July 23, 1957 F. MULKA 2,800,157

MACHINE FOR PRODUCING SLIDING CLASP FASTENERS

Filed Nov. 23, 1953

FIG. 3a

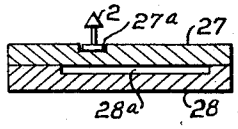



FIG. 1

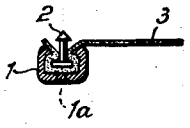



FIG. 1a


FIG. 3b

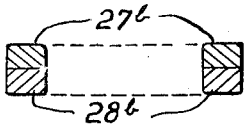



FIG. 2

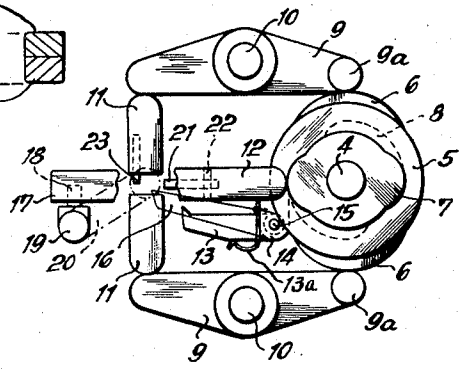



FIG. 4a

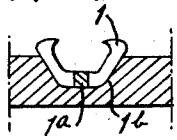



FIG. 4b

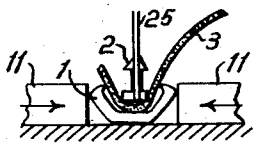



FIG. 4c

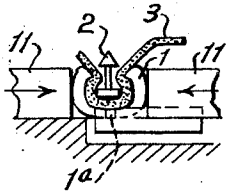



FIG. 4d

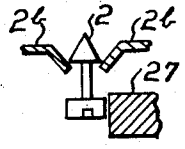
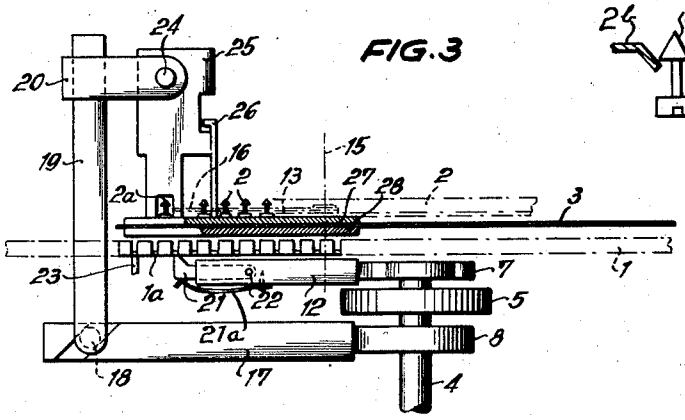



FIG. 3




INVENTOR

Friedrich Mulka,

by Hall & Houghton

ATTORNEY

United States Patent Office 2,800,157 Patented July 23, 1957



2,800,157

# MACHINE FOR PRODUCING SLIDING CLASP FASTENERS

Friedrich Mulka, Paderborn, Germany

Application November 23, 1953, Serial No. 393,916

Claims priority, application Germany November 27, 1952

5 Claims. (Cl. 153—1)

The present invention relates to sliding clasp fasteners, and more particularly to a fully automatic machine for the production of a sliding clasp fastener with elements embedded in cloth folds and clips gripping from the outer side.

This type of sliding clasp fastener is known and the invention relates to a fully automatic machine for making this type of fastener which is the latest known to the art.

Different kinds of automatic machines are already known for setting sliding clasp elements on cloth bands or stringers. But there exists no machine which is capable of producing the above mentioned novel type of sliding clasp fastener.

Moreover, the constructional parts already known in technical designing are not sufficient to enable the building of a suitable machine on the general technical lines applicable to the particular branch of engineering. Consequently the problem to be solved required inventive ingenuity.

A preferred embodiment of the invention is hereinafter described with reference to the accompanying drawing, in which:

Fig. 1 shows a new sliding clasp fastener in cross section;

Fig. 1*a* is a vertical cross section taken at right angles to that of Fig. 1;

Fig. 2 shows diagrammatically in top plan view the essential parts for producing the fastener illustrated in Fig. 1;

Fig. 3 is also a diagrammatic view of Fig. 2 in side elevation, partly in longitudinal section.

Fig. 3*a* is a vertical section taken on the lines **15** of Fig. 3;

Fig. 3*b* is a similar section taken through the left hand ends of plates **27**, **28**;

Fig. 4*a* is a detail partly in section showing one mode of supporting the clips being fed to the assembly point;

Fig. 4*b* is a detail partly in section showing the relation of the parts at the assembly point;

Fig. 4*c* is a similar view showing the parts in clip-closing position, and showing the arrangement of the web-cutter **23**, which is located one step beyond the assembly point as shown in Fig. 3.

Fig. 4*d* is a vertical sectional detail showing one mode of supporting the studs for movement by pawl **16** to position 2*a* of Fig. 3, and for providing for their downward displacement by the ram **25**.

Referring to Fig. 1, studs **2** are fixed in the fold of a cloth band **3** by clips **1** gripping from the outside.

In the machine illustrated a driving shaft **4** carries a cam disk **5**. This disk has lifts or curves **6**, **7** and **8**. The lifts **6**, which are mutually displaced through an angle of 180°, act simultaneously and alternately on ends 9*a* of two similarly shaped levers **9**. These levers turn about their pivots **10** and their other ends act on spreader jaws **11**. These jaws serve for clamping the clips fed in the form of a chain formed by webs **1***a* as shown in



Figs. 1 and 3. Before being clamped or compressed the clips are V-shaped. The jaws **11**, after being acted upon by the lifts **6**, can be moved apart by tension or compression springs (not shown). Before the clips **1** are pressed together the studs **2** and the cloth band or stringer **3** are introduced into the clip in the following manner:

The cam **8** acts on a control rod **17** which has a groove set at an angle of about 45° in which a pin or roller **18** engages. As the rod **17** moves to and fro the horizontal movement is converted by the groove into a vertical movement which is imparted to a control rod **19**. A strap **20** carried by the rod **19** is connected to a ram **25** by a pin **24**. As the ram descends it pushes a stud **2***a* into the clip **1** located thereunder and which has not yet been compressed. The cloth strip **3** which is under the stud **2***a* (Fig. 3) is simultaneously pressed in so that after the jaws **11** have operated the result shown in Fig. 1 is attained.

A plate **27** serves as guide for the studs **2** which are also fed like a chain. The row of studs is of course supported against movement laterally of the intended direction of feed by the lateral faces of guiding tracks (**27***a*) adapted to their cross section. The plate **27** therefore does not have, effectively, a plane surface, but effectively affords a guiding groove or channel as illustrated in Fig. 3*a*. Support and guidance is of course also afforded in a similar manner for the row of clips **1**, as illustrated at **1***b* in Fig. 4*a*. A plate **28** and the plate **27** form a guide for the cloth band or stringer **3** as shown in Fig. 3, and the clips **1** cannot be forced upwardly from their guiding support under pressure of the pawl **21**, as such displacement is prevented by the underside of the guide-plate **28**. As indicated at the left in diagrammatic Fig. 3 (see also Fig.3*b*), the plates **27** and **28** are cut away at their ends **27***b*, **28***b* underlying the ram **25** so that as illustrated in Fig. 4*b* the ram, carrying one of the studs **2***a*, may descend, pushing the tape **3** ahead of it, into the underlying clip **1** which is then closed around the tape and the base of the stud by the jaws **11** as shown in Fig. 4*c*. The supporting plate for the clip **1** of course extends under the jaws **11** and the ram **25** and dog **21** hold the thus supported clip in place thereon while it is being closed. The stud positioning end of the ram, shown as of sheet like form in Fig. 3, of course is as narrow as, or narrower than, the shank of the stud **2** (Fig. 1) and thus can carry the stud **2***a* into position to have the clip **1** closed about the fold in the strip **3** embracing its foot, and still be withdrawn after the clip has been closed (cf. Figs. 4*b* and 4*c*). For diagrammatic clarity, Fig. 3 shows the tape **3** as initially inserted and before it has been depressed into the clip **1**, shows the row of clips **1** as extending past the cut off position **23**, and shows the stud **2***a* in the position from which it is struck down by the ram **25**. It will be appreciated that with the machine operating at the rate hereinafter mentioned, the effect of gravity on the stud **2***a* is negligible as compared to the movements positively enforced on the parts, and that in operation of the machine, the tape **3**, and previously set studs, are actually locked in the clips located to the left of the ram portion. It will also be appreciated that the leading tine of the ram **25** (at the left of stud **2***a*, Fig. 3) enters between the tape embraced by the sides of the previously set clip and that being closed, and thus assists in supporting the clips while they are being severed by the punch **23**, as hereinafter described. For relatively slow operation any suitable means may be employed for guiding the studs to, and supporting them at, the position **2***a*. For example, as shown in Fig. 4*d*, the stud heads may be supported between resilient tracks **2***b*, from between which they may be forced by descent of the ram **25**, but such sup-

port is not essential when the machine operates at a high rate of speed. After the clips are severed by the punch **23**, the strip **3** to which the studs and clips are attached, maintains the continuity of the fastener assembly, which feeds from the severance point **23** over the underlying base of the machine (cross-hatched in Fig. 4*b*) until removed therefrom.

The clip chain is fed towards the left link by link by means of the cam lifts **7**, a control rod **12** and a feed pawl **21** which is pivoted at **22**, as can be clearly seen from Figs. 2 and 3. Similarly the stud chain is moved forward step by step by a horizontal pawl **13** pivoted at **15** and by an arm **14** on the control rod **12**.

A particularly important feature of the invention is an additional pawl **16** which is mounted on the pin **15** with the pawl **13**. This additional pawl moves each stud **2***a* into the position shown in Fig. 3 so that it is deposited exactly in the middle of one of the clips **1**, an operation which must be carried out with the highest degree of accuracy. In Figs. 2 and 3 the additional pawl **16** is shown by thin lines. Before the additional pawl **16** becomes operative the stud **2***a* is separated from the chain on the plate **27** by a cutter **26** as shown in Fig. 3. This cutter **26** drops downwardly with the ram **25** until it reaches the position shown in Fig. 3 resting on one of the little webs that initially connect the studs **2** into a strip or chain. The downward motion of the cutter **26** then ceases while motion of the ram **25** continues, for which purpose clearance is provided as indicated by the lost motion space in ram **25** adjacent the cutter arm **26** in Fig. 3. Finally, as the ram **25** approaches the end of its downward stroke, the cutter **26** reaches the upper end of the lost motion space, and is thus driven through the little connecting web as the ram **25** moves to the end of its downward stroke.

When the stud **2***a* has been fixed, the clip **1** last compressed is severed by a punch **23**. This punch is controlled by the jaws **11**. It will likewise be appreciated that these jaws, closing on the following clip **1**, further aid in immobilizing the connection **1***a* being severed by the punch **23**, which, in the form shown is carried by and moves with one of said jaws (see Fig. 2). The pressure required by the pawls **13**, **16** and **21** can be produced in known manner by springs.

The idea of the invention is the automatic feed of the two chains **1** and **2** and the severing of the studs **2***a* before they are introduced and the severance of the clips **1** at **1***a* after the studs **2***a* have been fixed or clamped in position.

From a kinematic point of view the whole mechanism represents a novel technical advance in the art. For example during a single revolution of the driving shaft **4** two working operations take place, namely the clamping of the studs and the feeding of chains **1** and **2** and of the cloth band or stringer **3**.

The actions of force of the levers **9** are oppositely directed and the one offsets the other in relation to the driving shaft **4**. The mechanism therefore, even when the driving shaft **4** is running at maximum speed, say about 1400 revolutions per minute, is dynamically balanced. As all movements are derived from a single driving shaft with the aid of cams or lifts, they can be carried out in the best possible manner according to the rules of kinematics and dynamics. The movements can be produced by cams and races having the smallest pitch, beginning at zero and ending at zero.

It will, of course, be understood that various details of construction may be varied through a wide range without departing from the principles of this invention and it is, therefore, not the purpose to limit the patent granted hereon otherwise than necessitated by the scope of the appended claims.

I claim:

1. An automatic machine for the production of a sliding clasp fastener of the type formed by assembling studs within a folded flexible strip and gripping the same therein by clips clamped externally about the fold, said machine comprising, in combination, means for guiding the flexible strip past an assembly point, means for feeding a chain of open-jawed clip elements to said assembly point with their open jaws facing one side of said strip at said assembly point, means for feeding a chain of stud elements toward said assembly point on the other side of said strip, means for severing the leading stud element from the chain of stud elements, means for advancing the severed stud element to a position aligned with the open jaws of a clip element at the assembly point with said strip intervening therebetween, for forcing the so aligned stud element against the strip, and for forcing said stud element and said intervening portion of said strip into the aligned open-jawed clip thus placing said stud element in a fold in said strip means for closing the jaws of the said clip to thereby affix the aligned stud and clip to the folded strip, and means for severing the closed clip from the chain of clips.

2. An automatic machine for the production of a sliding clasp fastener of the type formed by assembling studs within a folded flexible strip and gripping the same therein by clips clamped externally about the fold, said machine comprising, in combination, means for guiding the flexible strip past an assembly point, means for feeding a chain of open-jawed clip elements to said assembly point step by step with their open jaws facing one side of said strip, at said assembly point, means for feeding a chain of stud elements toward said assembly point on the other side of said strip, means for severing the leading stud element from the chain of stud elements, means for advancing the severed stud element to a position aligned with the open jaws of a clip element at the assembly point with said strip intervening therebetween, for forcing the so aligned stud element against the strip, and for forcing said stud element and said intervening portion of said strip into the aligned open-jawed clip thus placing said stud element in a fold in said strip, reciprocating means for closing the jaws of the said clip to thereby affix the aligned stud and clip to the folded strip, and means for severing the closed clip from the chain of clips.

3. An automatic machine for the production of a sliding clasp fastener of the type formed by assembling studs within a folded flexible strip and gripping the same therein by clips clamped externally about the fold, said machine comprising, in combination, means for guiding the flexible strip past an assembly point, reciprocating means for feeding a chain of open-jawed clip elements to said assembly point step by step with their open jaws facing one side of said strip at said assembly point, means for feeding a chain of stud elements toward said assembly point on the other side of said strip, means for severing the leading stud element from the chain of stud elements, reciprocating means for advancing the severed stud element to a position aligned with the open jaws of a clip element at the assembly point with said strip intervening therebetween, for forcing the so aligned stud element against the strip, and for forcing said stud element and said intervening portion of said strip into the aligned open-jawed clip thus placing said stud element in a fold in said strip reciprocating means for closing the jaws of the said clip to thereby affix the aligned stud and clip to the folded strip, and means for severing the closed clip from the chain of clips.

4. An automatic machine according to claim 3, said machine having a vertical driving shaft, said shaft carrying cam discs for actuating said reciprocating clip feeding and stud advancing means, said cam discs and said reciprocating clip feeding and stud advancing means being horizontally oriented, whereby the reciprocations

thereof take place at right angles to the force of gravity and are free of gravity accelerations and decelerations.

5. A machine according to claim 1, said jaw closing means being arranged to close a clip while said clip is still attached to said chain of clips, and said clip severing means being arranged to sever and clip from the chain at a position removed from the point at which said clip is closed.



**References Cited** in the file of this patent

UNITED STATES PATENTS

| | | |
|---|---|---|
| 2,054,821 | Kase | Sept. 22, 1936 |
| 2,198,345 | Legat | Apr. 23, 1940 |
| 2,385,836 | Norkin et al. | Oct. 2, 1945 |
| 2,545,756 | Andren | Mar. 20, 1951 |
| 2,670,531 | Mackey | Mar. 2, 1954 |