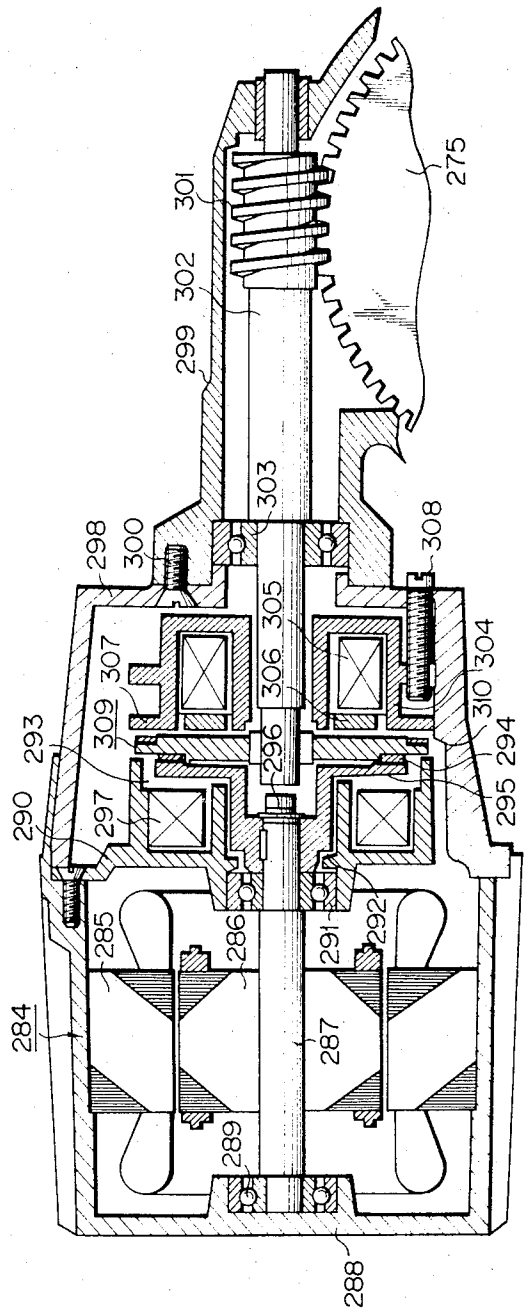
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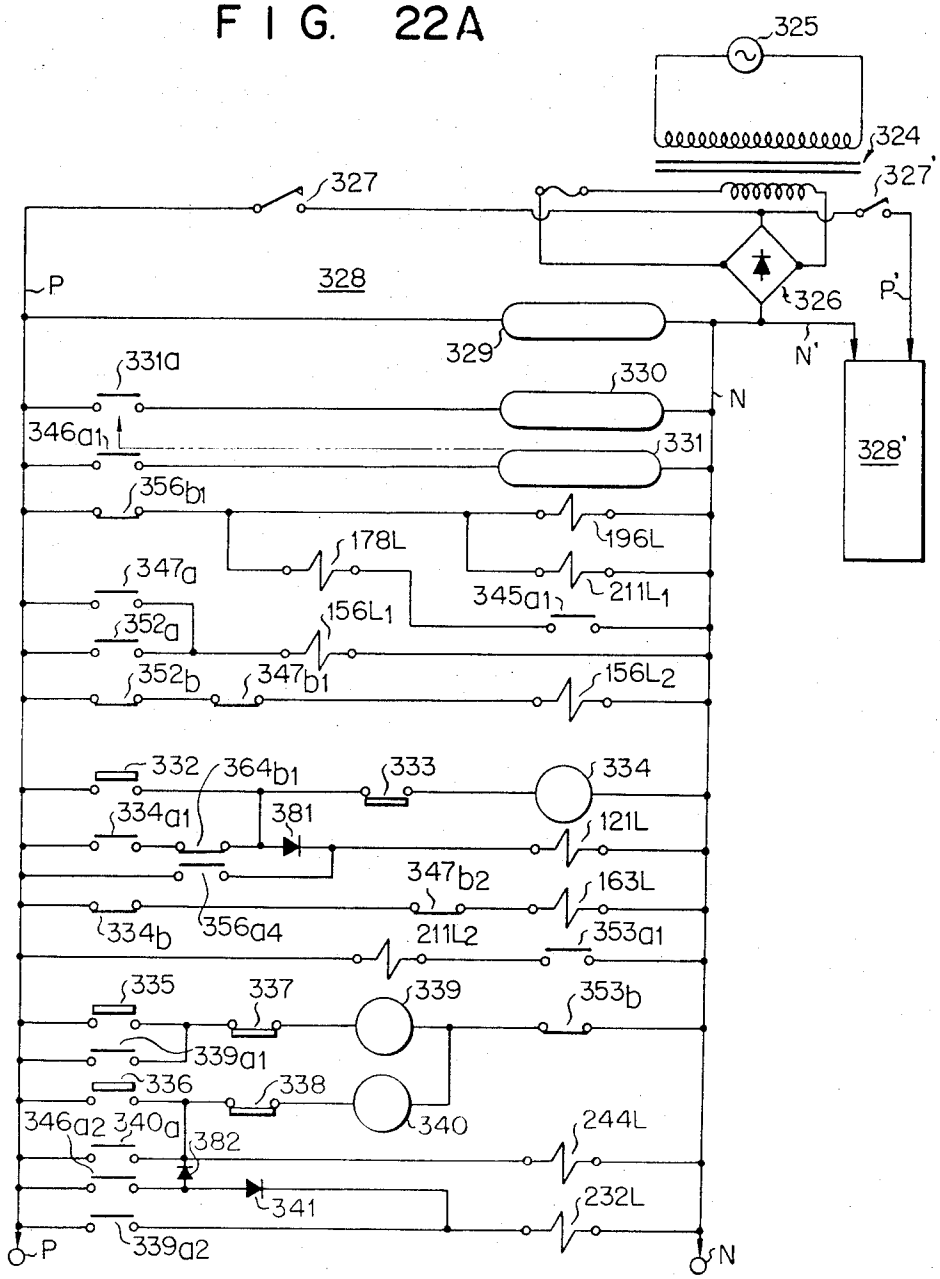
FIG. 22A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P'
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328'
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178L
196L
347a
345a1
211L1
352a
156L1
352b
347b1
156L2
332
364b1
333
334
334a1
381
121L
347b2
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232L
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P
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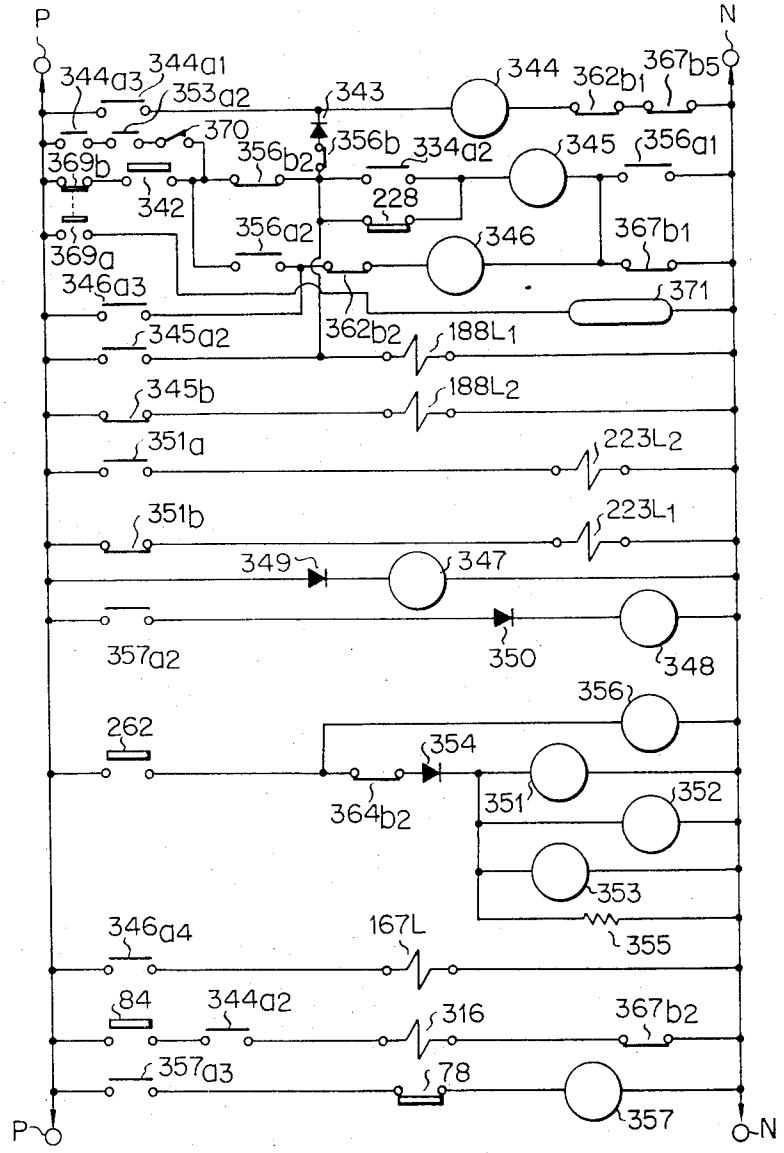
FIG. 22B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357
P
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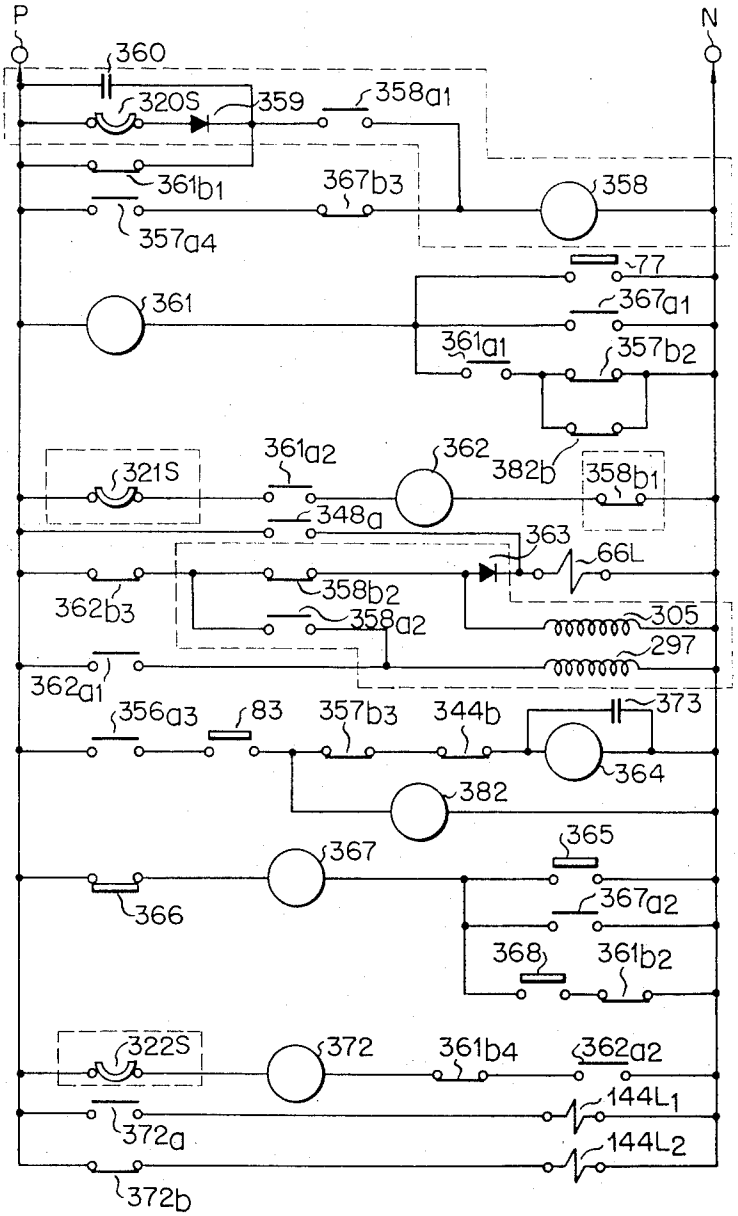
FIG. 22C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382b
358b1
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358b2
358a2
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362a1
356a3
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357b3
344b
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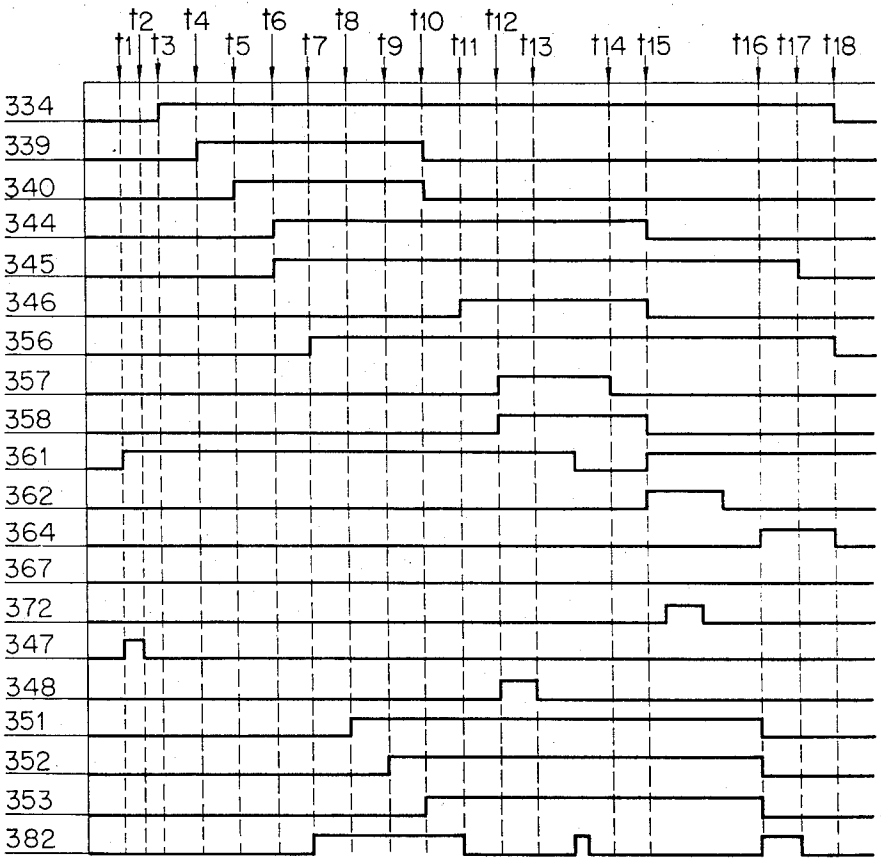
FIG. 23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t17
t18
334
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FIG. 24

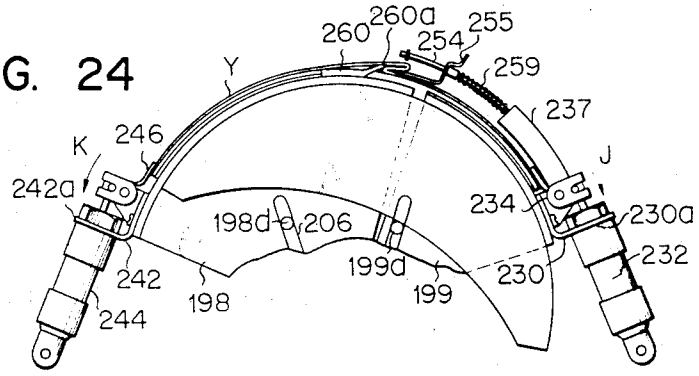
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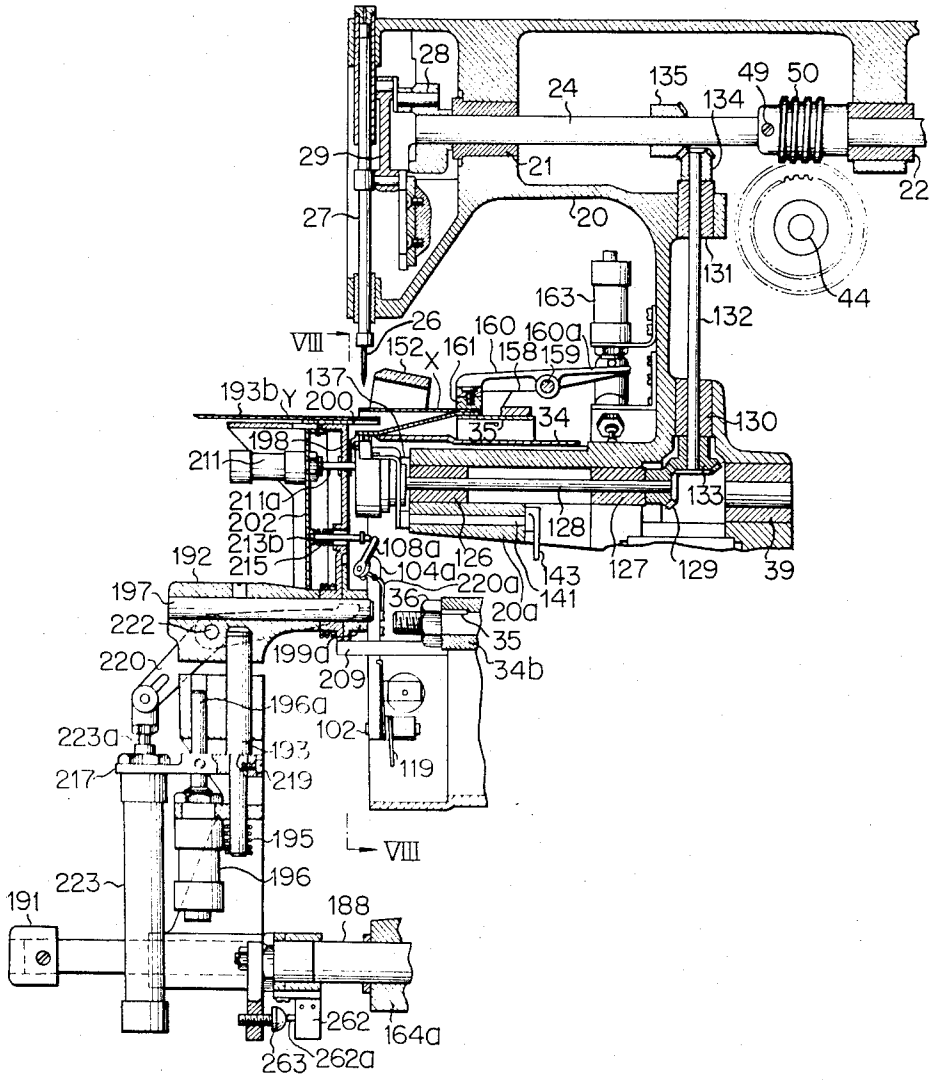
FIG. 25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164a
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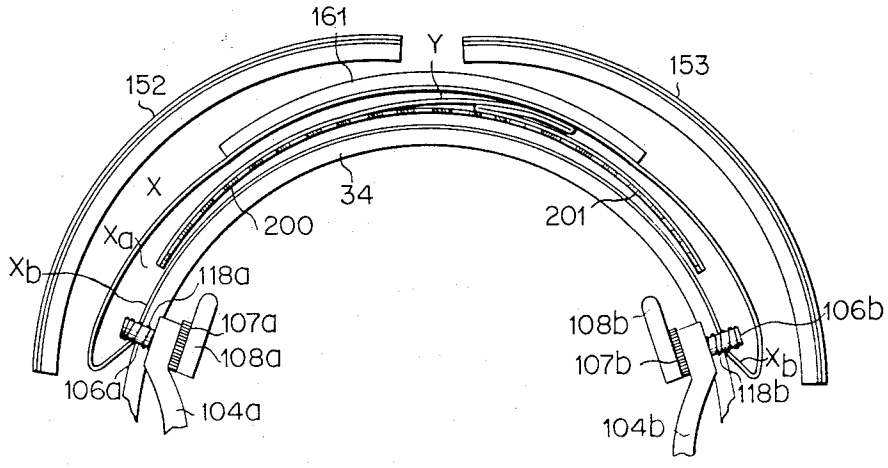
262a

FIG. 26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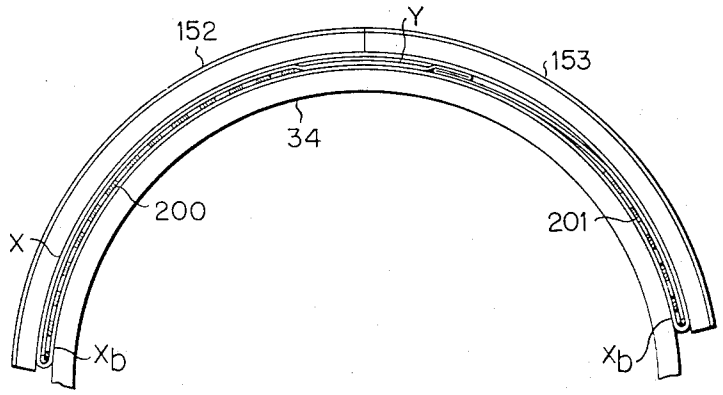
106a
104a
108b
106b
107b
Xb
118b
104b

FIG. 27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Y
153
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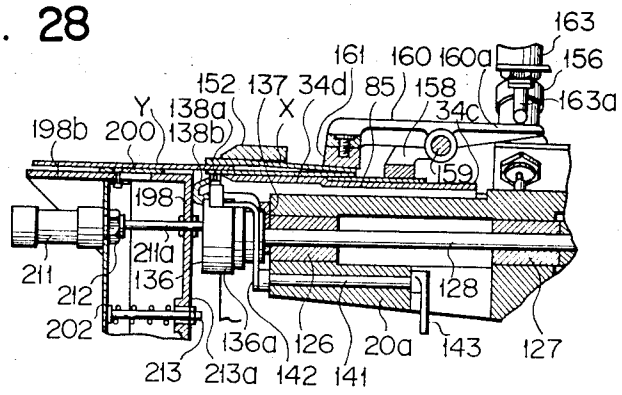
200
201
X
Xb
Xb

FIG. 28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163a
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138a
X
34c
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200
138b
159
198
211a
211
136
128
212
202
136a
126
20a
143
127
213
213a
142
141

FIG. 29

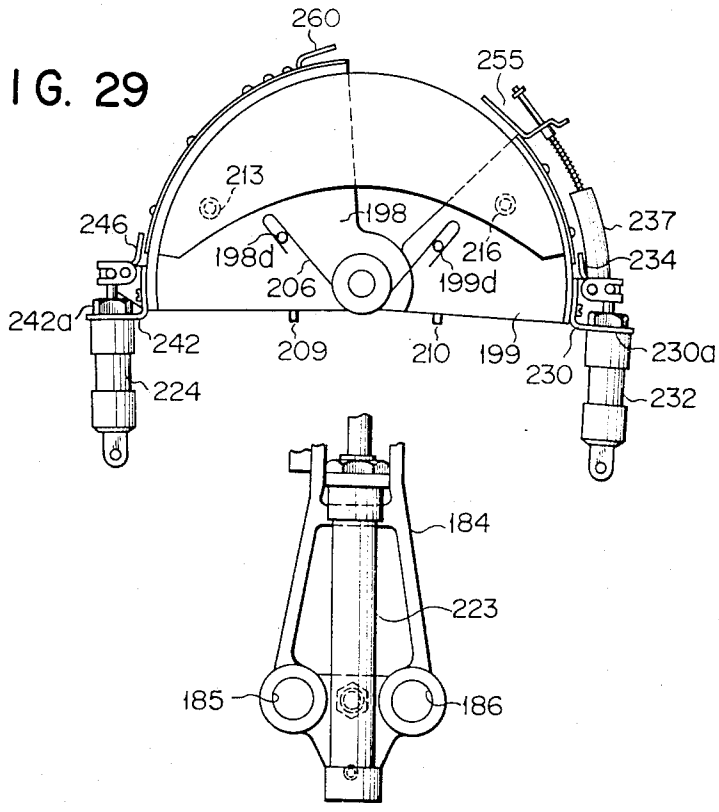

260
255
213
246
198
237
198d
216
234
206
199d
242a
242
209
210
199
230
230a
224
232
184
223
185
186

FIG. 30

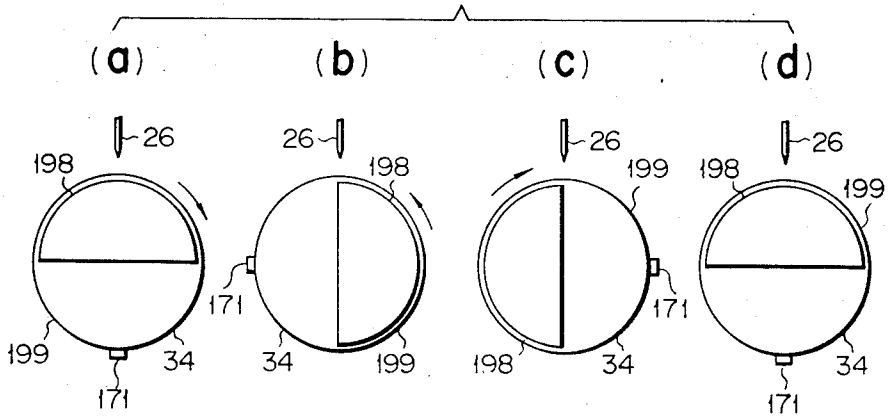
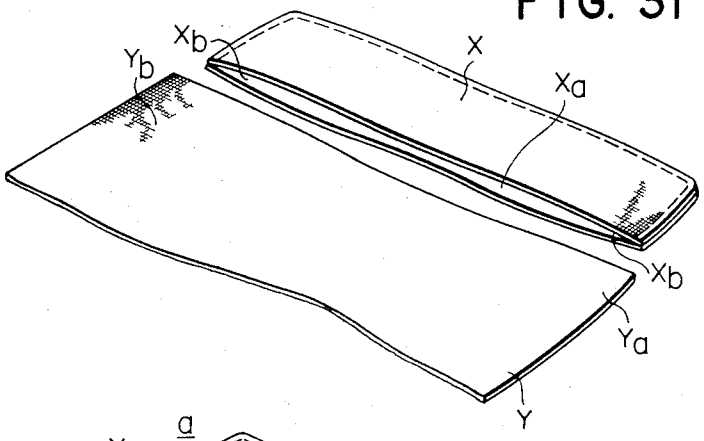


FIG. 31



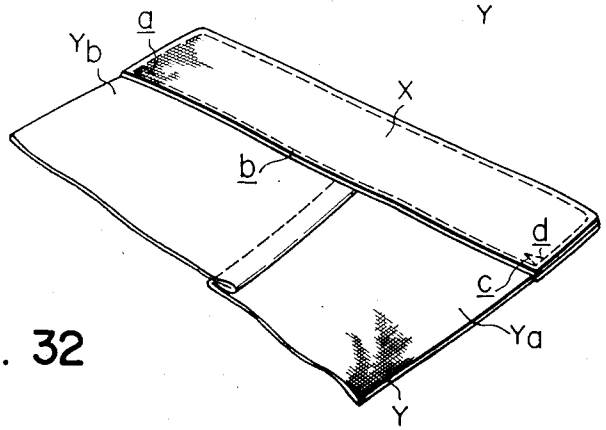


FIG. 32

APPARATUS FOR JOINING TOGETHER TWO PIECES OF WORK FABRIC OR SIMILAR MATERIALS

This invention relates to an apparatus for joining together two pieces of work fabric or similar materials, and more particularly to an apparatus adapted to join together by sewing or with an adhesive two pieces of work fabric or similar materials, for example, a sheeted piece of work fabric and a bag-shaped piece of work fabric such as the sleeves and cuffs of a shirt or the body and collar of a garment.

For example, where there are sewn cuffs to the sleeves of a shirt, the conventional practice is to insert prior to machine sewing the fitted portion of the sleeve into the cuff while tucking said sleeve and conduct both pieces between the work pressure and feeding mechanisms of an ordinary sewing machine in a superposed state so as to finally sew them together.

With such prior art method, however, the operator has to superpose a sleeve and cuff each time they are sewn together. This work is very troublesome, eventually resulting in the decreased work efficiency and extreme fatigue of the operator. Moreover, superposition of the sleeve and cuff is performed simply by the operator's senses and consequently becomes irregular, thus failing to provide, for example, a straight stitching line required for the operator to guide said superposed pieces of work fabric through a sewing machine so as to finally sew them together. Since this type of sewing requires skill as well as due to shortage of man power and elevated personnel cost, there has been strongly voiced demand for automation or mechanization of said sewing work.

It is accordingly an object of this invention to provide an apparatus for joining together two pieces of work fabric or similar materials efficiently in an attractive form.

Another object of the invention is to provide an apparatus for joining two pieces of work fabric or similar materials efficiently and uniformly without any skill.

Another object of the invention is to provide an apparatus for joining together two pieces of work fabric in a cylindrical form, as in the case of the sleeves and cuffs of a shirt.

Still another object of the invention is to provide an apparatus for fitting together a sheeted piece of work fabric and a pouch-shaped piece of work fabric such as the sleeves and cuffs of a shirt or the body and collar of a garment.

Still another object of the invention is to provide an apparatus having means for reliably opening a pouch-shaped piece of work fabric when it is to be joined together with a sheeted piece of work fabric.

A further object of the invention is to provide an apparatus adapted reliably to introduce a sheeted piece of work fabric into the opening of a pouch-shaped piece of work fabric.

A further object of the invention is to provide an apparatus for automatically bringing a sheeted piece of work fabric to a state adapted to be sewn to the inside of the opening of a pouch-shaped piece of work fabric when they are sewn together.

Further advantages of this invention will be apparent by reference to the later described embodiments.

According to the invention, there is provided an apparatus for joining together two pieces of work fabric

or similar materials at their edges comprising a first support for setting one of said two pieces; a second support for setting the other of said two pieces; means for moving at least one of said supports to superpose those edges of said pieces which are to be joined together; and means for joining together the superposed portions of said two pieces.

The present invention can be more fully understood from the following detailed description when taken in conjunction with reference to the appended drawings, in which:

FIG. **1** is a schematic elevation of the apparatus of this invention fitted to the table of a sewing machine;

FIG. **2** is a plan view of the same;

FIG. **3** is an enlarged elevation of a switch box;

FIGS. **4A** and **4B** taken together as one figure presents an assembly of a sewing machine and a sleeve end catcher;

FIG. **5** is an elevation of a drum bed;

FIG. **6** is a sectional view on line I—I of FIG. **4**;

FIG. **7** is a developed view of a cylindrical cam;

FIG. **8** is an elevation of a switch-fitting disk;

FIG. **9** is a side view of the drum bed;

FIG. **10** is an enlarged perspective view of a cuff catcher;

FIG. **11** is a perspective view of FIG. **10** as taken in the direction of the indicated arrow II;

FIG. **12** is an enlarged side view on line III—III of FIG. **10**;

FIG. **13** is a sectional view on line IV—IV of FIG. **4**;

FIG. **14** is a side view of a sleeve end holder base;

FIG. **15** is an exploded perspective view of a sleeve end holder;

FIG. **16** is a developed plan view of the upper part of the sleeve end holder;

FIGS. **17** and **18** are respectively enlarged sectional views on lines V—V and VI—VI of FIG. **16**;

FIG. **19** is a perspective view of FIG. **4** taken in the direction of the arrow VII;

FIGS. **20** and **21** are respectively side views, partly in section, of the main and auxiliary motors of a drive device;

FIG. **22A**, **22B**, **22C** taken together as one figure presents a circuit arrangement of said drive device.

FIG. **23** is a time chart illustrating the operation of the apparatus of the invention;

FIG. **24** is a view corresponding to FIG. **14** where the sleeve end is set;

FIG. **25** shows part of FIG. **4**;

FIG. **26** is a sectional view as taken on line VIII—VIII of FIG. **25**;

FIG. **27** is a view corresponding to FIG. **26** where the joining edge of the sleeve end is expanded in the cuff;

FIG. **28** illustrates the condition in which the combed members are retracted after the fitting of the sleeve end into the cuff;

FIG. **29** is a view corresponding to FIG. **14**;

FIGS. **30**(*a*) to **30**(*d*) shows changes in the rotation of the drum bed;

FIG. **31** is a perspective view of the cuff and sleeve end; and

FIG. **32** is a perspective view of the cuff and sleeve end which have been fully sewn together.

There will now be described by reference to the appended drawings the application of an apparatus according to an embodiment of this invention to a sewing machine for sewing together the sleeves and cuffs of a

shirt. Referring to FIGS. 1 and 2, reference numeral 11 denotes a sewing machine table on which there are disposed in parallel a right side sewing machine 12 for sewing together the right side sleeve and cuff of a shirt and a left side sewing machine 12' for sewing together the left side sleeve and cuff of the shirt. Below the table 11 at both ends are provided drive mechanisms 13 and 13' for said sewing machines 12 and 12' respectively. Numeral 14 represents a switch box (FIG. 3) positioned at the center of the upper front part of the table 11. In said switch box 14 are received the switches, lamps, etc. associated with the later described control circuits for the sewing machines 12 and 12'. On the table 11 are juxtaposed members 15 and 15' for hanging two shirts in a manner to project ahead of the switch box 14. Below the shirts hangers 15 and 15' are disposed foot petals 16 and 16' for exclusive use with the sewing machines 12 and 12'. Numerals 17 and 18 show the boxes set below the rear part of the table 11 which respectively contain solenoid valves and air control device associated with the aformentioned control circuit. Numeral 19 indicates a box housing a power control device associated with said control circuit.

There will now be described the sewing machines 12 and 12'. Since both units are of the same construction, there will be hereinafter described only the right side machine 12 by reference to FIGS. 4 to 19. Numeral 20 represents a sewing machine frame erected on the table 11. In said frame 20 is provided the main shaft 24 of the sewing machine through bearings 21, 22 and 23. The rear end of the main shaft 24 is made to project outside of the frame 20 to engage a pulley 25. As mentioned later, the main shaft 24 is rotated by the drive mechanism 13, and is intended to cause a needle bar 27 supporting an eye pointed needle 26, located at the front part of the frame 20 to move vertically through a balancing crank 28 and a needle bar crank 29 and also control the movement of all movable parts of the sewing machine including the vertical movement of a counter balance (not shown). Numeral 30 is a drive shaft placed on the lower side of the frame 20 in parallel to the main shaft 24 through bearings 31, 32 and 33, the forward end of said shaft 30 being made to project outside of the frame 20. Numeral 34 represents a first support or stand (hereinafter referred to as a "drum bed") for supporting a cylindrical piece of work fabric. Said first stand 34 has two spokes 34*a* fitted at a peripheral space of, for example, 120° and a shaft sleeve 34*b* located at the base of the spokes 34*a*. The shaft sleeve 34*b* is fixed to the projection at the front part of the drive shaft 30 by means of keys 35 and a nut 36 screwed to said projection. To the substantially middle part of the drive shaft 30 is fixed a small gear 37 through a screw 38. Said small gear 37 is engaged with a large gear 43 which is fixed by a screw 42 to a rockable intermediate shaft 41 positioned above the drive shaft 30 in parallel therewith by means of bearings 39 and 40. In this case, the number of teeth of the small gear 37 bear the ratio of, for example, 1 : 3 to those of the large gear 43. Numeral 44 as shown in FIG. 6 is a rotatable shaft supported by bearings 45 and 46 to dispose in the frame 20 below the main shaft 24 at right angles thereto. To the rotatable shaft 44 is fixed by a screw 48 a worm wheel 47 which in turn is made to engage a worm 50 fixed to the substantially middle part of the main shaft 24 by a screw 49. To the rotatable shaft 44 is fitted by a screw 51 a small gear 52 which in turn is made to engage a large gear 57 positioned in the frame 20 slantwise below the rotatable shaft 44 and fixed integrally with a cylindrical cam 56 to a rotatable shaft 55 carried on bearings 53 and 54. The above arrangement reduces the rotating speed of the main shaft 24 and causes the cylindrical cam 56 to be turned in the direction of the indicated arrow A (FIG. 4). Numeral 58 denotes a substantially L-shaped cam lever, the bent portion of which is rotatably supported on a shaft 60 fixed to the rear wall of the frame 20 by a screw 59. To the end of the upright section of the L-shaped lever 58 is fitted a roller 62 inserted into the later described cam groove 61 (FIG. 6) formed in the cylindrical cam 56. Between the upright section of the L-shaped lever 58 and a spring holder 63 provided in the frame 20 is stretched an extension spring 64 (FIG. 6) normally to supply the cam lever 58 with a force to rotate in the direction of the indicated arrow B. To the end of the horizontal section of the L-shaped cam lever 58 is connected the end of the piston rod 66a of an air cylinder 66 fixed to the frame 20 by a fitting member 65 so as to pull the L-shaped cam lever 58. When there is introduced air into the air cylinder 66 in the manner as later described to bring down the piston rod 66a, then the L-shaped lever 58 swings opposite to the direction of the indicated arrow B against the force of the draw spring 64. To the upright section of the L-shaped cam lever 58 is fixed by a screw 68 an intervening plate 67 (FIG. 4) substantially presenting a horizontally throun rectangular C-shape in cross section with an angular groove 67*a*. Behind the intervening plate 67 is fixed a rockable lever 69 to the rockable intermediate shaft 41 by a bolt 70. The lower end portion of the rockable lever 69 is perforated with an arcuate hole 69*a* (FIG. 6) through which the aforesaid shaft 60 passes. The upper half of the rockable lever 69 is bored with an elongated hole 69*b* extending lengthwise thereof. Through the elongated hole 69*b* is inserted a connection pin 71 into the angular groove 67*a*.

As shown in FIGS. 6 and 7, the groove 61 of the cylindrical cam 56 is constituted by a first arcuate groove section 61a having substantially the same radius as the locus along which the roller 62 moves with the rotation of the cam lever 58; a second groove section 61*b* connected to the right end of the first groove section 61*a* and directed slightly toward the edge 56a of the cylindrical cam 56; a third groove section 61*c* connected to the second groove section 61b and slightly directed toward the edge 56*b* of the cylindrical cam 56 along its periphery; a fourth groove section 61*d* connected to the third groove section 61*c* and slightly directed in an opposite direction to the edge 56*b* of the cylindrical cam 56; a fifth groove section 61*e* connected to the fourth groove section 61*d* and also the the left end of the first groove section 61a and slightly directed toward the edge 56*b* of the cylindrical cam 56; and an overrun groove section 61*f* connected to the fifth groove section 61*e* and extending opposite to the direction of the indicated arrow A (FIG. 4). The first groove section 61*a* has a width slightly broader than the diameter of the roller 62, and the remaining groove sections 61*b* to 61*f* have a width substantially equal to the diameter of the roller 62. The groove 61 of the cylindrical cam 56 is so designed as to cause the cam lever 58 to rock through the roller 62 with the rotation of the cylindrical cam 56 within the range of peripheral angle of substantially 60°. When, therefore, the connection pin 71 of

the rockable lever **69** is brought to the same horizontal plane as the roller **62** of the cam lever **58**, then the rocking of the cam lever **58** within the aforementioned range of substantially 60° concomitant with the rotation of the cylindrical cam **58** causes the rockable intermediate shaft **41** to rock similarly within the range of approximately 60° through the rockable lever **69**. The rocking of the cam lever **58** is further multiplied three fold through the gears **43** and **37** and transmitted to the drive shaft **30**, eventually causing the drum bed **34** to rock through an angle of approximately 180°. In this case, the drum bed **34** rocks opposite to the rocking direction of the cam lever **58**, because the rocking stroke of the drum bed **34** has to be multiplied by the gears **43** and **37**. Numeral **72** (FIG. **6**) shows a switch lever fixed to the rotatable shaft **55** so as to face a switch panel **74** fitted to the right side wall of the frame **20** by a screw **73**. While the roller **62** of the cam lever **58** remains inserted into the first groove section **61**a of the cylindrical cam **56**, the switch lever **72** is so designed as to turn upward. To the upper end of the switch lever **72** is fixed a magnet **75** by a screw **76**. There is fitted to the switch panel **74** a stop switch **77** such as a lead switch; a speed reduction switch **78** such as a lead switch to that part of the switch panel **74** which is slightly displaced opposite to the rotating direction of the switch lever **72**, that is, the direction of the indicated arrow A; and an overrun detecting switch **368** such as a lead switch at that part of the switch panel **74** which is slightly displaced in the direction of the indicated arrow A, all these switches being so disposed as to closely face the magnet **75**. When the magnet **75** approaches said switches **77**, **78** and **368**, they are closed, opened and closed respectively. Numeral **79** is a switch fitting disk (FIG. **8**) fixed to the frame **20** so as to loosely engage the drive shaft **30**. To the drive shaft **30** is fixed a switch lever **80** by a screw **81** so as to face the disk **79**. The switch lever **80** is so designed as to turn upward when the roller **62** of the cam lever **58** is brought to the substantially central part of the first groove section **61**a of the cylindrical cam **56** (the position of the drum bed **34** at this time is referred to as "a bed center position") To the upper end of the switch lever **80** is fixed a magent **82**. To the switch fitting disk **79** is fixed a bed center detecting switch **83** such as a lead switch so as to closely face the magnet **82** when the switch lever **80** turns upward. Further to that part of the disk which is displaced about 90° clockwise from the bed center detecting switch **83** (FIG. **8**) a start switch **84** such as a lead switch. These switches **83** and **84** are closed when the magnet approaches them upon the rotation of the switch lever **80** together with the drum bed **34**.

There will now be described the drum bed **34** by reference to FIGS. **5** and **9**. The spokes **34**a are omitted from FIG. **5** to illustrate the operation of the invention. The periphery **34***c* of the rear section of the drum bed **34** has a slightly smaller diameter than the periphery **34***d* of its forward section, presenting a stepped appearance. To the periphery **34***c* of the rear section is fitted a semicircular cuff supporting stand **85** whose curvature has substantially the same radius as the drum bed **34**. When the drum bed **34** takes the bed center position, the cuff stand **85** is so designed as to be located at the upper half portion of the rear periphery **34***c*. Both ends of the cuff stand **85** are bent outward to form fitting portions **85***a* and **85***b*. Numerals **86** and **87** represent support plates substantially presenting a horizontally thrown rectangular C-shape which are fixed to the periphery of the drum bed **34** by screws **88** and **89** so as to face the fitting portions **85***a* and **85***b*. To the support plates **86** and **87** are fixed guide cylinders **90** and **91** so as to penetrate them vertically. Into the guide cylinders **90** and **91** are inserted guide rods **92** and **93** so as to travel vertically therethrough. To the screw threaded upper end of the guide rod **92** is fixed the fitting portion **85***a* by a nut **95** through a washer **94**. To the similarly screw threaded upper end of the guide rod **93** is fixed the fitting portion **86***a* by a nut **97** through a washer **96**. Across the fitting portion **85***a* and support plate **86** and across the fitting portion **85***b* and support plate **87** are stretched extension springs **98** and **99** so as to normally urge the cuff stand **85** downward and press it against the periphery **34***c* of the rear section of the drum bed **34**. The drum bed **34** and cuff support **85** have such a dimensional relationship that when the cuff support **85** is pressed against the rear periphery **34***c* of the drum bed **34**, the forward periphery **34***d* of the drum bed **34** and the periphery of the cuff support **85** are rendered substantially flush with each other. When the guide rods **92** and **93** are pushed from below in the manner as later described, the aforementioned arrangement causes the cuff support **85** to be moved upward against the force of the extension springs **98** and **99**. Said upward movement is limited when stoppers **100** and **101** fitted to the lower ends of the guide rods **92** and **93** strike against the lower ends of the guide cylinders **90** and **91**.

On the lower inner walls of the forward section of the drum bed **34** are formed fitting portions **34***e* and **34***f* (FIG. **5**) peripherally spaced, for example, 120°. To the fitting portions **34***e* and **34***f* are rotatably fitted cuff catchers **104***a* and **104***b* by pins **102** and **103** respectively. There will now be described the cuff catcher **104***a*, for example, by reference to FIGS. **10**, **11** and **12**. The upper part of the cuff catcher **104***a* is obtusely bent. Into the end of the bent portion is rotatably inserted a rotatable shaft **106***a* having a cuff catching pawl **105***a* integrally formed at the end. To that side of the rotatable shaft **106***a* which is disposed opposite to the cuff catching pawl **105***a* are fixed a small diameter ratchet wheel **107***a* and a depressible strip **108***a*. In that side of the rotatable shaft **106***a* to which there is fitted the cuff catching pawl **105***a* is formed a groove **109***a* which partly extends over the periphery of the rotatable shaft **106***a*. To one side of the bent portion of the cuff catcher **104***a* is fixed by a screw **112***a* (FIG. **12**) a rotation controlling member **111***a* having a protrusion **110***a* which is inserted into the groove **109***a*. Therefore, the movement of the rotatable shaft **106***a* is restricted within the length of the groove **109***a*. The bent portion of the cuff catcher **104***a* is penetrated by a guide pin **113***a* which is disposed parallel with the rotatable shaft **106***a* and allowed to move in its axial direction. Aside the ratchet wheel **107***a* is provided a ratchet pawl **114***a* (FIG. **11**) concurrently acting as a stopper for preventing the rotation of the ratchet wheel **107***a* in the direction of the indicated arrow C by engagement with said wheel **107***a*. To that side of the guide pin **113**a which faces the ratchet pawl **114***a* is connected one end of a wire spring **116***a* having the other end fixed to the side of the cuff catcher **104***a* by a screw **115***a* so as to normally cause the guide pin **113***a* to project to that side of the cuff catcher **104***a* which faces the cuff catching pawl **105***a*, thereby allowing the ratchet pawl **114***a* to

engage the ratchet wheel 107*a*. This ratchet wheel 107*a* is provided with a notch 117*a* which receives the ratchet pawl 114*a* when the rotatable shaft 106*a* turns opposite to the direction of the indicated arrow C. About the rotatable shaft 106*a* is wound a coil spring 118*a*, one end of which is fixed to the shaft 106*a* and the other end of which is fixed to the bent portion of the cuff catcher 104*a*, thereby normally supplying the shaft 106*a* with a force to rotate in the direction of the indicated arrow C. When the depressible strip 108*a* is pushed opposite to the direction of the indicated arrow C in the manner as later described to make a maximum rotation the rachet wheel 107*a* engages the ratchet pawl 114*a*, bringing the rotatable shaft 106*a* to a maximum rotated position. When, under this condition, the guide pin 113*a* is pushed against the force of the wire spring 116*a*, the ratchet wheel 107*a* is disengaged from the ratchet pawl 114*a*, causing the rotatable shaft 106*a* to turn back in the direction of the indicated arrow C by the force of the coil spring 118*a*. A cuff catcher 104*b* is operated in substantially the same manner as the cuff catcher 104*a* except that the former is constructed in horizontally symmetrical relationship with the latter. The parts of the cuff catcher 104*b* the same as those of the cuff catcher 104*a* are denoted by the same numerals suffixed with the letter *b*, and description thereof is omitted. The cuff catchers 104*a* and 104*b* are normally made to rotate in a mutually separating direction, that is, a direction departing from the center of the drum bed 34, by the force of wire springs 119 and 120 respectively (FIG. 5). Under this condition, the guide pins 113*a* and 113*b* of the cuff catchers 104*a* and 104*b* are pressed against the inner walls of the front opening of the drum bed 34 to be pushed against the force of the wire springs 116*a* and 116*b*, causing the rotatable shafts 106*a* and 106*b* to make a maximum rotation in the direction of the indicated arrow C. At this time, the respective ends of the cuff pawls 105*a* and 105*b* of the rotatable shafts 106*a* and 106*b* project from the front opening of the drum bed 34 in the direction of its diameter. Said pawls 105*a* and 106*b* are designed to extend in the axial direction of the drum bed 34 (FIG. 9), defining a prescribed space with the periphery 34d of the forward section of the drum bed 34. When the depressible strips 108*a* and 108*b* are pushed to cause the rotatable shafts 106*a* and 106*b* to make a maximum rotation opposite to the direction of the indicated arrow C, then the cuff pawls 105*a* and 105*b* rotate in the direction to be brought ahead of the front opening of the drum bed 34 in substantially parallel relationship therewith. Numeral 121 is a cuff catching air cylinder (FIG. 5) disposed between the cuff catchers 104a and 104*b*. One end of the piston rod 121*a* of the air cylinder 121 is pivoted to the cuff catcher 104*a* through a connecting member 122 by means of a pin 123, and the air cylinder 121 is rotatably connected to the cuff catcher 104*b* through a connecting member 122 by means of a pin 123, and the air cylinder 121 is rotatably connected to the cuff catcher 104*b* at the rear end through a connecting member 124 by means of a pin 125. When there is introduced air into the air cylinder 121 in the manner as later described, the piston rod 121*a* moves in the direction of the indicated arrow D to cause the air cylinder 121*a* itself to travel accordingly opposite to the direction of the indicated arrow D. As a result, the cuff catchers 104*a* and 104*b* rotate toward the center of the drum bed 34 against the force of the wire springs 119 and 120.

The frame 20 has a bearing cylinder 20*a* disposed in the upper inside of the drum bed 34. Into the cylinder 20*a* is inserted a loop taker assembly shaft 128 so as to rotate through bearings 126 and 127. To the rear end of the loop taker assembly shaft 128 is fixed a bevel gear 129, which engages another bevel gear 133 fixed to the lower end of a rotatable shaft 132 disposed in the frame 20 so as to move vertically through bearings 130 and 131 (FIG. 4). To the upper end of said rotatable shaft 132 is fixed another bevel gear 134, which engages another gear 135 fixed at an intermediate point on the main shaft 24. The aforementioned arrangement enables the rotation of the main shaft 24 to be transmitted to the loop taker assembly shaft 128. To the forward end of the loop taker assembly shaft 128 is fixed a loop retainer 136*a* of a loop taker assembly 136, for example, by a screw (FIG. 5). Numeral 137 is a support plate fixed to the front part of the bearing cylinder 20*a*. To the support plate 137 is fixed by a screw 139 a loop taker stopper 138 for fixing a loop taker 136*c* receiving a bobbin case 136*b*. The loop taker stopper 138 has an integrally formed a work fabric support 138*b* bored with a needle hole 138a penetrated by the sewing needle 26 (FIG. 4). Numeral 140 denotes a thread cutting device positioned above the loop taker assembly 136 (FIG. 5). Said cutting device 140 has a stationary blade 140*a* fixed to the support plate 137 and a movable blade 140*b* fixed to a rotatable arm 142 fitted to a rockable shaft 141. This rockable shaft 141 is placed in the bearing cylinder 20*a*, and has its rear end fitted with an actuating arm 143. To the free end of the actuating arm 143 is connected the upper end of the piston rod 144*a* of a thread-cutting air cylinder 144 which is fixed to a fitting plate 145 attached to the frame 20. When there is introduced air into the air cylinder 144 from one side in the manner as later described to push the piston rod 144*a* upward, then the movable blade 140*b* is made to rotate in the direction of the indicated arrow E through the actuating arm 143, rockable shaft 141 and rotatable arm 142 to catch the upper and lower threads. Later when there is conducted air into the air cylinder 144 from the other side to bring down the piston rod 144*a*, causing the movable blade 140*b* to rotate opposite to the direction of the indicated arrow E, then the movable blade 140*b* cuts the upper and lower threads in co-operation with the stationary blade 140*a*.

To the upper rear end of the periphery 34*c* of the rear section of the drum bed 34 are screwed substantially at right angles a pair of main cuff holder supports 146 and 147 provided with forked pivotal portions 146*a* and 147*a* respectively. These main cuff holder supports 146 and 147 are designed to define an angle of substantially 45° to the right and left with respect to a perpendicular line passing through the center of the drive shaft 30 of the drum bed 34. To the pivotal portions 146*a* and 147*a* of said supports 146 and 147 are rotatably fitted main cuff holders 150 and 151 through shaft pins 148 and 149. To the forward ends of the main cuff holders 150 and 151 extending ahead of the drum bed 34 are screwed keep plates 152 and 153 respectively which are curved within the range of approximately 45° and have substantially the same radius as the drum bed 34. The forward ends of the keep plates 152 and 153 are designed to fall in line with the forward end of the drum bed 34. The shaft pins 148 and 149 are wound with coil

springs 154 and 155 to cuase the main cuff holders 150 and 151 to rotate in the driection in which the keep plates 152 and 153 are pressed against the periphery 34d of the forward section of the drum bed 34. Numerals 156 and 157 represent air cylinders for lifting the main cuff holders 150 and 151. These air cylinders 156 and 157 are fitted to the frame 20, for examle, through fitting plates in such a manner that when the drum bed 34 takes the bed center position, the piston rods 156*a* and 157*a* of said air cylinders 156 and 157 are made to face the depressible portions 150*a* and 151*a* which respectively constitute the rear end surfaces of the main cuff holders 150 and 151. When there is introduced air into the air cylinders 156 and 157 in the manner as later described to bring down the piston rods 156*a* and 157*a*, thereby to push the depressible portions 150*a* and 151*a* of the main cuff holders 150 and 151, then said holders 150 and 151 rotate against the force of the coil springs 154 and 155 wound about the shaft pins 148 and 149, causing the keep plates 152 and 153 to move about the periphery of the drum bed 34. To the rear end of the cuff support 85 is screwed a supplementary cuff holder support 158 provided with a formed pivotal portion, said support 158 being positioned at the substantially middle point between the main cuff holder supports 146 and 147. To the pivotal portion 158*a* is fitted a supplementary cuff holder 160 through a shaft pin 159. To the end of the supplementary cuff holder 160 is screwed a supplementary keep plate 161 (FIG. 9), which is corved with substantially the same radius as the cuff support 85. In this case, the forward edge of the supplementary keep plate 161 and the forward edge of the cuff support 85 are designed to fall in line with each other. The shaft pin 159 is wound with a coil spring 162 to cause the supplementary cuff holder 160 to rotate in the direction in which the supplementary keep plate 161 is pressed against the cuff support 85. Numeral 163 is an air cylinder for lifting the supplementary cuff holder 160. This air cylinder 163 is fitted to the frame 20, for example, through a fitting plate in such a manner that when the drum bed 34 takes the bed center position, the piston rod 163*a* of said cylinder 163 faces a depressible portion 160*a* constituting the upper rear end surface of the supplementary cuff holder 160. When there is introduced air into the air cylinder 163 in the manner as later described to bring down the piston rod 163a of said cylinder 163 thereby to push the depressible portion 160a of the supplementary cuff holder 160, then said holder 160 rotates against the force of the coil spring 162, causing the supplementary keep plate 161 to move above the cuff support 85.

Numeral 164 denotes a support member (FIGS. 4 and 13) fixed to the bottom plate of the frame 20 by stepped screws 165. This support member 164 has a box shape open at the bottom. In said bottom opening below the drum bed 34 is provided a shaft cylinder 164a extending ahead of said drum bed 34 in its axial direction. To the inner wall of one side of the aforesaid support member 164 is fixed a fitting strip 166, for example, by a screw. To said fitting strip 166 is fixed by a screw 168 an air cylinder 167 for stopper release. The piston rod 167a of the air cylinder 167 is made to project through the front wall of the support member 164. Numeral 169 is a forked stopper support plate fixed to the outer front wall of the support member 164. To the intermediate part of the forked portion of the support plate 169 is pivoted one end of a movable stopper 171 by a shaft pin 170. To the substantially middle point of the stopper 171 is rotatably connected the projecting end of the piston rod 167*a* through a fitting plate 172 and shaft pin 173. Numeral 174 denotes a stationary stopper fixed to the rear end of the periphery of the drum bed 34 by screws 175 in such a manner that when the drum bed 34 takes the bed center position, said stopper is brought to the lowest level. This stationary stopper 174 is pressed against the movable stopper 171 when the drum bed 34 takes the bed center position, thereby preventing said drum bed 34 from rotating in the direction of the indicated arrow F (FIG. 5). The piston rod 167*a* of the air cylinder 167 is normally urged in the direction of the indicated arrow G by a spring contained in the cylinder 167 to bring the movable strip 171 to a state ready to be pressed against the stationary stopper 174. When, under this condition, there is introduced air into the air cylinder 167 in the manner as later descirbed, then the piston rod 167*a* moves opposite to the direction of the indicated arrow G against the force of the spring contained in said cylinder 167, causing the movable stopper 17 to rotate in the direction of the indicated arrow H so as to be prevented from being pressed against the stationary stopper 174. To the right and left walls of the support box 164 are fixed outward extending support arms 176 and 177. To the respective ends of these support arms 176 and 177 are fixed, for example, by nuts 180 and 181 air cylinders 178 and 179 for lifting the cuff support 85 (FIG. 5). The piston rods 178*a* and 179*a* of said air cylinders 178 and 179 are made to face the lower ends of the guide rods 92 and 93 respectively when the drum bed 34 takes the bed conter position. When there is conducted air into the air cylinders 178 and 179 in the manner as later described to lift the piston rods 178*a* and 179*a* thereby to push the guide rods 92 and 93, then the cuff support 85 is detached from the periphery of the drum bed 34 to move upward.

Numerals 182 and 183 are guide shafts fixed parallel with the shaft cylinder 164*a* of the support member 164 (FIGS. 4 and 5). There guide shafts are engageable with the guide holes 185 and 186 (FIG. 14) perforated on the right and left sides of the lower end of a sleeve end holder base 184 to move it along the guide shafts 182 and 183. To the guide shafts 182 and 183 is fixed a cylinder support 187, for example, by a screw so as to bridge them. To the cylinder support 187 is fixed by a nut 189 an air cylinder 188 for shifting the holder 184. The piston rod 188a of the air cylinder 188 is connected by a nut 190 to the lower part of the holder 184. To the end of the guide shaft 182 and 183 is fitted, for example, by a screw a stopper 191 (FIG. 4) for restricting the movement of the holder base 184 in an opposite direction (hereinafter referred to as the retracting direction) to that in which the drum bed 34 moves (hereinafter referred to as the downward preceeding direction). On the head 184*a* (FIG. 4) of the holder base 184 is mounted a sleeve end holder base support 192, to which there is fixed, for example, by a screw the upper end of the vertically sliding shaft 193 (FIG. 4). The lower end of the vertically sliding shaft 193 penetrates an intermediate wall 184*b* formed at the substantially middle part between the head 184*a* and the sleeve end holder base 184 so as to project downward. To the projecting lower end of the vertically sliding shaft 193 is fitted a stop ring 194. Between the stop ring 194 and

the intermediate wall 184*b* is stretched a spring 195 normally to urge the vertically sliding shaft 193 downward, thereby causing the holder base support 192 to be pressed against the upper end of the head 184*a* of the holder base 184. To the intermediate wall 184*b* of the holder base 184 is fixed, for example, by a nut, an air cylinder 196 (FIG. 4) for lifting the holder base 184. The piston rod 196*a* of the air cylinder 196 is inserted into a through hole 184*c* vertically bored in the head 184*a* of the holder base 184. The piston rod 196*a* and vertically sliding shaft 193 are connected by being fixed to a connection plate 217 by screws 218 and 219 respectively. When there is introduced air into the air cylinder 196 in the manner as later described to push up the piston rod 196*a*, then the vertically sliding shaft 193 is lifted through the connection plate 217 agianst the force of the spring 195. Into the sleeve end holder base support 192 is inserted a horizontal stationary shaft 197, which is fixed, for example, by a screw so as to have one end to project forward. To the projecting end of the stationary shaft 197 are fitted both holders 198 and 199 (FIG. 4) through the shaft cylinders 198*a* and 199*a* associated therewith. The left holder 198 is formed into a sectorial shape defining a peripheral angle of substantially 90° and has a rearwardly extending arcuate flange 198*b* formed on the upper edge (FIG. 15). The right holder 199 has a sectorial shape defining a peripheral angle of approximately 45° and has a rearwardly extending arcuate flange 199*b* formed on the upper edge. On the arcuate flanges 198*b* and 199*b* of the left and right holders 198 and 199 are mounted combed members 200 and 201 respectively (FIG. 15), each of which is formed of a base portion having substantially the same curvature of the corresponding arcuate flange and a large number of teeth extending forward. On the underside of both holders 198 and 199 are disposed a substantially crescent plate 202 for actuating the combed members 200 and 201. This actuating plate 202 has a forward extending flange 202*a* formed on the upper edge so as to be aligned with the aforesaid flanges 198*b* and 199*b*. The flange 198*b* of the left sleeve end holder 198 has four equally spaced elongated holes 198*c* (FIG. 15) extending in the crosswise direction. Those parts of the combed member 200 and the combed member actuating plate 202 which correspond to the four elongated holes 198*c* of the left holder 198 are bored with four through holes 200*a* and 202*b* respectively. Into the through holes 200*a* and 202*b* and the elongated holes 198*c* are inserted pins 203 from above. The lower ends of the pins 203 are caulked to connect the combed member 200, combed member actuating plate 202 and left holder 198. The flange 199*b* of the right holder 199 are perforated with two elongated holes 199*c* disposed at a prescribed space and extending in the crosswise direction. Those parts of the combed member 201 which correspond to said elongated holes 199*c* are bored with two through holes 201*a*. The right side of the flange 202*a* of the combed member actuating plate 202 is perforated with a single elongated hole 202*c* extending in the lengthwise direction longer than the interspace between the two elongated holes 199*c* formed in the flange 199*b* of the right holder 199. Below the flange 202*a* is disposed a supplementary plate 204 having two through holes 204*a* bored at those parts which correspond to the elongated holes 199*c*. Into the through holes 201*a* and 204*a* and the elongated holes 199*c* and 202*c* are inserted pins 205 from above, the lower ends of which are caulked to connect the combed member 201, supplementary plate 204, right holder 199 and combed member actuating plate 202. Accordingly, the combed members 200 and 201 are made to move back and forth relative to the left and right holders 198 and 199 together with the combed member actuating plate 202 within the length of the elongated holes 198*c* and 199*c*. The left holder 198, combed member 200 and combed member actuating plate 202 jointly rotate relative to the right sleeve end holder 199 around the stationary shaft 197 within the length of the elongated hole 202*c*. The right sleeve end holder 199 and combed member 201 jointly rotate relative to the left sleeve end holder 198 around the stationary shaft 197 within the length of the elongated hole 202*c*. The shaft cylinder 198*a* of the left sleeve end holder 198 is wound with a wire spring 206, one end of which engages a projection 198*d* formed on the front side of the left sleeve end holder 198 (FIG. 14), thereby normally supplying the left and right sleeve end holders 198 and 199 with a force to rotate in opposite directions (hereinafter referred to as the sleeve end holder opening direction). While the sleeve end holder base 184 is advancing, the rotation of the left and right sleeve end holders 198 and 199 are restricted, as later described (FIG. 25), due to the open sides of the sleeve end holders 198 and 199 being pressed against the ends of the sleeve end holder driving levers 209 and 210 which are fixed to the center of the two spokes 34*a* of the drum bed 34 by screws 207 and 208 and extend forward so as to make the ends of the levers 209 and 210 parallel with each other. Under this condition, the left and right holders 198 and 199 are made to open in a substantially semicircular form. Numeral 211 represents an air cylinder (FIG. 4) fixed to the combed member actuating plate 202 by a nut 212. The end of the piston rod 211*a* of the air cylinder 211 is connected to the left sleeve end holder 198. When there is conducted air into the air cylinder 211 from one side in the manner as later described to push the piston rod 211*a* thereinto, then the combed member actuating plate 202 and consequently the left and right combed members 200 and 201 proceed accordingly. When there is brought air into the air cylinder 211 from the other side to urge the piston rod 211*a* in the opposite direction to the preceding case, then the combed members 200 and 201 retract. Numeral 213 is a sleeve end catcher releasing pin, the end portion of which penetrates a through hole 214 formed in the left sleeve end holder 198 so as to project forward. The pin 213 is fitted with a stopper 213*a* at the projecting end and has a flange 213*b* formed at the rear end. Across the flange 213*b* and the back side of the left sleeve end holder 198 is stretched a compression spring 215 normally to press the flange 213*b* against the front side of the combed member actuating plate 202. When the left and right sleeve end holders 198 and 199 are closed in the manner as later described and the drum bed 34 takes the bed center position, the sleeve end catcher releasing pin 213 is so designed as to have its end face the depressible strip 108*a* of the sleeve end catcher 104*a*. Numeral 216 is another sleeve end cathcer releasing pin disposed between the right sleeve end holder 199 and combed member actuating plate 202. When the left and right sleeve end holders 198 and 199 are closed and the drum bed 34 takes the bed center position, then the latter pin 216 is so designed as to

have its end face the depressible strip **108***b* of the cuff catcher **104***b*. Numerals **220** and **221** are sleeve end holder closing levers rotatably fitted to both ends of a shaft **222** which is fixed to the sleeve end holder base support **192** by having its intermediate part penetrate crosswise thereof. The levers **220** and **221** have depressible portions **220***a* and **221***a* formed at one end which are pressed against the edges of the left and right sleeve end holders **198** and **199** when they are opened, and lengthwise extending elongated holes **220***b* and **221***b* bored at the other end. Numeral **223** is an air cylinder for actuating a sleeve end holder closing lever, said cylinder being connected to the connection plate **217** by a nut **224.** To the end of the piston rod **223***a* of the cylinder **223** is fixed a fitting member **225** by a nut **226.** The fitting member **225** is crosswise penetrated by a shaft pin **227,** both ends of which are inserted into the elongated holes **220***b* and **221***b* of the sleeve end holder closing levers **220** and **221.** Where there is introduced air into the cylinder **223** from one side to bring down the piston rod **223***a*, then the sleeve end holder closing levers **220** and **221** rotate in the direction of the indicated arrow I, causing the depressible portions **220***a* and **221***a* thereof to be pressed from below against the edges of the open sides of the left and right sleeve holders **198** and **199,** which are consequently closed agianst the force of a coil spring **206.** Where there is brought air into the cylinder **223** from the other side to push up the piston rod **223***a*, then the sleeve end holder closing levers **220** and **221** widely rotate opposite to the direction of the indicated arrow I, preventing the depressible portions **220***a* and **221***a* from pressing the left and right sleeve end holders **198** and **199** thereby to cause them to open in a substantially semicircular from by the wire spring **206.** Numeral **228** (FIG. **14**) is a switch connected to the side of the holder base **184,** for example, by a screw so as to detect the closing of the holders **198** and **199.** The actuator **228***a* of the switch **228** is made to project upward. To the shaft pin **227** is fixed an operating lever **229** which, when the holder closing levers **220** and **221** make a maximum rotation in the direction of the indicated arrow I, to close the holders **198** and **199,** depresses the actuator **228***a* to open the switch **228.** Numeral **230** (FIG. **14**) is a support plate fixed to the open end of the right holder **199** by a screw **231.** The lower end of the support plate **230** is bent substantially in the L shape to constitute a cylinder fitting portion **230***a*, to which there is fixed by a nut **233** an air cylinder **232** for actuating a holder of the right side of the sleeve end. Both sides of the upper part of the support plate **230** are bent in the same direction substantially at right angles so as to face each other, constituting fitting portions **234***b* and **234***c* for the holder of the right side of the sleeve end. To the fitting portions **234***a* and **234***b* are fitted spacers **235** and **236,** for example, by welding. Numeral **237** is a support plate for tucking which is bored at one end with a through hole into which is fitted a bush **238.** The fitting portions **230***b*, **230***c*, **234***a* and **234***b*, spacers **235** and **236** and bush **238** are all penetrated by a support shaft **239** (FIG. **17**), so as to rotatably support the holder **234** of the right side of the sleeve end and the tucking support plate **237.** In this case, the tucking support plate **237** can be made to rest at any desired rotating position by the action of the bush **238.** To the end of the fitting portion **234***b* of the holder **234** of the right side of the sleeve end is fixed by a pin **241** a connector **240** fitted to the end of the piston rod **232***a*. The piston rod **232***a* of the air cylinder **232** is normally pulled downward by a spring contained in the cylinder **232** so as to cause the holder **34** of the right side of the sleeve end to rotate in the direction of the indicated arrow J (FIG. **14**). When there is taken air into the cylinder **232** in the manner as later described, then the piston rod **232***a* is pushed up to cause the holder **234** of the right side of the sleeve end opposite to the direction of the indicated arrow J so as to be pressed against the combed member **201.** To the open end of the left holder **198** is fixed by a screw **243** a similar support plate **242** to the aforesaid support plate **230.** To the cylinder fitting portion **247***a* of the latter support member **242** is fixed by a nut **245** an air cylinder **244** for actuating the holder of the left side of the sleeve end. Numeral **246** is a holder of the left side of the sleeve end formed in horizontally symmetrical relationship with the holder **234** of the right side of the sleeve end (FIG. **18**). To the fitting portions **246***a* and **246***b* of said holder **246** are fixed spacers **247** and **248,** for example, by welding. The fitting portions **242***b* and **242***c* of the support plate **242,** the fitting portions **246***a* and **246***b* of the holder **246** of the left side of the sleeve end and spacers **247** and **248** are penetrated by a support shaft **250** through a spacers **249** so as to rotatably hold the holder **246** of the left side of the sleeve end. To the end of the fitting portion **246***b* of said holder **246** is fixed the end of the piston rod **244***a* of the air cylinder **244** through a connector **251** and pin **252.** This air cylinder also contains a spring which normally urges the piston rod **244***a* downward to rotate the holder **246** of the left side of the sleeve end in the direction of the indicated arrow K. When the air cylinder **244** is supplied with air to push up the piston rod **244***a*, then the holder **246** of the left side of the cuff rotates opposite to the direction of the indicated arrow K to be pressed against the combed member **200.**

To that end of the tucking support plate **237** which is bent substantially in the horizontally reversed L-shape are fitted two parallel tucking guide rods **253** and **254** (FIG. **15**) which are slidably inserted into a tucking pawl **255** having a substantial L-shape. To the ends of the guide rods **253** and **254** are fitted stoppers **256** and **257** to prevent the tucking pawl **255** from falling off. The guide rods **253** and **254** are wound with coil springs **258** and **259** normally to urge the tucking pawl **255** in the direction of the indicated arrow O. To the flange **198***b* of the left sleeve end holder **198** is fixed by a screw **261** a tucking guide plate **260** formed substantially into a horizontally reversed L-shape and provided at one end with an upwardly extending tucking portion **260***a* (FIG. **15**). Referring to FIG. **4,** numeral **262** represents a switch fixed to the cylinder support **187** so as to detect the completion of engagement between the pieces of work fabric. The switch **262** which is normally closed is designed to be opened when the joining of the pieces of work fabric is brought to an end due to the maximum advance of the sleeve end holder base **184** and the actuator **262***a* of said switch **262** is depressed by a push screw **263** fitted to the lower end of said holder base **184.**

There will now be described drive devices **13** and **13'**. Since both devices are of substantially the same arrangement, there is only explained by reference to FIGS. **20** and **21** the drive device **13** of the right side sewing machine **12.** Referring to FIG. **20,** numeral **264** is a main motor housed in a bracket **265** and consisting

of a stator **266** and rotor **267** with a shaft **268.** One end of the rotatable shaft **268** extends forward through a bearing **269.** To the end of the forward extending portion of the shaft **268** is connected by a tightening bolt **271** a flywheel **270** fitted with a brake member **270***a*. Numeral **272** is a hollow bearing cylinder formed in an end bracket on the same axial line of the rotatable shaft **268.** Around the periphery of the bearing cylinder **272** is rotatably arranged an annular worm wheel **275** through a bearing **274** mounted on the extending portion of the end blacket. Numeral **276** is a damping wheel having a brake member **276***a* fixed to one side. This damping wheel **276** is attached to that side of the worm wheel **275** which faces the flywheel **270.** Numeral **277** is a shaft received in the bearing cylinder **272** so as to move in the axial direction through bearings **278** and **279.** To the inner end of said shaft **277** is fixed by a bolt **281** a clutch disk **280** disposed between the brake members **270***a* and **276***a*. To the outer end of the movable shaft **277** is connected a pulley **282** by a bolt **283.** Referring to FIG. **21,** numeral **284** is an auxiliary motor consisting of a stator **285** and a rotor **286.** One end of the rotatable shaft **287** of the rotor **286** is fitted to one end bracket **288** through a bearing **289,** and the other end thereof projects from the other end bracket **290** through a bearing **291.** On the outside of the end bracket **290** are provided inner and outer chambers **292** and **293** partitioned by a double cylindrical wall formed around the rotatable shaft **287.** To that end of the rotatable shaft **287** which projects into the inner chamber **292** is fixed by a bolt **296** a connection ring **295** having its end face fitted with a friction engaging member **294.** In the outer chamber **293** is disposed a clutch coil **297** consisting of, for example, an annular solenoid. Numeral **298** is a clutch side bracket connected to the end bracket **290** and numeral **299** is a worm gear side bracket connected to said clutch side bracket **298** by a bolt **300,** the latter bracket **299** being integrally formed with the end bracket **273** of the main motor **264.** Numeral **301** is a worm engaging the worm wheel **275.** One end of a shaft **302** integrally formed with the worm **301** is rotatably fitted to the outer end of the bracket **299** and the other end of said shaft **302** is inserted into the clutch side bracket **298** with the intermediate part of said other end portion carried on a bearing **303.** Numeral **304** is a coil case placed in the clutch side bracket **298** so as to surround the shaft **302.** The coil case **304** is provided with a brake coil **305,** suction plate **306** and sliding engagement member **307,** and connected to the clutch side bracket **297** by a bolt **308.** Numeral **309** is a clutch disk fitted with a brake member **310** slidably engageably with the sliding engagement member **307.** This clutch disk **309** is disposed between the friction engaging member **294** of the connection ring **295** and the sliding engagement member **307** to be connected to the end of the shaft **302.** Referring to FIG. **20,** numeral **311** is a clutch lever whose intermediate part is pivoted to the support member **273***a* of the end bracket **273** by a pin **312.** The upper end of the clutch lever **311** is associated to the bearing cylinder **277** through an opening **313** formed in the under side of the bracket in a manner that a shaft pin **315** connected to the lever is engaged with the annular groove **314.** The lower end of the clutch lever **311** is connected to an air cylinder **316***b* of which piston rod **316***a* is attached to the end bracket. Between the end bracket **273** and the upper end of the clutch lever **311** is stretched a compression spring **317,** normally causing the clutch lever **311** to rotate in the direction of the indicated arrow L, and also the movable shaft **277** to move in the direction of the indicated arrow M, thereby pressing the clutch disk **280** against the brake member **276***a* of the damping ring **276.** When the air cylinder **316***b* controlled by the coil of an electromagnetic switching valve is supplied with air to be brought down by the action of the piston rod **316***a* thereof, then the clutch lever **311** rotates opposite to the direction of the indicated arrow L and consequently the moveable shaft **277** moves opposite to the direction of the indicated arrow M, thereby causing the clutch disk **280** to be pressed against the brake member **270***a* of the flywheel **270.** Now let it be assumed that the main and auxiliary motors **264** and **284** are energized to be put into operation, and the movable shaft **277** travels opposite to the direction of the indicated arrow M, causing the clutch disk **280** to be pressed against the brake member **270***a* of the flywheel **270.** Then the rotation of the main motor **264** is directly transmitted to the pulley **282** which in turn rotates at high speed. When the moveble shaft **277** is driven in the direction of the indicated arrow M to cause the clutch disk **280** to be pressed against the brake member **276***a* of the damping ring **276** and the clutch coil **277** is energized, then the suction force of said coil **297** causes a clutch disk **309** to engage the friction engagement member **294** of the connection ring **295.** Accordingly, the worm **301** is rotated by the auxiliary motor **284.** This rotation is transmitted to the movable shaft **277** through the worm wheel **275,** damping ring **276** and clutch disk **280,** with the resultant slow rotation of the pulley **282.** When, under the aforementioned condition, the brake coil **305** is energized, the brake member **310** is stopped by slidably contacting the sliding engagement member **307,** causing the pulley **282** to stand at rest. Said pulley **282** is connected to the pulley **25** fitted to the main sewing machine shaft **24** through a V belt **318.** To that side of the main shaft **24** which faces the pulley **25** is attached the known ring switch **319,** which comprises rings **320, 321** and **322** for detecting the fall and rise of the needle and the cut of threads, each being provided with conducting and shut of regions; a common ring **323;** and brushes slidably pressed against said rings. The aforesaid three rings, respectively, constitute a switch **320** S closed when the needle **26** takes substantially lowest and highest positions so as to detect its fall, a switch **321** S for detecting the rise of the needle **26** and a switch **322** S closed for a short length of time immediately before the main shaft **24** of the sewing machine is substantially brought to rest, so as to detect the cut of threads.

There will now be described by reference to the sections A to C of FIG. **22** the control circuit of an apparatus for joining together two pieces of work fabric according to this invention. Numeral **324** is a voltage stepdown transformer. To its primary winding is connected a single phase A.C. source **325,** for example, **220** (V). Both ends of the secondary winding are connected to the A.C. input terminal of a full wave rectifier **326.** The positive end of the D.C. output terminal of the full wave rectifier **326** is divided into two portions, which are connected to control buses paul P′ through the power source switches **327** and **327′** of the right and left sewing machines **12** and **12′** respectively. The negative end of the aforesaid D.C. output terminal is

also separated into two portions which are connected to control buses N and N'. Between the buses P and N and between the buses P' and N' are formed the control circuits **328** and **328'** of the right and left sewing machines **12** and **12'** respectively. Since both circuits **328** and **328'** are of exactly the same arrangement, there will now be described only the control circuit **328** of the right sewing machine **12.** Referring to FIG. **22,** numerals **329** and **330** respectively denote an input indicating lamp fitted to the switch box **14** and an alarm lamp informing the shortage of thread received in the bobbin case **136***b* of the loop taker **136,** namely, the lower thread. Numeral **331** is a counter for counting the number of times the sleeve end and cuff are sewn together. Between the buses P and N is connected the input indication lamp **329.** Further across said section are connected a series circuit consisting of the alarm lamp **330** and a contact **331***a* closed when the counter **331** completes the desired number of sewing operations and another series circuit consisting of the counter **331** and the later described normally open contact $346a_1$ of a sixth relay **346.** Numeral **196L** represents the solenoid of a solenoid valve for supplying air to the air cylinder **196** for lifting the sleeve end holder base **184** and numeral $211L_1$ is the solenoid of a solenoid valve for introducing air into the air cylinder **211** for actuating the combed members **200** and **201** from one side to advance them. These solenoids **196L** and $211L_1$ are arranged parallel and connected between the buses P and N through the serially connected normally closed contact $356b_1$ of the later described seventh relay **356.** To the solenoids **196L** and $211L_1$ is connected in parallel relationship a series circuit consisting of a solenoid **178L** and the normally open contact $345a_1$ of the later described fifth relay **345.** The solenoid **178L** is associated with a solenoid valve for supplying air to the cylinders **178** and **179** for lifting the cuff support **85.** Numeral $156L_1$ is an electromagnetic solenoid for maintaining at a higher position the piston rods **156***a* and **157***a* of the air cylinders **156** and **157** for lifting the main cuff holder and numeral $156L_2$ is the solenoid of a solenoid valve for supplying air to said air cylinders **156** and **157** to bring down the piston rods **156***a* and **157***a* thereof. The electromagnetic solenoid $156L_1$ is connected between the buses P and N serially through a parallel circuit consisting of the normally open contact **347***a* of the later described first timer **347** and the normally open contact **352***a* of the later described fourth timer **352.** Between the buses P and N is also connected the solenoid $156L_2$ through the serially connected normally closed contacts $347b_1$ and **352***b* of the first and fourth timers **347** and **352.** Numeral **332** is a normally open cuff setting switch which is closed when the pedal **16** is worked and numeral **333** is a hand operable normally closed cuff resetting switch fitted to the switch box **14.** Between the buses P and N is connected a first relay **334** through serially connected switches **332** and **333.** Between the buses P and N is further connected a series circuit consisting of the normally open contact $334a_1$ of the first relay **334,** the normally closed contact $364b_1$ of the later described twelfth relay **364,** diode **381,** and the solenoid **121L** of a solenoid valve for supplying air to the air cylinder for actuating the cuff catcher. To the contacts $334a_1$ and $364b_1$ and diode **381** is connected in parallel the normally open contact $365a_4$ of the seventh relay **356.** The juncture of both switches **332** and **333** and the anode fo the diode **381** are connected to each other. Numeral **163L** is the solenoid of a solenoid valve for supplying air to an air cylinder for lifting the auxiliary cuff holder and numeral $211L_2$ is the solenoid of a solenoid valve for supplying air to the cylinder **211** from the other side to retract the combed members **200** and **201.** Between the buses P and N is connected the solenoid **163L** through a series circuit consisting of the normally closed contact **334***b* of the first relay **334** and the normally closed contact $347b_2$ of the first timer **347,** as well as the solenoid $211L_2$ through the normally open contact $353a_1$ of the later described fifth timer **353.** Numerals **335** and **336** are normally open switches for setting the holder of the right side of the sleeve end that of the left side thereof disposed on the right and left side of the table **11** relative to the right side sewing machine **12.** Numerals **337** and **338** are normally closed resetting switches placed adjacent to the aforesaid switches **335** and **336.** Between the buses P and N is connected a series circuit consisting of the switches **335** and **337,** second relay **339** and the normally closed contact **353***b* of the fifth timer **353.** To the switch **335** is connected in parallel the self-holding normally open contact $339a_1$ of the second relay **339.** To a series circuit consisting of the switches **335** and **337** is connected in parallel a series circuit consisting of the switches **336** and **338** and the third relay **340.** To the switch **336** is connected in parallel the self-holding normally open contact **340***a* of the third relay **340.** Numeral **232L** is the solenoid of a solenoid valve for supplying air to an air cylinder **232** for actuating the holder of the right side of the sleeve end and numeral **244L** is the solenoid of a solenoid valve for supplying air to an air cylinder **244** for actuating the holder of the left side of the sleeve end. Between the buses P and N is connected the solenoid **232L** through the normally open contact $339a_2$ of the second relay **339.** To said normally open contact $339a_2$ is connected in parallel a series circuit consisting of the normally open contact $346a_2$ of a sixth relay **346** and a diode **341** of the indicated polarity. The anode of the diode **341** is connected to the common juncture of the switch **340***a* and solenoid **244L** through a diode **382** and further to that juncture of the switches **336** and **338** through a diode **382.** To a series circuit consisting of the diode **341** and solenoid **232L** is connected in parallel the solenoid **244L.** Numeral **342** is a switch fitted to the switch box **14** so as to start the right side sewing machine **12.** Numerals **369***a* and **369***b* are thread-cut detecting switches, either of which is closed or opened interlockingly with the other. Namely, when the upper thread is in normal condition, the switch **369***a* is opened and the switch **369***b* is closed. When the upper thread is cut the switch **369***a* is closed and the switch **369***b* is opened. Between the buses P and N is connected a series circuit consisting of one threadcut detecting switch **369***b,* starting switch **342,** the normally closed contact $356b_2$ of the seventh relay **356,** diode **343** of the indicated polarity, fourth relay **344,** and the normally closed contacts $362b_1$ and $367b_5$ of the later described eleventh and thirtenth relays **362** and **367.** To a series circuit consisting of the switches **369***b* and **342,** contact $356b_2$ and diode **343** is connected in parallel the self-holding normally open contact $344a_1$ of the relay **344.** The anode of the diode **2343** is connected to the bus N through a series circuit consisting of the normally closed contact $356b_1$ of the seventh relay **356,** the nor-

mally open contact $334a_2$ of the first relay **334**, the fifth relay **345** and the normally open contact $356a_1$ of an eighth relay **356**. To the contact $334a_2$ is connected in parallel the switch **228** for detecting the closing of the sleeve end holder, and to the contact $356a_1$ is connected is parallel the normally closed contact $367b_1$ of the later described thirteenth relay **367**. To a series circuit consisting of the contacts $356b_2$ and $334a_2$ and fifth relay **345** is connected in parallel a series circuit consisting of the normally open contact $356a_2$ of the seventh relay **356**, the normally closed contact $362b_2$ of the eleventh relay **362** and the sixth relay **346**. To a series circuit consisting of the switches **369***b* and **342** and contact $356a_2$ is connected in parallel the normally open contact $346a_3$ of the sixth relay **346**. To a series circuit consisting of the switches **369***b* and **342** is connected in parallel a series circuit consisting of the normally open contact $344a_3$ of the fourth relay **344**, the normally open contact **353***a*of the fifth timer **353** and a switch **370** for selecting the automatic or manual sewing operation. The thread-cut detecting switch **369***a* is connected between the buses P and N through a threadcut indicating lamp **371**. Numerals $188L_1$ and $188L_2$ are the solenoids of the solenoid valves for supplying air to the air cylinder **188** for moving the sleeve end holder from either side so as to advance or retract the sleeve end holder base **184**. The solenoid $188L_1$ is connected between the buseds P and N through the normally open contact $345a_2$ of the fifth relay **345**. The common juncture of the contact $345a_2$ and the solenoid $188L_1$ is connected to the anode of the diode **343** through the contact **356***b*. Between the buses P and N is connected the solenoid $188L_2$ through the normally closed contact **346***b* of the fifth relay **345**. Numeral $223L_1$ is the solenoid of a solenoid valve for supplying air to the cylinder **223** for actuating the sleeve end holder closing lever from one side to bring down the piston rod **223***a* and close the right and left sleeve end holders **198** and **199**. Numeral $223L_2$ is the solenoid of a solenoid valve for supplying air to the air cylinder **223** from the other side to lift the piston rod **223***a*. These solenoids $223L_1$ and $223L_2$ are connected between the buses P and N through the normally closed contact **351***b* and normally open contact **351***a* of the later described third timer **351** respectively. Numerals **347** and **348** represent first and second timers operating for a short length of time when energized as illustrated in the time chart of FIG. **24**. Between the buses P and N are connected the first timer **347** through a diode **349** of the indicated polarity and the second timer **348** through the normally open contact $357a_2$ of the relay **357** and a diode **350** of the indicated polarity. Numerals **351**, **352** and **353** are third, fourth and fifth timers which, when energized as shown in the time chart of FIG. **24**, are actuated by being successively delayed for a prescribed interval. The third timer **351** is connected between the buses P and N through a switch **262** for detecting the completion of engagement between the pieces of work fabric, the normally closed contact $364b_2$ of the twelfth relay **364** and the diode **354** of the indicated polarity. To the third timer **351** are connected in parallel the fourth and fifth timers **352** and **353** in turn. To the fifth timer **353** is connected a resistor **355** in parallel. The seventh relay **356** is connected in parallel to a series circuit consisting of the contact $364b_2$, diode **354** and third timer **351**. Numeral **167L** is the solenoid of a solenoid valve for supplying air to the air cylinder **167** for stopper release to urge the piston rod **167***a* thereof opposite to the direction of the indicated arrow G. Said solenoid **167L** is connected between the buses P and N through the normally open contact $346a_4$ of the sixth relay **346**. Further between the buses P and N are connected a series circuit consisting of a start detecting switch **84**, the normally open contact $344a_2$ of the fourth relay **344**, the electromagnetic solenoid **316** and the normally closed contact $367b_2$ of the thirteenth relay **367**, and also a series circuit consisting of the normally open contact $357a_3$ of the eighth relay **357**, a speed reduction switch **78** and the eighth relay **357**. The common juncture of the contact $344a_2$ and solenoid **316** is connected to the common juncture of the contact $357a_3$ and switch **78**. Numeral **358** is a ninth relay connected between the buses P and N through the normally open contact $357a_4$ of the eighth relay **357** and the normally closed contact $367b_3$ of the thirteenth relay **367**. To a series circuit consisting of the contacts $357a_4$ and $367b_3$ is connected in parallel a series circuit consisting of the needle fall detecting switch **320** S, the diode **359** of the indicated polarity and the normally open contact $358a_1$ of the ninth relay **358**. To a series circuit consisting of the switch **320** S and diode **359** are connected in parallel a capacitor **360** and the normally closed contact $361b_1$ of the tenth relay **361**. Between the buses P and N is connected a series circuit consisting of the tenth relay **361** and the normally open contact $367a_1$ of the thirtenth relay **367**. To the contact $367a_1$ are connected in parallel a stop switch **77** and a series circuit consisting of the normally open contact $361a_1$ of the tenth relay **361** and the normally closed contact $357b_2$ of the eighth relay **357** in turn. To said contact $357b_2$ is connected in parallel the normally closed contact **382***b* of the fifteenth relay **382**. Between the buses P and N is connected a series circuit consisting of the needle rise detecting switch **321** S, the normally open contact $361a_2$ of the tenth relay **361**, the eleventh relay **362** and the normally closed contact $358b_1$ of the ninth relay **358**. Numeral **66L** is the solenoid of a solenoid valve for supplying air to the air cylinder **66** to draw the cam lever. This solenoid **66L** is connected between the buses P and N through the normally closed contact $362b_3$ of the eleventh relay **362**, the normally closed contact $358b_2$ of the ninth relay **358** and the diode **363** of the indicated polarity. To a series circuit consisting of the contacts $362b_3$ and $358b_2$ and diode **363** is connected in parallel the normally open contact **348***a* of the second timer **348**. To a series circuit consisting of the diode **363** and solenoid **66L** IS connected in parallel a brake coil **305**. Between the buses P and N are connected a series circuit consisting of the normally open contact $362a_1$ of the eleventh relay **362** and clutcher coil **297** and also a series circuit consisting of the normally open contact $356a_3$ of the seventh relay **356**, a bed center detecting switch **83**, the normally closed contact $357b_3$ of the eighth relay **357**, the normally closed contact **344***b* of the fourth relay **344**, and the 12th relay **364**. The fifteenth relay **382** is connected in parallel to a series circuit having the contact $357b_3$ and 12th relay **364**. The common juncture of the contact $362a_1$ and clutch coil **297** is connected to a common juncture of the contacts $362b_3$ and $358b_2$ through the normally open contact $358a_2$ of the ninth relay **358**. To the twelfth relay **364** is connected in parallel a capacitor **373** for recovering its delay. Numeral

365 is an energy stop switch fixed to the switch box 14. Said switch 365 is connected between the buses P and N through a normally closed reset switch 366 interlockingly actuated with the start switch 342 and the 13th relay 367. To the switch 365 is connected in parallel a series circuit consisting of the normally open contact $367a_2$ of the 13th relay 367, overrun detecting switch 368 and the normally closed contact $361b_2$ of the 10th relay 361.

Between the buses P and N is connected a series circuit consisting of the thread-cut detecting switch 322 S, the fourteenth relay 372, the normally closed contact $367b_4$ of the thirteenth relay 367 and the normally open contact $362a_2$ of the eleventh relay 362. Numeral $144L_1$ is the solenoid of a solenoid valve for supplying air to the air cylinder for the thread cut from one side to push up its piston rod 144*a* thereby to swing the movable blade 140*b* in the direction of the indicated arrow E. Numeral $144L_1$ is the solenoid of a solenoid valve for supplying air to the air cylinder 144 from the other side to bring down its piston rod 144*a* thereby to retract the movable blade 140*b* opposite to the direction of the indicated arrow E. Both solenoids $144L_1$ and $144L_2$ are connected between the buses P and N through the normally open contact 372*a* and normally closed contact 372*b* of the 14 th relay 372 respectively. The solenoid valves for supplying air to the aforesaid air cylinders are received in the solenoid valve box 17.

There will now be described by reference to the time chart of FIG. 23 the operation of the apparatus of this invention arranged as described above. FIGS. 4 to 21 present the condition of the apparatus immediately after the power supply switch 327 is thrown. When the power supply switch is closed (time t_1), the first timer 347 is energized for operation through the diode 349 with its normally open contact thereof closed and its normally closed contact opened. Since, at this time, the switch lever 72 is in an upper position, the stop switch 73 is closed to actuate the tenth relay 361 through the switch 73 with the normally open contact of said relay 361 closed and the normally closed contact thereof opened. The other relays and timers remain inoperative, and have the normally open and closed contacts kept in the original state. Under this condition therefore, the solenoid 167L is not energized (due to the contact $346a_4$ being opened), the stopper release air cylinder is not supplied with air and the piston rod 167*a* is urged in the direction of the indicated arrow G by the spring contained in the cylinder, bringing the movable stopper 171 to a position to be pressed against the stationary stopper 174. When the solenoid 66L is energized through the contacts $362b_3$ and $358b_2$ and diode 363, the cam lever drawing air cylinder 66 is supplied with air to bring down its rod 66*a*, causing the cam lever 58 to rotate opposite to the direction of the indicated arrow B against the force of the draw spring 64. As a result, the drum bed 34 rotates in the direction of the indicated arrow F with its stroke magnified three fold by the gears 43 and 37, and is thereafter brought to rest when the stationary stopper 175 is pressed against the movable stopper 171, that is, stops at the bed center position. At this time the roller 62 of the cam lever 58 is located at the substantially central part of the first cam groove 61*a* of the cylindrical cam 56. When the drum bed 34 rotates in the direction of the indicated arrow F, the electromagnetic solenoid $156L_1$ is energized through the contact 347*a* of the first timer 347 to push up the piston rods 196*a* and 157*a* of the air cylinders 156 and 157 for lifting the main cuff holders 150 and 151. The solenoid $156L_2$ is not energized due to the opening of the contact $347b_1$ and the air cylinders 156 and 157 are not supplied with air. Accordingly, the main cuff holders 150 and 151 are brought down by the coil springs 154 and 155 to the position where the keep plates 152 and 153 are pressed against the periphery 34*d* of the forward section of the drum bed 34. Further, due to the opening of the contact $347b_2$ the solenoid 163L is not energized and the air cylinder 163 for actuating the auxiliary cuff holder 160 is not supplied with air, bringing down said holder 160 to the position where the keep plate 161 is pressed against the cuff holder 85. Therefore, the rotation of the drum bed 34 does not obstruct the operation of the main and auxiliary cuff holders 150, 151 and 160. The brake coil 305 is energized through the contacts $362b_3$ and $358b_2$, and the brake member 310 of the clutch disk 309 is pressed against the sliding engagement member 307, rendering the main shaft 24 of the sewing machine inoperative. Due to the opening of the contact $345a_1$, the solenoid 178L is not actuated and the cuff holder lifting air cylinder 178 is not supplied with air. The cuff holder 85 is brought down by the springs 98 and 99 to be pressed against the periphery 34*c* of the rear section of the drum bed 34. On the other hand, the closing of the contact 345*b* renders the soleoid $188L_2$ inoperative and the air clinder 188 for moving the sleeve end holder is supplied with air from the other side, causing its piston rod 188*a* to move forward with the resultant retraction of the sleeve end holder base. The closing of the contacts 351*b* energizes the solenoid $223L_1$ and the air cylinder 223 for closing the sleeve end holders is supplied with air from one side to bring down its piston rod 223*a*, causing the levers 220 and 221 for closing the left and right sleeve end holders 198 and 199 to rotate in the direction of the indicated arrow I thereby to close said holders 198 and 199. The solenoids 196L and $211L_1$ are energized through the contact 356*b*, causing the air cylinder 196 for lifting the sleeve end holders 198 and 199 to be supplied with air to push up its cylinder 196*a*, thereby raising the sleeve end holder support 192. In this case, the air cylinder 223 is also pushed up through the connection plate 217 to keep the left and right sleeve end holders closed. Upon energization of the solenoid $211L_1$, the combed member actuating air cylinder 211 is supplied with air from one side to take its piston rod 211*a* thereinto, with the resultant advancement of the combed member actuating plate 202 and in consequence the combed members 200 and 201.

The solenoid $144L_2$ is actuated through the contact 372*b* and the air cylinder 144 for the thread cutting device is supplied with air from the other side to bring down the piston rod 144*a*, thereby causing the movable blade 140*b* to rotate opposite to the direction of the indicated arrow E. The first timer 347 which operates only for a short time is brought back to its original state after a prescribed interval (time t_2). As a result, the normally open contact 347*a* remains open and the normally closed contacts $347b_1$ and $347b_2$ remain closed. Due to the opening of the contact 347*a*, the electromagnetic solenoid $156L_1$ is energized, leaving the piston rods 156*a* and 157*a* of the air cylinders 156 and 157 free. The solenoid $156L_2$ is energized through the contacts 352*b* and 347*b* and the air cylinders 156 and 157 are supplied with air to bring down the piston rods

156*a* and 157*a* to urge the depressible portions 150 *a* and 151*a* of the main sleeve end holders 150 and 151, which are consequently lifted against the force of the coil springs 154 and 155. The solenoid 163L is energized through the contacts 334*b* and $347b_2$ and the air cylinder 163 is supplied with air to bring down its piston rod 163*a* thereby to urge the depressible portion 160*a* of the auxiliary cuff holder 160, which is consequently lifted against the force of the coil spring 162.

Under the aforementioned condition, a cuff X open on one lengthwise side is so placed as to bridge the periphery 34*d* of the forward section of the drum bed 34 and the cuff holder 85 with its opening X*a* disposed forward. At this time, the solenoid 121L is not energized due to the opening of the contact $364b_1$ and the air cylinder 121 is not supplied with air. Accordingly, the cuff catchers 104*a* and 104*b* are made to rotate in opposite directions by the wire springs 119 and 120, and the guide pins 113*a* and 113*b* are pressed against the inner wall of the forward section of the drum bed 34, causing the rotatable shafts 106*a* and 106*b* to rotate again in the direction of the indicated arrow C. The cuff catching pawls 105*a* and 105*b* are located in the axial direction of the drum bed 34. Therefore, the cuffs X are so placed as to cause the cuff catching pawls 105*a* and 105*b* to be disposed in the openings X*a*. When, under this condition, the pedal is worked to close the cuff setting switch 332 (time t_3), then the first relay 334 is energized for operation through the switches 332 and 333 to close the normally open contacts $334a_1$ and $334a_2$ and open the normally closed contact 334*b*, thereby holding itself by the contact $334a_1$. Accordingly, the solenoid 121L is energized through the contacts $334a_1$ and $364b_1$ to supply air to the cuff catcher actuating air cylinder 121, causing its piston rod 121*a* to move in the direction of the indicated arrow D and consequently the cylinder 121 itself to be urged opposite to said direction. Accordingly, the cuff catchers 104*a* and 104*b* rotate toward the center of the drum bed 34 against the force of wire springs 119 and 120. When the cuff catchers 104*a* and 104*b* rotate, the cuff catching pawls 105*a* and 105*b* which extend rearward in the axial direction of the drum bed 34 are made to engage the front edge of the periphery of the drum bed 34, thereby preventing the cuff catchers 104*a* and 104*b* from making further rotation. At this time, the guide pins 113*a* and 113*b* are released from the depression by the inner wall of the drum bed 34. As a result, substantially both ends of the lower edge of the cuff opening X*a* and are fixed by being pinched between the peripheral edge of the forward section of the drum bed 34 and the cuff catching pawls 105*a* and 105*b*. It is advised in this connection that the size and fitted position of the cuff catchers 104*a* and 104*b* be so designed as to cause said cuff opening X*a* to be pinched at a point about 2 cm inward from both edges. When the contact 334*b* is opened by the action of the relay 334, the solenoid 163L is deenergized to prevent the air cylinder 163 for lifting the auxiliary cuff holder 158 from being supplied with air, so that the piston rod 163*a* ceases to urge the depressible portion 158*a* of the auxiliary cuff holder 158. Thus the auxiliary cuff holder 158 is brought down by the force of the coil spring 162 to cause the auxiliary keep plate 161 to depress the rear end of the cuff X, which is consequently held between the auxiliary keep plate 161 and the cuff holder 85. When the cuff X is found to be undesirably set, the reset switch 333 is opened to return the relay 334 to its original position, and the set switch 332 is closed again.

Under this condition, the tucking pawl 255 is manually moved opposite to the direction of the indicated arrow O and then in the direction of the indicated arrow J together with the tucking support plate 237. The right sleeve end Y of a shirt is mounted over the combed members 200 and 201 which have already advanced as previously described. The switch 355 for actuating the holder of the right side of the sleeve end is manually closed (time t_4). The second relay 399 is energized for operation through the switches 335 and 337 and contact 353*b* and then close the normally open contact $339a_1$ to hold itself through the contact. The solenoid 232L is energized through the contact $339a_2$ to supply air to the air cylinder 232, so that its piston rod 232*a* is pushed up to cause the holder 234 of the right side of the sleeve end to rotate opposite to the direction of the indicated arrow J, thereby pinching the right side Y*a* of the sleeve end Y between the combed member 201 and the holder 234 of said right side Y*a*. Next when the switch 336 for actuating the holder of the left side of the sleeve end is manually closed (time t_5), the third relay 340 is energized for operation through the switches 336 and 338 and the contact 353*b* and then holds itself with the normally open contact 340*a* closed. Accordingly, the solenoid 344L is energized through one or both of the switch 336 and contact 340*a* to supply air to the air cylinder 344, so that its piston rod 344*a* is pushed up to cause the holder 246 of the left side of the sleeve end to move opposite to the indicated arrow K, thereby pinching the left side Y*b* of the sleeve end between the combed member 200 and the holder 246 of the left side of the sleeve end. The foregoing operation completes the setting of the sleeve end Y on the left and right sleeve end holders 198 and 199. When the sleeve end Y is formed to be undesirably mounted, the reset switch 337 or 338 is manually opened to return the second or third relay 339 or 340 to its original position and the set switch 335 or 336 is closed. After the setting of the sleeve end Y, the tucking pawl 255 is urged opposite to the direction of the indicated arrow O against the force of the springs 258 and 259 and under this condition is further manually rotated opposite to the direction of the indicated arrow J together with the tucking support plate 237 so as to release the tucking pawl 255 from depression. Then said pawl 255 rapidly moves in the direction of the indicated arrow O by the springs 258 and 259 and is brought to the tucking portion 260*a* of the tucking guide plate 260 while depressing part of the sleeve end Y, so as to carry out the formation of pleats or tucking (FIG. 24).

After the setting of the cuff X and sleeve end Y, the start switch 342 is manually closed (time t_6). Then the fourth relay 344 is energized for operation through the switches 369*b* and 342, contact 356*b*, diode 343 and contacts $362b_5$ in turn and holds itself through the contact $344a_1$ with the normally open contact $344a_1$ to $344a_3$ closed and the normally closed contact 344*b* opened. The fifth relay 345 is energized for operation through the switches 369*b*, 342, contact 356*b* and $334a_2$ and contact $367b_1$, and holds itself through the contact $345a_2$ with the normally open contacts $345a_1$ and $345a_2$ closed and the normally closed contact 345*b* opened. Accordingly, the solenoid 178L is energized for operation through the contacts 356*b* and $345a_1$ to

supply air to the air cylinders **178** and **179** for lifting the cuff holders so that the piston rods **178***a* and **179***a* are pushed up to move the guide rods **92** and **93** upward with the resultant rise of the cuff holder **85.** Accordingly, the cuff X is carried upward with the lower edge X*b* of the cuff opening X*a* fixed by the cuff pawls **105***a* and **105***b* and only the rear end of said cuff opening X*a* pinched between the cuff holder **85** and auxiliary keep plate **161.** As a result, the opening X*a* of the cuff X is made to expand widely. At this time the solenoid $188L_2$ is deenergized due to the normally closed contact **345***b* being opened by the action of the fifth relay **345.** Instead, the solenoid $188L_2$ is energized by the closing of the normally open contact $345a_2$ to supply air to the air cylinder **188** from one side to pull its piston rod **188***a* thereinto, thereby causing the sleeve end holder base **184** to move forward. With the advancement of said sleeve end holder base **184,** the sleeve end Y set on the combed members approach the drum bed **34.** After some time, the forward edge of the sleeve end Y slowly moves together with the combed members **200** and **201** into the opening X*a* of the cuff X which is already widely expanded as previously described (FIGS. **25** and **26**). When, due to the advancement of the sleeve end holder base **184,** the compression spring **263** fitted to the lower part thereof urges the actuator **262***a* of the switch **262** for detecting the completion of engagement between the pieces of work fabric to close said switch **262** (time t_7), then the seventh relay **356** is energized therethrough with the resultant actuation of the third to fifth timers **351** to **353** through the contact $364b_2$ and diode **354.** When energized, the seventh relay **356** immediately commences operation to close the normally open contacts $356a_1$ to $356a_3$ and open the normally closed contact **356***b*. However, the third to fifth timers **351** to **353** are not instantly brought into operation. The solenoids **178**L, **196**L and $211L_1$ are deenergized. Deenergization of the solenoid **178**L stops supply of air to the air cylinders **178** and **179** for lifting the cuff holder **85,** which is consequently brought down by the springs **98** and **99** to be pressed against the periphery **34**C of the rear section of the drum bed **34,** thereby closing the opening Xa of the cuff X. Deenergization of the solenoid **196**L stops air supply to the air cylinder **196** for lifting the sleeve end holder to cause the sleeve end holder support **192** to be brought down by the spring **195.** Further deenergization of the solenoid $211L_1$ stops air supply to the air cylinder **211** for actuating the combed members **200 201,** which, however, are not retracted but remain in an advance position. Almost as simultaneously as the depression by the compression spring **263** of the actuator **262***a* of the switch for detecting the completion of engagement between the pieces of work fabric, the ends of the cuff catcher releasing pins **213** and **216** which proceed with the sleeve end holder base **184** urge the depressible strips **108***a* and **108***b* of the cuff catchers **104***a* and **104***b* to cause the rotatable shafts **106***a* and **106***b* to rotate opposite to the direction of the indicated arrow C. Consequently the cuff catching pawls **105***a* and **105***b* move in the same direction and cease to engage the front peripheral edge of the drum bed **34.** Since, at this time, the air cylinder **121** still continues to be supplied with air, the cuff catchers **104***a* and **104***b* rapidly rotate toward the center of the drum bed **34** to be brought to a state illustrated by the two-dot dash line of FIG. **5.** After energized for a prescribed length of time, the third to fifth timers **351, 352** and **353** begin to operate in turn. When the third timer **351** is actuated (time t_8), the normally open contact **351***a* is closed and the normally closed contact **351***b* is opened. The solenoid $223L_1$ is deenergized due to the opening of the contact **351***b*, and the solenoid $223L_2$ is energized by closing of the contact **351***a* to supply air to the air cylinder **223** for closing the sleeve end holder from the other side to push up its piston rod **223***a*, causing the sleeve end holder closing levers **220** and **221** to rotate opposite to the direction of the indicated arrow I, and consequently the depressible portions **220***a* and **221***a* of said levers **220** and **221** to be brought to the lower part of the sleeve end holder base **184.** As a result, the left and right sleeve end holders **198** and **199** are opened by the coil spring **206.** The open edges of said holders **198** and **199** are pressed against the sleeve end driving levers **209** and **210** projecting from the inside of the drum bed **34,** thereby causing said holders **198** and **199** to be opened in a substantially semicircular form. The opening of the holders **198** and **199** leads to the opening of the combed members **200** and **201.** As a result, the sleeve end Y is made to expand in the opening Xa of the cuff X (FIG. **27**). When the fourth timer **352** is actuated (time t_9), the normally open contact **352***a* is closed and the normally closed contact **352***b* is opened. The solenoid $156L_2$ is deenergized by the opening of the contact **352***b* to stop air supply to the air cylinders **156** and **157** for pushing up the main cuff holder. The electromagnetic solenoid $156L_2$ is energized by the closing of the contact **352***a* to lift the piston rods **156***a* and **157***a* of the air cylinders **156** and **157.** As a result, the main cuff holders **150** and **151** are brought down by the coil springs **154** and **155** to cause the keep plates **152** and **153** to be pressed against the cuff X thereby to hold together the mutually engaged cuff X and sleeve end Y. When the fifth timer **353** is actuated (time t_{10}), the normally open contacts **353***a* and $353a_2$ are closed and the normally closed contact **353***b* is opened. Due to the opening of said contact **253***b*, the second and third relays **339** and **340** are deenergized to return to the original position, thereby opening the normally open contacts $339a_1$, $339a_2$ and **340***a*. The solenoids **232**L and **244**L are deenergized by the opening of said contacts $339a_2$ and **340***a* and the air cylinders **232** and **244** cease to be supplied with air, causing the piston rods **232***a* and **244***a* to be brought down by the springs contained in said cylinders **232** and **244.** As a result the holder **234** of the right side of the sleeve end and the holder **246** of the left side thereof rotate in the directions of the indicated arrows J and K respectively, thereby releasing the holder of the sleeve end Y. The solenoid $211L_2$ is energized by the closing of the normally open contact $352a_1$ to supply air to the air cylinder **211** for actuating the combed members from the other side, causing its piston rod **211***a* to be drawn outward, with the resultant retraction of the combed member actuating plate **202** and consequently the combed members **200** and **201.** At this time, the cuff X and sleeve end Y still remain depressed by the keep plates **152** and **153** of the main cuff holders **150** and **151** (FIG. **28**).

After examining the condition in which the cuff X and sleeve end Y are thus engaged with each other, the start switch **342** is closed (time t_{11}). Then the sixth relay **346** is energized for operation through the switch **342** and contacts $356a_1$ and $362b_2$ and $367b_1$ and holds

itself through the contact $346a_3$ with the normally open contacts $346a_1$ to $346a_4$ closed. The counter **331**, makes the counting of [1] by the closing of the contact $346a_1$ and the solenoids **232L** and **244L** are again energized by the closing of the contact $346a_1$. In the same manner as previously described, the left and right side of the sleeve end Y are held by the holder **234** of the sleeve end Y and holder **246** of the left side thereof. The solenoid **167L** is energized by the closing of the contact $346a_4$ to supply air to the stopper release air cylinder **167**, causing its piston rod $167a$ to move opposite to the direction of the indicated arrow G and consequently the movable stopper to rotate **171** in the direction of the indicated arrow H. As a result, the stationary stopper **174** is released from its rest position, enabling the drum bed **34** to rotate in the direction of the indicated arrow F. At this time the cam lever **58** is supplied with a force to move opposite to the direction of the indicated arrow B by the piston rod $66a$ of the air cylinder **66** for pulling said cam lever **58.** When the drum bed **34** rotates in the direction of the indicated arrow F, the cam lever **58** rapidly rotates opposite to the direction of the arrow B along the first cam groove **61a** of the cylindrical cam **56.** When the cam lever **58** rotates through a peripheral angle of substantially 30°, then the roller **62** is pressed against the right end of the first cam groove section $61a$ (FIGS. **6** and **7**). The rotation of the cam lever **58** through a peripheral angle of substantially 30° opposite to the direction of the arrow B is transmitted to the drum bed **34** with its stroke multiplied three fold by the actions of the gears **43** and **37**, with the result that the drum bed **34** rotates through a peripheral angle of substantially 90° in the direction of the arrow F (FIG. $30b$), causing the switch lever **80** fitted to the drive shaft **30** to rotate silimarly through a peripheral angle of substantially 90° in the same direction. As a result, the magnet **82** at the end of said switch lever **80** closely approaches the start detecting switch **84** fitted to the disk **79** to close it (time t_{12}). The eighth relay **357** is energized for operation by the closing of said switch **84** through the contact $344a_2$ and speed reduction switch **78** and holds itself through the contact $357a_3$ with the normally open contacts $357a_1$ to $357a_4$ closed and the normally closed contacts $357b_1$ to $357b_3$ opened. At this time the electromagnetic solenoid **316** is energized through the switch **84** and contact $344a_2$ or $357a_3$ to bring down the plunger $316a$ of said solenoid **316** brought down, causing the clutch lever **311** to rotate opposite the direction of the arrow L against the force of the compression spring **317** and consequently the movable shaft **277** to travel opposite to the direction of the arrow M, with the result that the clutch disk **280** is pressed against the brake member **270** of the flywheel **270.** Accordingly, the pulley **282** rotates quickly by the main motor **264,** causing the main shaft **24** to rotate similarly at high speed through the Vbelt **318** and pulley **25.** The rotation of the main shaft **24** puts all the movable parts of the sewiing machine into operation, including the verical movement of the needle bar **27** and counter-balance, the actuation of the loop taker **136** and the rotation of the cylindrical cam **56** in the direction of the arrow A, thereby commencing the sewing cycle. The main and auxiliary motors **264** and **284** are energized ready for operation before the power supply switch **327** is thrown.

Where the switch for selecting the automatic or manual sewing operation is closed in advance, the closing of the normally open contact $353a_2$ due to the actuation of the fifth timer **353** (time t_{10}) causes the sixth relay **346** to be energized for operation as in the case when the start switch **342** is again closed at time t_{11}, permitting the sewing cycle to be performed in the same manner as when said start switch **342** is closed at time t_{11}. Namely, the switch **370** for selecting the automatic or manual sewing operation determines whether the steps following time **11** should be carried out manually or automatically.

The ninth relay **358** is energized for operation by the closing of the contact $357a_4$ of the eighth relay **357** through the contact $367b_2$ and holds itself by the closing of the contact $358a_1$ with the normally open contacts $358a_1$ and $358a_2$ closed and the normally closed contacts $358b_1$ and $358b_2$ opened. The solenoid **66L** and brake coil **305** are deenergized by the opening of the contact $358b_2$. Since, however, the second timer **348** is energized only for a short period by the closing of the contact $357a_2$ through the diode **350,** said solenoid **66L** continues to be energized for a short length of time after the commencement (time t_{12}) of the sewing cycle. As a result, the cam lever pulling air cylinder **66** is supplied with air to cause the cam lever **58** to rotate opposite to the direction of the arrow B. When the cylinderical cam **56** commences rotation at the start of the sewing cycle, the roller **62** of the cam lever **58** travels unfailingly along the second cam groove section $61b$ to cause said lever **58** further to rotate opposite to the direction of the arrow B. Therefore with the drum bed **34** kept rotating in the direction of the arrow F, there is commenced the sewing together of the cuff X and sleeve end Y thereby forming a seam a illustrated in FIG. **32.** A little while later, the second timer **348** is rendered inoperative (time t_{13}) and the solenoid **66L** is deenergized by the opening of the contact $348a$. The roller **62** of the cam lever **58** travels along the third cam groove section $61c$, causing said lever **58** slowly to rotate in the direction of the arrow B. Accordingly, the drum bed **34** rotates opposite to the direction of the arrow F, that is, moves in the directions shown in FIGS. **30** (b) and **30** (c), thereby sewing the cuff X to the sleeve end Y. At the commencement of said sewing, there is carried out the lock stitch in the gently bent form. During the aforesaid operation, the clutch coil **297** is energized through the contact $362b_3$ by the closing of the contact **358** a_2 of the ninth relay **338,** and the worm wheel **275** is driven by the auxiliary motor **284** and idly rotates at a low speed around the bearing cylinder **272.** The stop switch **77** is opened by the rotation of the cylindrical cam **56** in the direction of the arrow A. A little while later, the tenth relay **361** is deenergized to return to its original position, thereby leaving the normally open contacts $361a_1$ and $361a_2$ and normally closed contact $361b$ in the original state.

As mentioned above, the rotation of the cylindrical cam **56** in the direction of the arrow A and consequently the cam lever **58** in the direction of the arrow B causes the drum bed **34** to move opposite to the direction of the arrow F, thereby advancing the sewing operation with the resultant formation of a seam b shown in FIG. **32.** When the cam lever **58** reaches the left end of the third cam groove section $61c$ (FIGS. **6** and **7**) to complete the sewing (prior to this point, the cam lever **58** rotated about 60° in the direction of the arrow B and consequently the drum bed **34** rotated about 180° opposite to the direction of the arrow F as

shown in FIG. 30(*c*)), then the roller **62** of the cam lever **58** moves along the fourth cam groove section **61***d*, causing said lever **58** slightly to rotate opposite to the direction of the arrow B. Therefore, with the drum bed **34** kept rotating in the direction of the arrow F, the sewing of the cuff X to the sleeve end Y proceeds with the resultant formation of a seam *c* shown in FIG. **32.** Later, the roller **62** of the cam lever **58** is urged along the fifth cam groove section **61***e* to cause said lever **58** slightly to rotate in the direction of the arrow B. With the drum bed **34** kept rotating opposite to the direction of the arrow F, the sewing of the cuff X to the sleeve end Y is further conducted with the resultant formation of a seam *d* shown in FIG. **32.** When said sewing is brought to an end, there is performed a lock stitch in the form of the letter Z. Referring to FIG. **32,** the seams *a*, *c* and *d* are indicated at a point apart from the seam *b* for better understanding of the description. It will be apparent that the former seams *a*, *c* and *d* are actually formed on the seam *b*. The cam lever **58** is normally supplied by the draw spring **64** with a force to rotate in the direction of the arrow B, enabling its caller **62** to move unfailingly along the fifth cam groove section **61***e*, and consequently the Z-shaped lock stitch to be reliably effected. Immediately before or during said Z-shaped lock stitch, the magnet **75** of the switch lever **72** rotating with the cylindrical cam **56** approaches the speed reduction switch **78** to open it (time t_{14}). The eighth relay **357** is deenergized by the opening of said switch **78** to return to its original position, thereby leaving the normally open contacts **357**a_1 to **357**a_4 and normally closed contacts **357**b_1 to **357**b_3 in the original state. The electromagnetic solenoid **316** is deenergized by the opening of the contact **357**a_3 and ceases to attract the plunger **316***a*, so that the clutch lever **311** is rotated by the compression spring **317** in the direction of the arrow L, the moval shaft **277** travels in the direction of the arrow M and the clutch disk **280** is pressed against the brake member **276***a* of the damping wheel **276.** Accordingly, the pulley **282** slowly rotates to cause the main shaft **24** of the sewing machine to rotate similarly at a low speed through the pulley **25** with the resultant slowdown of the sewing operation. Later, the switch lever **72,** together with the cylindrical cam **56,** further rotates in the direction of the arrow A. The magnet **75** at the end of said switch lever **72** approaches the stop switch **77** to close it (time t_{13}). The tenth relay **361** is energized by the closing of the stop switch **77** and holds itself through the normally open contact **361**a_1 with the normally open contacts **361**a_1 to **361**a_3 closed and normally closed contact **361***b* opened. The opening of the normally closed contact **361***b* renders operative the needle fall detecting circuit consisting of the switch **320** S, diode **359,** capacitor **360,** contact **358**a_1 and ninth relay **358.** When the sewing needle **26** takes the substantially lowest position, the needle fall detecting switch **320** S is opened. As a result, the ninth relay **358** is deenergized to return to its original position, thereby leaving the normally open contacts **358**a_1 and **358**a_2 and normally closed contacts **358**b_1 and **358**b_2 in the original state. Accordingly there is actuated the needle rise detecting circuit consisting of the switch **321** S, contact **361**a_2, eleventh relay **362** and contact **358**b_2. As a result, the eleventh relay **362** is energized for operation to close the normally open contacts **362**a_2 and open the normally closed contacts **362**b_3. The opening of the contact **362**b_3 renders the solenoid **66**L and brake coil **305** deenergized, and the closing of the contact **362**a_1 energizes the clutch coil **297.** Thus even when the needle **26** takes the lowest position, the main shaft **24** is driven at a low speed to lift the needle **26** slowly. The fourth relay **344** is deenergized by the opening of the contact **362**b_1 to return to its original position, and the sixth relay **346** is deenergized by the opening of the contact **362**b_2 to return to its original position, thereby leaving the normally open contacts **344**a_1, **344**a_2, **344**a_3 and **346**a_4 and normally closed contact **344***b* in the original state. The solenoid **167**L is deenergized by the opening of the contact **346**a_4 to stop air supply to the stopper release air cylinder **167.** Accordingly, its piston rod **167***a* moves in the direction of the arrow G by the action of the spring contained in said air cylinder **167** and the movable stopper **171** rotates opposite to the direction of the arrow H, to engage the stationary stopper **174.** Since the solenoids **232**L and **244**L are deenergized by the opening of the contact **346**a_2, the air cylinders **232** and **244** for actuating the holder **234** of the right side of the sleeve end and the holder **246** of the left side thereof cease to be supplied with air, thereby releasing the sleeve end Y from depression by said holders **246** and **234.** The closing of the contact **362**a_2 actuates the thread cut detecting circuit consisting of the switch **322** S, fourteenth relay **372,** and contacts **367**b_4 and **362**a_1. When the needle **26** is brought above the pieces of work fabric, namely the cuff X and sleeve end Y, the thread cut detecting switch **322** S is closed for a short time. This energizes the fourteenth relay **20** for operation to close the normally open contact **372***a* and open the normally closed contact **372***b*. The solenoid **144**L is energized to supply air to the thread cut air cylinder **144** from one side to push up its piston rod **144***a*, causing the movable blade **140***b* to rotate in the direction of the arrow E so as to catch the lower thread. The fourteenth relay **372** is deenergized by the opening of the thread cut switch **322** S, thereby leaving the normally open contact **372***a* and normally closed contact **372***b* in the original state. The solenoid **144**L_2 is energized by the closing to supply air to the air cylinder **144** from the other side to bring down its piston rod **144***a*. As a result, the movable blade **140***b* rotates opposite to the direction of the arrow E to cut the upper and lower threads in co-operation with the stationary blade **140***a*. Later when the needle **26** takes the substantially uppermost position, the needle rise detecting switch **321** S is opened. Accordingly, the eleventh relay **362** is deenergized to return to its original state, thereby leaving the normally open contacts **362**a_1 and **362**a_2 and normally closed contacts **362**b_1 and **362**b_2 in the original state. The brake coil **305** is energized by the closing of the contact **362**b_3 through the contact **358**b_2, so that the brake member **310** of the clutch disk **309** is pressed against the sliding engagement member **307** to stop the worm **301** and consequently the main shaft **24** of the sewing machine. At this time, the solenoid **66**L is energized through the contacts **362**b_3 and **358**b_2 and diode **363** to supply air to the cam lever pulling air cylinder **66,** so that its piston rod **66***a* is brought down to cause the cam lever **58** to rotate rapidly opposite to the direction of the arrow B against the force of the extension spring **64** due to its roller **62** travelling along the first cam groove section **61***a*. When, therefore, the drum bed **34** rapidly rotates about 90° in the direction of the arrow F (prior to this time the cam lever **58** rotated

about 30° opposite to the direction of the arrow B), then the stationary stopper **174** engages the movable stopper **171**, causing the drum bed **34** to stop at the bed center by being prevented from rotating in the direction of the arrow F (FIG. 30(*d*)). At this time the cam lever **58** is of course brought to rest. The rotation of the drum bed **34** back to the bed center is transmitted to the sleeve end holders **198** and **199** by the sleeve end drive levers **209** and **210** which consequently rotate with the drum bed **34**. When the drum bed **34** returns the bed center, the magnet **82** of the switch lever **80** approaches the bed center detecting switch **83** to close it (time t_{16}). The 12th relay **364** is energized for operation through the contact **356***a*$_2$, bed center detecting switch **83** and contacts **357***b*$_3$ and **344***b* to open the normally closed contacts **364***b*$_1$ and **34***b*$_2$. The third to fifth timers **351** to **353** are deenergized by the opening of the contact **364** b_2 to return to its original position, thereby leaving the normally open contacts **351***a*, **352***a*, **353***a*$_1$ and **353***a*$_3$ and normaly closed contacts **351***b*, **352***b* and **353***b*. The electromagnetic solenoid **156**L$_1$ is deenergized by the closing of the contact **352***b* to supply air to the air cylinder **156** for lifting the main cuff holders **150** and **151** which are consequently pushed up. Though the solenoid **211**L$_2$ is deenergized by the opening of the contact **353***a*, the combed members **200** and **201** are in a retracted position. While the solenoid **223**L$_1$ is deenergized by the opening of the contact **351***a*, the solenoid **223**L$_2$ is energized by the closing of the contact **351***b* to supply air to the air cylinder **223** for actuating the sleeve end closing lever so that its piston rod **223***a* is brought down to cause the sleeve end holder closing levers **220** and **221** to rotate in the direction of the arrow I, thereby closing the left and right sleeve end holders **198** and **199**. Upon completion of said closing the actuating lever **229** opens the switch **228** for detecting the closing of the sleeve end holder by depressing its actuator **228** (time t_{17}). The fifth relay **345** is deenergized by the opening of said switch **228** to return to its original position, thereby leaving the normally open contacts **346***a*$_1$ and **345***a*$_2$ and normally closed contact **345**b in the original state. While the solenoid **188**L$_1$ is deenergized by the opening of the contact **345***a*$_1$, the solenoid **188**L$_2$ is energized by the closing of the contact **345***b* to supply air to the sleeve end holder shifting air cylinder **188** from the other side to retract the sleeve end holder base **184** through the piston rod **188***a*. The retraction of the sleeve end holder base **184** prevents the cam pression spring **263** from depressing the actuator **262***a* of the switch for detecting the completion of engagement between the pieces of work fabric thereby to open said switch **262** (time t_{18}). The seventh relay **356** is deenergized by the opening of said switch **262** to return to its original position, thereby leaving the normally open contacts **356***a*$_1$ to **356***a*$_4$ and normally closed contact **356***b*, **356***b*$_1$ and **356***b*$_2$ in the original state. The solenoids **196**L and **211**L$_1$ are energized by the closing of the contact **356***b*$_1$. Energization of the solenoid **196**L supplies air to the air cylinder **196** for lifting the sleeve end holder to push up the sleeve end holder support **192**. On the other hand, energization of the solenoid **211**L$_1$ supplies air to the combed member actuating cylinder **211** to advance the combed members **200** and **201**. The first relay **334** is deenergized by the opening of the contact **356***a*$_3$, thereby leaving the normally open contacts **334***a*$_1$ and **334***a*$_2$ and normally closed contact 334b in the original state. The solenoid **121**L is deenergized by the opening of the contact **334***a*$_1$ and the cuff catching air cylinder **121** ceases to be supplied with air. As a result, the cuff catchers **104***a* and **104***b* return to the original position by being rotated in opposite directions by the wire springs **119** and **120**. The guide pins **113***a* and **113***b* are pressed against the inner walls of the drum bed **34**, causing the rotatable shaft **106***a* and **106***b* to return to the original position by rotating in the direction of the arrow C. The solenoid **163**L is energized by the closing of the contact **334***b* to supply air to the air cylinder **160** for lifting the auxiliary cuff holder **160**. Later when pressed against the stopper **191**, the sleeve end holder base **184** ceases to be retracted. The various parts, switches and contacts are brought back to the original position when the power supply switch **327** is thrown. Though deenergized by the opening of the contact **356***a*$_4$ due to the return of the seventh relay **356**, the 12th relay **364** still continues to operate later for a little while by the discharge of the delayed return capacitor **373**, and thereafter is brought back to its original position. The sewing together of the cuff and sleeve end is continued hereafter in the same manner as described above. According to this invention, the sewing together of the right side sleeve end and cuff of a shirt is effected by the right side sewing machine **12** and that of the left side sleeve end and cuff thereof by the left side unit **12**′. In this case, during the operation of the right side sewing machine **12**, the left side cuff and sleeve end are set on the left side sewing machine **12**′. While said left side unit **12**′ is in operation, the right side sleeve end and cuff are sent on the right side unit **12**. Thus the setting of pieces of work fabric and their joint sewing are performed alternately by said sewing units. As previously mentioned, the right and left side sewing units **12** and **12**′ are of substantially the same construction and description thereof is omitted. Referring to FIGS. **1**, **2** and **3**, the parts of the left side unit **12**′ the same as those of the right side unit **12** are denoted by the numerals used for those of the latter, each of which bears a single prime "′".

If there should happen any abnormality during the aforementioned sewing cycle, this invention takes the undermentioned emergency steps according to the point of time at which such failure occurs.

For example, where the opening Xa of the cuff X is not fully expanded to obstruct the engagement between the cuff X and sleeve end Y before the commencement (before time t_{11}) of their joint sewing, there is manually closed an emergency switch **365**. This energizes through a start resetting switch **366** the thirteenth relay **367** which holds itself through the contact **367***a*$_2$ with the normally open contacts **367***a*$_1$ and **367***a*$_2$ closed and normally closed contacts **367***b*$_1$ to **367***b*$_3$ opened. The fifth relay **345** is deenergized by the opening of the contact **356***b*$_1$ to return to its original position, thereby leaving the normally open contacts **345***a*$_1$ and **345***a*$_2$ and normally closed contact **345***b* in the original state. The fourth relay **344** is deenergized by the opening of the contact b_3, thereby leaving the normally open contacts **344***a*$_1$ to **344***a*$_3$ and normally closed contact **344***b* in the original state. The 12th relay **364** is energized for operation by the closing of the contact **344***b* throughh the contact **356***a*$_3$, switch **83** and contact **357***b*$_3$ to open the normally closed contacts **364***b*$_1$ and **364***b*$_2$. The third to fifth timers **351** to **353** are deenergized by the opening of the contact **364***b*$_2$ to return to

the original position. As previously described, the return of the third third timer **351** energizes the solenoid $223L_1$ to close the left and right sleeve end holders **198** and **199**, and the return of the fourth timer **352** energizes the solenoid $156L_2$ to lift the main cuff holders **156** and **157**. On the other hand, the solenoid $188L_2$ is energized by the closing of the contact **345***b* of the fifth relay **345**, causing the sleeve holder base **184** to commence its retraction. Some time after said retraction, there is opened the switch **262** for detecting the completion of engagement between the pieces of work fabric. As a result, the seventh relay **350** is deenergized to return to its original position, thereby leaving the normally open contacts $356a_1$ to $356a_4$ and normally closed contacts **356***b*, $356b_1$ and $356b_2$ in the original state. The solenoids **196**L and $211L_1$ are energized by the closing of the contact $356b_1$, as previously described, to push up the sleeve end holder support **192**, thereby advancing the combed members **200** and **201**. When, therefore, there is closed the emergency stop switch **365** before the sewing together of the cuff X and sleeve end Y is commenced, all the parts are returned to the positions which they take when the power supply switch **327** is thrown. Later it is only required to set the cuff X and sleeve end over again according to the previously described steps. When the start switch **342** is closed at time t_{16}, the start resetting switch **366** is opened interlockingly therewith, so that the thirteenth relay **367** is deenergized to return to its original position.

When the emergency stop switch **367** is closed in the case where the thread is cut or the engagement between the cuff X and sleeve end Y presents an undesirable condition during their joint sewing, then the thirteeth relay **367** is energized for operation. The fourth relay **344** is deenergized by the opening of the contact $367b_5$ of said relay **367** to return to its original position. Since, at this time, the seventh relay **356** is operated to have its contact $356a_1$ closed despite the opening of the contact $367b_1$, the fifth relay is not brought back to its original position, but continues to operate. As a result the solenoide $188L_2$ is not energized unlike the previous case, nor is retracted the sleeve end holder base **184**. The electromagnetic solenoid **316** is deenergized by the opening of the contact $367b_2$ and the clutch lever **311** rotates in the direction of the arrow L to return to its original position, causing the clutch disk **280** to be pressed against the brake member **276***a* of the damping wheel **276**. Therefore, the main shaft **24** of the sewing machine driven through the pulley **282**, V-belt **318** and pulley **25** in turn is made to rotate slowly. The tenth relay **361** is energized for operation by the closing of the contact $367a_1$ to close the normally open contacts $361a_1$ and $361a_2$ and open the normally closed contacts $361b_1$ and $361b_2$. Accordingly, there is actuated the needle fall detecting circuit including the ninth relay **358** by the opening of the contact $361b_1$ and the contact $367b_3$ of the 13th relay **367**. When the needle takes the substantially lowest position, the needle fall detecting switch **320S** is opened to cause the ninth relay **358** to be deenergized and brought back to its original position. The closing of the contact $358b_1$ of the ninth relay **358** due to its return and that of the contact $361a_2$ of the 10th relay **361** actuate the needle rise detecting circuit including the 11th relay **362**, which is consequently put into operation. Later when the needle **26** takes the substantially uppermost position, the needle rise detecting switch **321S** is opened to bring the eleventh relay **362** back to its original position, thereby leaving its normally open contact $362a_1$ and normally closed contact $362b_3$ in the original state. The opening of said normally open contact $362a_1$ deenergizes the clutch coil **297** and the closing of said normally closed contact $362b_3$ energizes the brake coil **305** to stop the main shaft **24** of the sewing machine. When there is closed the emergency stop switch **365** during the sewing together of the cuff X and sleeve end Y, the main shaft **24** or the sewing machine as a whole is brought to rest. During this stop operation, the circuit for energizing the fourteenth relay **372** is shot off by the opening of the contact $367b_4$ of the thirteenth relay **367**, so that the solenoid $144L_1$ is not energized and the thread cutting mechanism **140** does not work. When there is closed the start switch **342** with proper steps taken after the aforesaid stop of the sewing machine, then the fourth relay **344** is actuated, and the start resetting switch **366** interlocking with the start switch **342** is opened to bring the thirteenth relay **367** back to its original position, causing the main shaft **24** to rotate quickly again.

If there is cut a thread during the sewing cycle, the thread cut detecting switch **369***a* is closed and the thread cut detecting switch **369***b* is opened, so that the thread cut indicating lamp **371** is lighted to inform said cut. Since, at this time, the switch **396***b* is opened, the closing of the start switch **342** will have no effect.

If the stop switch **77** is not closed due to some failure at time t_{15}, then there are not actuated the needle fall detecting circuit including the ninth relay **358** and the needle rise detecting circuit including the eleventh relay **362**. Accordingly, the main shaft **24** keeps on rotating and consequently the cylindrical cam **56** continues to rotate in the direction of the arrow A, until the roller **62** of the cam lever **58**, engages the left end of the first cam groove **61***a* of said cam **56** (FIGS. **6** and **7**) possibly resulting in the damage of said cam and cam levers **56** and **58** and other parts.

With this invention, however, the cylindrical cam **56** is provided with the overrun groove section **61***f* to be allowed to make some rotation in the direction of the arrow A in such a manner that the roller **62** of the cam lever **58** travels along said overrun groove section **61***f*. The magnet **75** of the rotatable switch lever **72** is closed by facing the overrun switch **368** somewhat disposed in the direction of the arrow A of the stop switch **77** to actuate the thirteenth relay **367**. The closing of the contact $367a_1$ of said relay **367** due to its actuation energizes the 10th relay **361**. Accordingly, the main shaft **24** of the sewing machine is brought to rest as in the case where the stop switch **77** is properly closed. When there is commenced a sewing cycle after the preceding one, the overrun switch **368** is operated. At this time, the relay **361** remains held since the previous actuation of the stop switch **77**, so that the aforesaid operation of the overrun switch **368** becomes ineffective. The resetting of the relay **361** is so carried out as to cause the relay **382** to be energized when the drum bed **34** passes through the bed center position during sewing. After the stop of the main shaft **24** of the sewing machine, the power supply switch **327** is opened. Said shaft **24** is manually rotated backward to cause the cylindrical cam **56** opposite to the direction of the arrow A, thereby locating the roller **62** of the cam lever **58** at the left end of the first cam groove section **61**a (FIGS. **6**

and 7) (Said location is as certained by the possibility of manually rotating the drum bed 34 in the direction of the arrow F.). Thereafter it is only required to throw the power supply switch 327.

When the counter 331 counts a prescribed number of sewing cycles (for example, 100 until the lower thread is consumed), then its contact 331*a* is closed to light the alarm lamp 330 so as to inform the shortage of the lower thread.

The foregoing description refers to the case where there were sewn together two pieces of work fabric, that is the cuff and sleeve end. However, the pieces of any other material may be bonded together using supersonic waves. Further, in the aforesaid embodiment, the first working assembly including the drum bed and cuff holder and the second working assembly including the sleeve end holders were made to rotate in sewing together the cuff and sleeve end. However, the joining means itself may be moved. Moreover, the first and second working assemblies may be disposed in a horizontal plane to overlap both work objects in substantially abutting relationship in the same plane by moving at least one of the working assemblies, and finally attaching them to each other by said joining means.

This invention comprises the steps of setting one of two pieces of work fabric on the first working assembly and the other on the second working assembly, moving at least one of said working assemblies to overlap both pieces in substantially abutting relationship in the same plane, relatively moving both working assemblies and joining means finally to join both pieces of work fabric by said joining means. Accordingly, this invention has the advantage of joining both pieces of work objects in a fixed overlapped condition, eliminating the advanced skill demanded of the prior art joining apparatus, and obtaining a constant and attractive finish.

According to this invention, when there is set on the first working assembly the first pouch-shaped piece of work material like a cuff, the lower edge of the opening of the first work material is securely held by a cuff catching pawl, the rear part of the first work material is pushed up by a cuff holder fully to expand the opening of said work material and there is fitted into said opening the joining edge of the second work material set on the second working assembly. Accordingly, the first pouch-shaped work material and the second work material can be engaged with each other reliably and easily, realizing a very attractive finish.

The first working assembly of this invention comprises a drum bed and a cylindrical cuff holder and the second working assembly thereof comprises an arcuate sleeve holder. Therefore, the work materials like the cuff and sleeve end which it is more favorable to mount on these working assemblies in an arcuate or semicircular form can be set in place reliably and easily and unfailingly overlapped, resulting in a very attractive finish.

Where there is engaged the joining edge of the second work material with the opening of the first work material consisting of a pouch-shaped cuff already expanded by proper means, the second working assembly on which the second work material is set is provided according to this invention with an air cylinder for lifting the sleeve end holder support. After the second work material is lifted to the substantially central part of the opening of the first work material, the joining edge of the second work material is engaged with said opening. Therefore, the pouch-shaped first work material can be more readily engaged with the second work fabric.

According to this invention, said engagement is effected by the second working assembly divided into the left and right sleeve end holders, a spring for urging them in opposite directions and a lever and air cylinder for drawing them together. Said engagement is carried out by drawing the two divided parts of the second working assembly to reduce the width of the joining edge of the second work material. Upon completion of the engagement, the divided parts are moved in opposite directions so as to cause the joining edge of the second work material to expand in the opening of the first work material. Therefore, said engagement is performed unfailingly, providing a very attractive finish and eliminating the advance skill required for the conventional joining method.

The width of the joining edge of the second work material is reduced by tucking means for pleating that part of the second work material which is in a loosened state between the divided parts of the second working assemblies. After reduced in width, the joining edge of the second work material is pleated by the tucking means. Thereafter said joining edge is fitted into the opening of the first work material. Therefore, tucking and engagement according to this invention are more reliably effected than in the customary case where these steps are manually performed, thus eliminating the skill demanded of the conventional apparatus.

The aforementioned engagement is effected by further providing the second working assembly with combed insertion plates which are made movable relative to said assembly. The joining edge of the second work material is engaged with the opening of the first work material together with said combed plates. Upon completion of engagement, the combed insertion plates alone are retracted, and the overlapped portions of both work materials are fixed together by the joining means. Accordingly, said engagement is performed unfailingly, and moreover said insertion plates do not obstruct the final joining of both work materials by the joining means.

The engagement of both work materials together with said insertion plates is conducted further by providing a main cuff holder for urging the overlapped portions of the first and second work materials to the second working assembly. After said engagement with the insertion plates. When the overlapped portions of both work materials are held by said main cuff holder after said engagement, the insertion plates are removed from the overlapped portions. When said insertion plates are withdrawn, the joining edge of the second work material is fully prevented from falling off the engaged portion of the first work material. Therefore, said engagement is firmly maintained.

A device for the aforesaid engagement further comprises a drum bed for mounting the first work material on the first working assembly, a vertically movable holder disposed on the drum bed so as to lift the closed end of the first work material or a cuff, and a cuff catcher for catching in cooperation with the drum bed the work material set on that part of the drum bed which faces both sides of the opening of the first work material. The lifting member is pushed up relative to the drum bed to expand the opening of the first work material. One of the working assemblies is moved so as to bring the joining edge of the second work material

into the opening of the first work material. As the result of said movement, the cuff catcher is released and the lifting member is brought down. The full expansion of the opening of the first work material permits the reliable engagement between both work materials. The cuff catcher which is automatically released after said engagement does not obstruct the final joining of both work materials.

There is further provided an emergency stop device for stopping the action of the members associated with the aforementioned overlapping, in case there occurs any abnormality during that time. Where said emergency stop device is actuated before said overlapping, both working assemblies are brought back to the original position. Again where said emergency stop device is operated after there is commenced the relative movement of both working assemblies and joining means, said working assemblies are brought to rest under the condition in which they are held at that time. Therefore there can be always taken a proper step according to the time when there takes place any failure.

This invention is not limited to the embodiment described by reference to the appended drawings, but may be practised in various modifications within a scope not departing from the object of the invention.

What we claim is:

1. An apparatus for joining together a first pouch-shaped piece of work fabric or similar materials having a pair of lips forming an opening such as a cuff and a second piece of work fabric or similar materials such as a sleeve comprising:

a first working assembly for setting said first piece, said assembly being provided with means for expanding the lips of the opening of said first piece;

a second working assembly divided into two components to set said second piece, one of said components having holding means for setting one end of said second piece thereon and the other component having holding means for setting the other end of said piece;

means for urging said two divided components near to or apart from each other;

means for moving at least one of said first and second working assemblies to insert the joining edge of said second piece into the opening of said first piece, said two divided components being adapted to make the joining edge of said second piece narrower than said first piece when the joining edge of said second piece is inserted into the opening of said first piece and expand said joining edge in the opening of said first piece after said insertion;

and means for joining together the overlapped portions of said first and second pieces.

2. An apparatus as set forth in claim **1** which further comprises tucking means disposed between said two divided components of the second working assembly so as to pleat that portion of said second piece which is slackened when said two divided components are drawn near thereto.

3. An apparatus for joining together first and second pieces of work fabric or similar materials at their edges comprising:

a. a first working assembly for setting one of said two pieces thereon;

b. a second working assembly for setting the other of said two pieces thereon;

c. means for moving at least one of said first and second working assemblies so as to overlap the edges of said two pieces;

d. means for joining together the overlapped portions of said two pieces; and,

e. means for making the joining edge of said second piece narrower than said first piece when the joining edge of said second piece is overlapped over said first piece and expand said joining edge after said overlapping.

4. An apparatus as claimed in claim **3** wherein said first working assembly comprises a drum bed with a cylindrical cuff holder and the second working assembly comprises an arcuate sleeve holder, said first piece being a cuff, said second piece being a sleeve, means for expanding said cuff so that said sleeve is overlapped into the cuff opening.

5. An apparatus as set forth in claim **3** which further comprises an emergency stop device for stopping the operation of all the aforesaid means, said first and second working assemblies being adapted to be stopped at the original position when said emergency stop device is actuated before the overlapping of said two pieces and immediately brought to rest with said two pieces of work fabric overlapped when said emergency stop device is energized after the commencement of said relative movement.

6. An apparatus for joining together first and second pieces of work fabric or similar materials at their edges comprising:

a. a first working assembly for setting thereon one of said two pieces;

b. a second working assembly for setting thereon the other of said two pieces;

c. means for moving at least one of said first and second working assemblies, to overlap the joining edges of said two pieces;

d. means worked by an operator to start the operation of said moving means;

e. means for joining together the overlapped portions of said two pieces;

f. means for conducting the relative movement of said working assemblies and joining means along said overlapped portions;

g. means responsive to the overlapping of said two pieces for effecting the automatic operation of said relative movement actuating means so as to join together said two pieces; and,

h. means for making the joining edge of said second piece narrower than said first piece when the joining edge of said second piece is overlapped over said first piece and expand said joining edge after said overlapping.

7. An apparatus as claimed in claim **6** wherein said first working assembly comprises a drain bed with a cylindrical cuff holder and the second working assembly comprises an arcuate sleeve holder, said first piece being a cuff, said second piece being a sleeve, means for expanding said cuff so that said sleeve is overlapped into the cuff opening.

8. An apparatus as set forth in claim **6** which further comprises:

a. second operator-worked means for commencing the operation of said relative movement-actuating means instead of said last mentioned means; and,

b. switching means for selectively energizing said second operator-worked means and last mentioned means.

9. An apparatus for joining together first and second pieces of work fabric or similar materials at their edges, the first piece being shaped like a cuff and the second piece being shaped like a sleeve, comprising:

a. a table;

b. a machine frame mounted on said table;

c. a main shaft rotatably fitted to said frame;

d. means for driving said main shaft;

e. stitch forming means including a reciprocable needle connected with said main shaft;

f. a drive shaft rotatable supported by said frame;

g. power transmitting means provided between said drive shaft and main shaft;

h. a first cylindrical working assembly connected to said drive shaft for the setting thereon of one of said two pieces;

i. a movable support base so disposed as to face said first working assembly;

j. a second working assembly rotatably fitted to said support base so as to rotate coaxially with said drive shaft, said second working assembly having a round supporting surface for receiving thereon the other of said two pieces whose surface has the same radius as the supporting surface of said first working assembly;

k. means for urging said support base with said second working assembly so as to overlap the joining edges of the second of said two pieces into the first of said two pieces;

l. means disposed between said first and second working assemblies for their connection so as to jointly rotate said two pieces when they are overlapped by the movement of said second working assembly, thereby causing said first and second working assemblies to be jointly rotated by the operation of said drive means and in consequence the overlapped portions of said two pieces to be sewn together by said stitch forming means; and,

m. means for making the joining edge of said second piece narrower than said first piece when the joining edge of said second piece is inserted into the opening of said first piece and expand said joining edge in the opening of said first piece after said insertion.

10. An apparatus as set forth in claim **9**, wherein said power transmitting means include cam means for actuating said drive shaft so as to rotate the first and second working assemblies in the direction of a predetermined stitching line along which stitching is to be performed.

11. An apparatus for joining together a first pouch-shaped piece of work fabric or similar materials having upper and lower lips forming an opening such as a cuff and a second piece of work fabric or similar materials such as a sleeve end comprising:

a. a first working assembly for setting said first piece and lower lip thereon, said assembly being provided with means for expanding the upper and lower lips of said first pouched shaped piece;

b. a second working assembly for setting said second piece thereon;

d. means for moving at least one of said first and second assemblies to insert the joining edge of said second piece in the expanded opening of said first pouched-shaped piece between said lips;

d. means for joining together the overlapped portions of said first and second pieces; and,

e. means for making the joining edge of said second piece narrower than said first piece when the joining edge of said second is inserted into the opening of said first piece and expand said joining edge in the opening of said first piece after said insertion.

12. An apparatus as set forth in claim **11**, wherein said expanding means includes: means for holding said lower lip and the side which faces the first working assembly against it; and means for lifting the upper lip.

13. An apparatus as set forth in claim **12** wherein said lifting means includes a lifting plate so mounted on the first working assembly as to move vertically, the supporting surface of said first working assembly and that of said lifting plate being designed to be made flush.

14. An apparatus as set forth in claim **11**, wherein said second working assembly includes means for elevating the joining edges of said second piece to the central level of the opening of said first piece.

15. An apparatus as set forth in claim **11** wherein said second working assembly includes a mechanical guide plate for introducing the joining edges of said second piece into the opening of said first piece, said guide plate having a combed member to facilitate the withdrawal of said guide plate from the work piece.

16. An apparatus for joining together a first pouched-shaped piece of work fabric or similar materials having a pair of lips forming an opening such as a cuff and a second piece of work fabric or similar materials such as a sleeve comprising:

a. a first working assembly;

b. a first holding device mounted on said first working assembly to set said first piece thereon;

c. means mounted in said first working assembly to expand the lips of the opening of said first piece;

d. a second working assembly;

e. a second holding device mounted on said second working assembly to set said second piece;

f. first means for moving at least one of said first and second working assemblies to insert the joining edges of said second piece into the opening of said first piece;

g. a guide plate movably fitted to said second working assembly to introduce the joining edge of said piece into the opening of said first piece;

h. second means for moving said guide plate toward said second working assembly, and inserting said guide plate into opening of said first piece by the action of said first moving means together with said second piece set on said guide plate, means facilitating the drawing out said guide plate from the opening of said first piece with the overlapped portions of said first and second pieces pressed against said first working assembly by said first holding means;

i. means for joining together the overlapped portions of said first and second pieces; and,

j. means for making the joining edge of said second piece narrower than said first piece when the joining edge of said second piece is inserted into the opening of said first piece and expand said joining edge in the opening of said first piece after said insertion.

17. An apparatus as set forth in claim **16** wherein said guide plate has a combed portion on the side which

faces said first piece to facilitate withdrawal of the guide plate from the work pieces.

18. An apparatus for joining together a first pouched-shaped piece of work fabric or similar materials having a pair of lips forming an opening such as a cuff and a second piece of work fabric or similar materials such as a sleeve comprising:

a. a machine frame;

b. a main shaft rotatably mounted on said frame;

c. stitch forming means including a reciprocable needle drivingly connected with said main shaft;

d. a drive shaft mounted on said frame for rotation about an axis in parallel with the axis of said main shaft,

e. a first cylindrical support secured to said drive shaft for supporting said first piece thereon;

f. expanding means movably mounted on said first cylindrical support for expanding the lips of the opening of said first piece set on said first support;

g. power transmitting means provided between said drive shaft and said main shaft for rotating said first cylindrical support according to the rotation of said main shaft;

h. a base movably supported on said frame in the direction of the axis of said drive shaft;

i. two divided second supports rotatably supported on said base coaxially with said drive shaft and having a round supporting-surface for said second piece whose surface has the same radius as the supporting surface of said first cylindrical support, one of said second supports having holding means for setting one end of said second piece thereon and the other of said second supports having holding means for setting the other end of said second piece;

j. means for urging said two divided second supports near to or apart from each other, said urging means being adapted to make the joining edge of said first pouched-shape piece narrower when the joining edge of said second piece is inserted into the opening of said first piece and then expand said joining edge;

k. actuating means provided between said base and said frame for moving said second supports through said base toward said first support to insert the joining edge of said second piece into the opening of said first pouched-shaped piece;

l. connecting means provided between said first and second supports for connecting the same with each other for joint rotation when said second supports have been moved by said actuating means;

m. holding means movably mounted on said first support for pressing the overlapped portion of said first and second pieces against said first support, so that the overlapped portion of said first and second pieces is sewn by said stitch forming means according to the rotation of said first and second supports.

19. An apparatus as set forth in claim **18,** wherein said urging means includes:

a. spring means provided between said two divided second supports for normally biasing the same apart from each other;

b. a pair of levers rotatably mounted on said base for moving said two divided second supports to each other against the action of said spring means; and,

c. actuating means provided bwtween said pair of levers and said base for moving said pair of levers.

20. An apparatus as set forth in claim **18** wherein said two divided second supports are formed into a sectorial shape having an arcuate flange forming said round supporting surface.

21. An apparatus as set forth in claim **18** further comprising

a. a guide plate movably mounted on said round supporting surface of said second support in the direction of the longitudinal axis of said drive shaft for introducing the joining edge of said second piece fittingly into the opening of said first piece; and,

b. another actuating means provided between said guide plate and said two divided second supports for moving said guide plate, said actuating means being adapted to normally move said guide plate in an advance position wherein said guide plate is projected from said second support toward said first support and further to move said guide plate to be drawn out from the opening of said first pouched-shaped piece while the overlapped portion of said first and second pieces is held on said first support by said holding means after the insertion of said joining edge.

22. An apparatus as set forth in claim **21,** wherein said guide plate has a comb portion on that side which faces said first piece, thereby smoothly drawing out said guide plate.

23. An apparatus as set forth in claim **18,** wherein said expanding means includes:

a. a pair of catchers movably mounted on said first support for holding on said first support the lower lips of both sides of said first pouched-shaped piece; and,

b. means movably mounted on said first support for lifting the closed side of said first pouched-shaped piece to open the opening of said first piece.

24. An apparatus as set forth in claim **23,** wherein said lifting means includes:

a. a lifting plate so mounted on said first support as to move vertically;

b. holding means movably mounted on said lifting plate of holding the closed side of said first pouched-shaped piece on said lifting plate; and,

c. actuating means provided between said lifting plate and said first support for lifting said lifting plate with said holding means.

25. An apparatus as set forth in claim **23,** wherein said second supports have operating means for releasing the catching action of said pair of catchers when said second supports are moved and said first and second supports are connected.

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