United States Patent [19]

Franzen

[11] **3,842,580**

[45] **Oct. 22, 1974**

[54] **SUCTION MECHANISMS FOR YARN PROCESSING MACHINES**

[75] Inventor: **Gustav Franzen,** Dusseldorf, Germany

[73] Assignee: **Palitex Project-Company GmbH,** Krefeld, Germany

[22] Filed: **July 23, 1973**

[21] Appl. No.: **381,767**

[30] **Foreign Application Priority Data**

July 28, 1972 Germany 2237126

[52] **U.S. Cl.** ..... **57/34 R,** 57/34.5, 242/35.5, 242/35.6

[51] **Int. Cl.** **D01h 15/00**

[58] **Field of Search** ..... 57/56, 54 R, 34.5, 1 R; 242/35.5 R, 35.6 R

[56] **References Cited**

UNITED STATES PATENTS

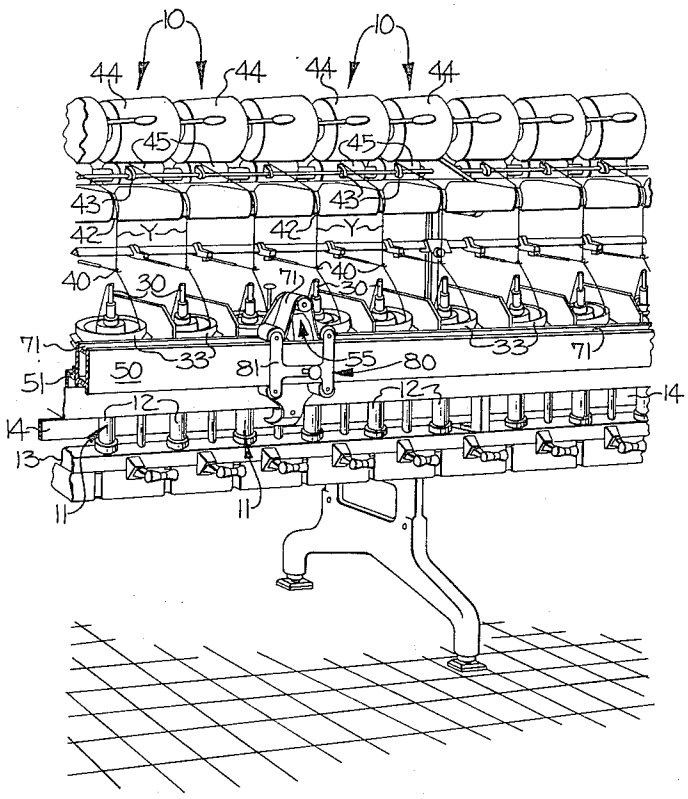
2,908,029	10/1959	Furst	57/34.5 X
3,018,503	1/1962	Hijiya et al.	57/56 X
3,077,311	2/1963	Furst	242/35.5 R

Primary Examiner—John Petrakes
Attorney, Agent, or Firm—Parrott, Bell, Seltzer, Park & Gibson

[57] **ABSTRACT**

Improved suction mechanisms, particularly for yarn processing machines having a plurality of spindle assemblies positioned in side-by-side relationship for the processing of yarn, as follows. Suction conduit means having a negative air stream therethrough is preferably mounted in front of the spindle assemblies and includes a plurality of apertures spaced along the length thereof for causing a suction through each of the apertures. A movable suction device, preferably in the form of a yarn knotter mechanism having pneumatic suction threading means thereon, is mounted on the conduit means for movement therealong for selectively positioning the device at a selected one of the apertures, preferably in front of a selected spindle assembly, and defining an air passageway therein, preferbly in the pneumatic threading mechanism of the yarn knotter mechanism, for mating communication with the selected aperture of the conduit means for creating a suction through the air passageway by the negative air stream in the conduit means. Continuous means is provided which covers the plurality of apertures in the conduit means not in mating relation with the suction device to prevent loss of suction in the conduit. Mechanisms are provided which cooperate with the suction device for uncovering the selected aperture for allowing the mating communication between the uncovered aperture and the air passageway of the suction device.

13 Claims, 8 Drawing Figures



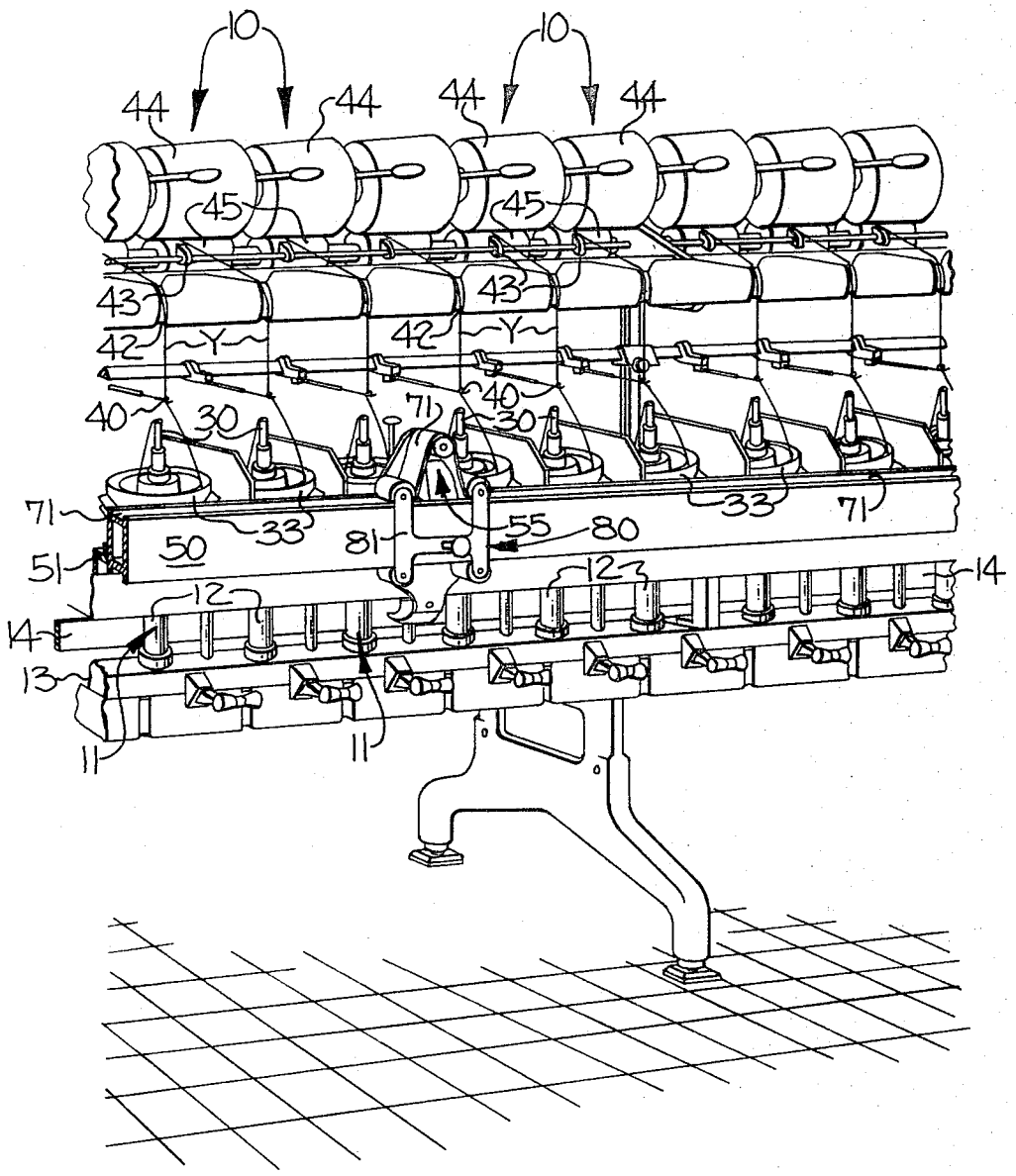

10
10
44
44
44
44
45
45
43
43
42
42
Y
Y
40
40
30
30
71
71
33
33
71
50
81
55
80
51
12
12
14
14
13
11
11

Fig-1

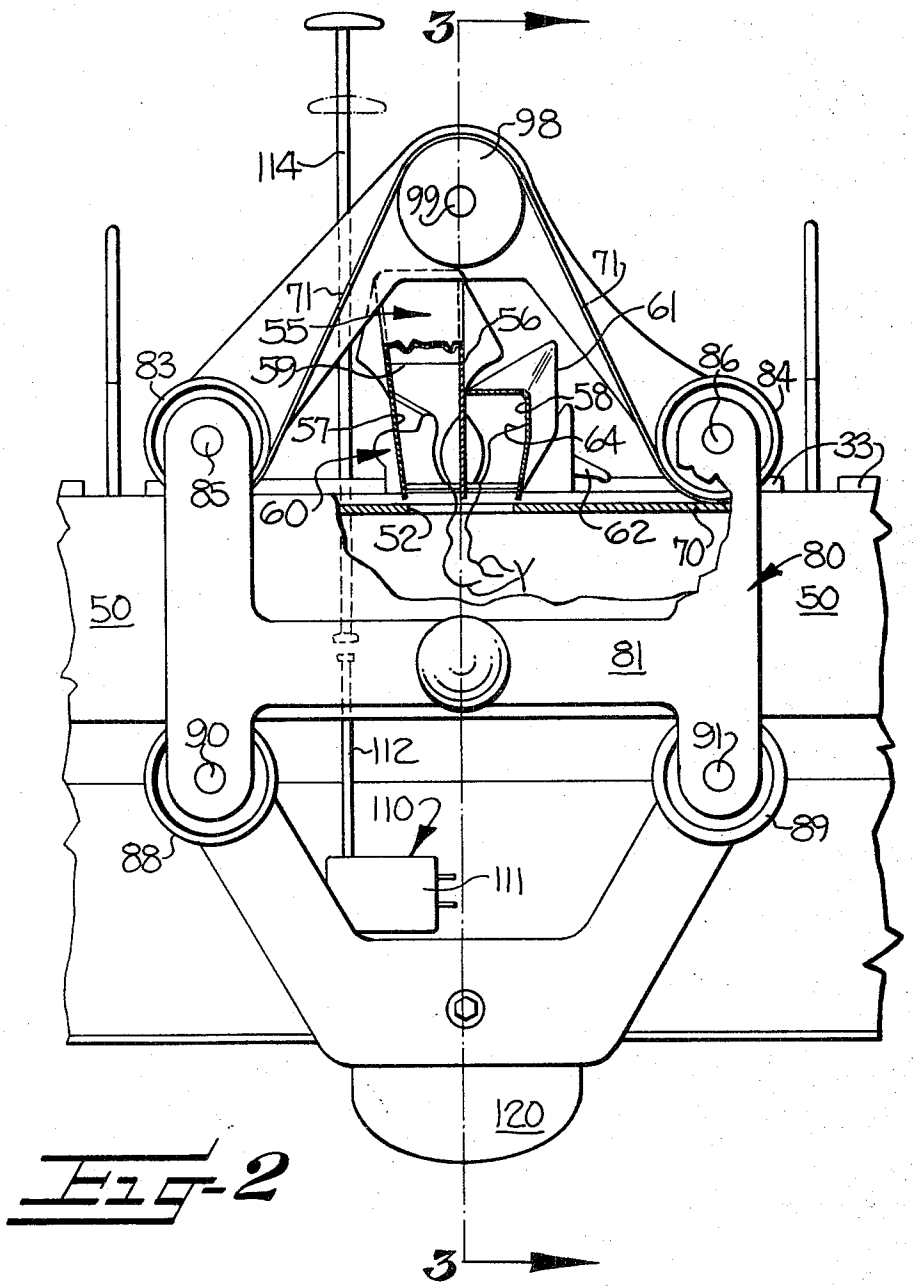

3
98
114
99
71
71
55
56
61
59
83
86
84
58
57
64
33
85
60
52
62
70
80
50
50
81
90
91
112
110
89
88
111
120
3

Fig-2

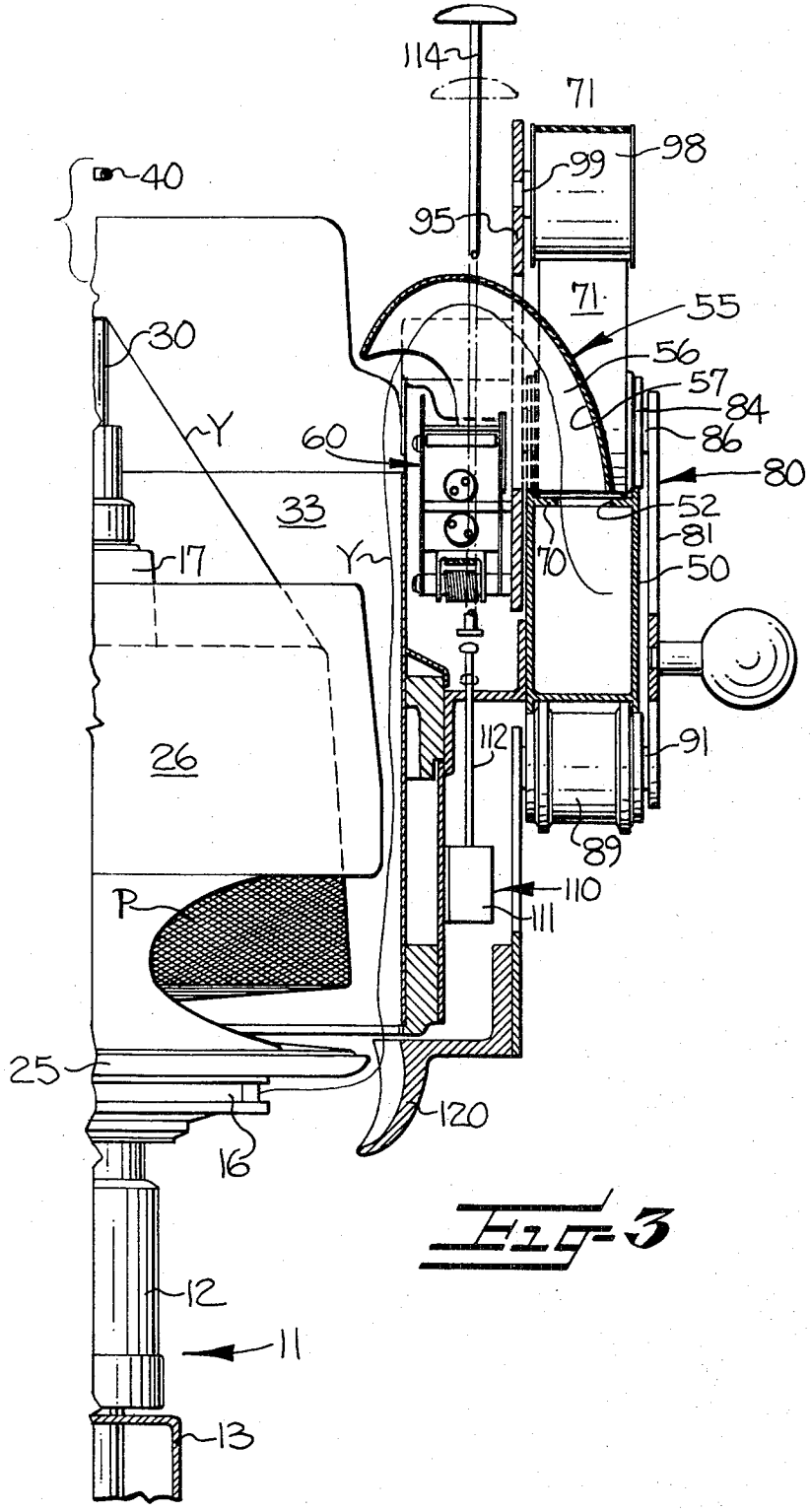

114
71
98
99
95
40
71
55
30
56
57
84
Y
60
86
80
33
52
81
17
Y
70
50
26
112
91
89
110
P
111
25
120
16
12
11
13

Fig-3

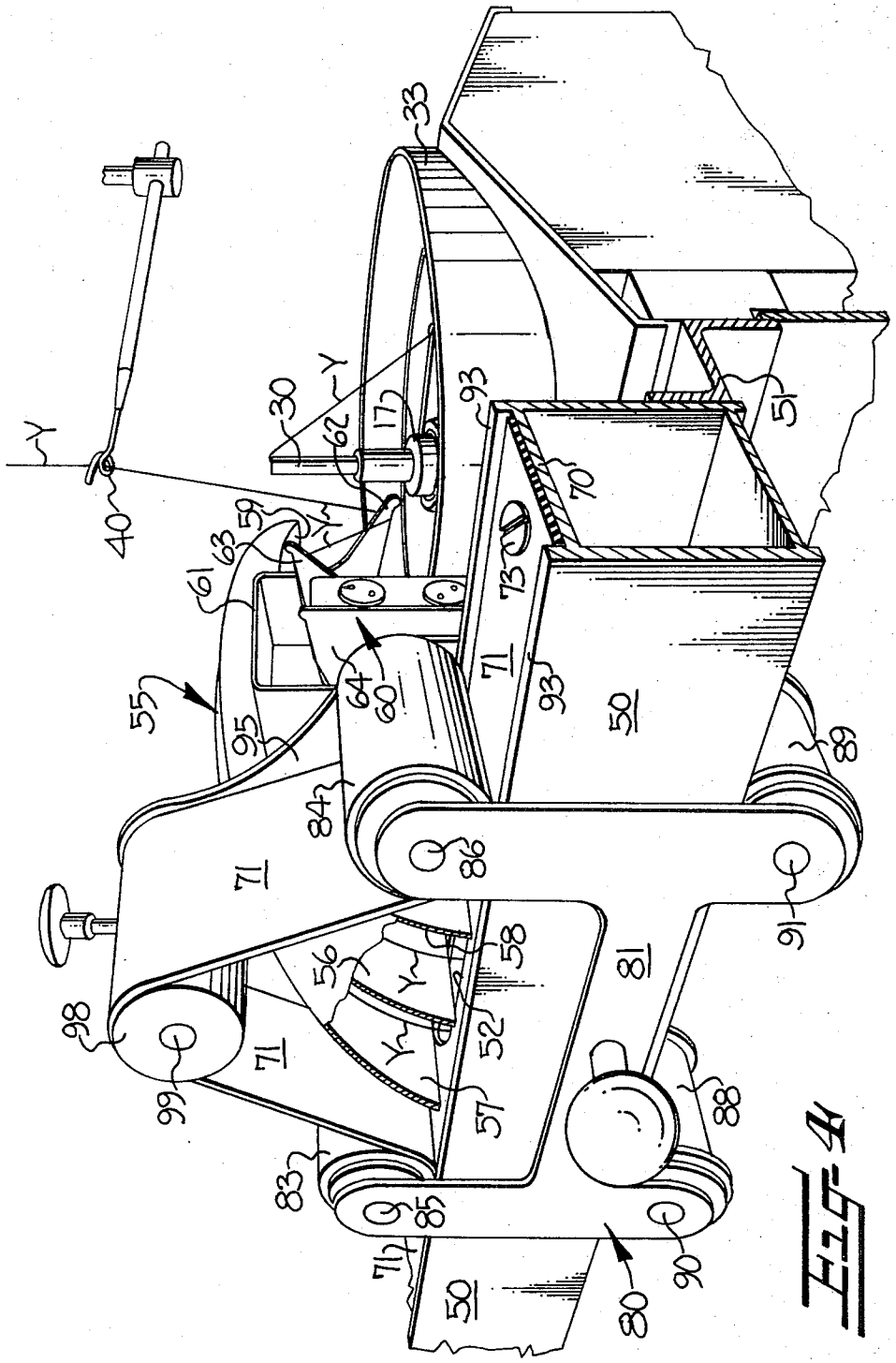

33
30
62
17
93
51
70
40
59
63
61
73
64
60
71
93
50
55
95
89
84
86
91
71
56
58
81
98
52
57
88
99
83
85
90
71
50
80

Fig. 4

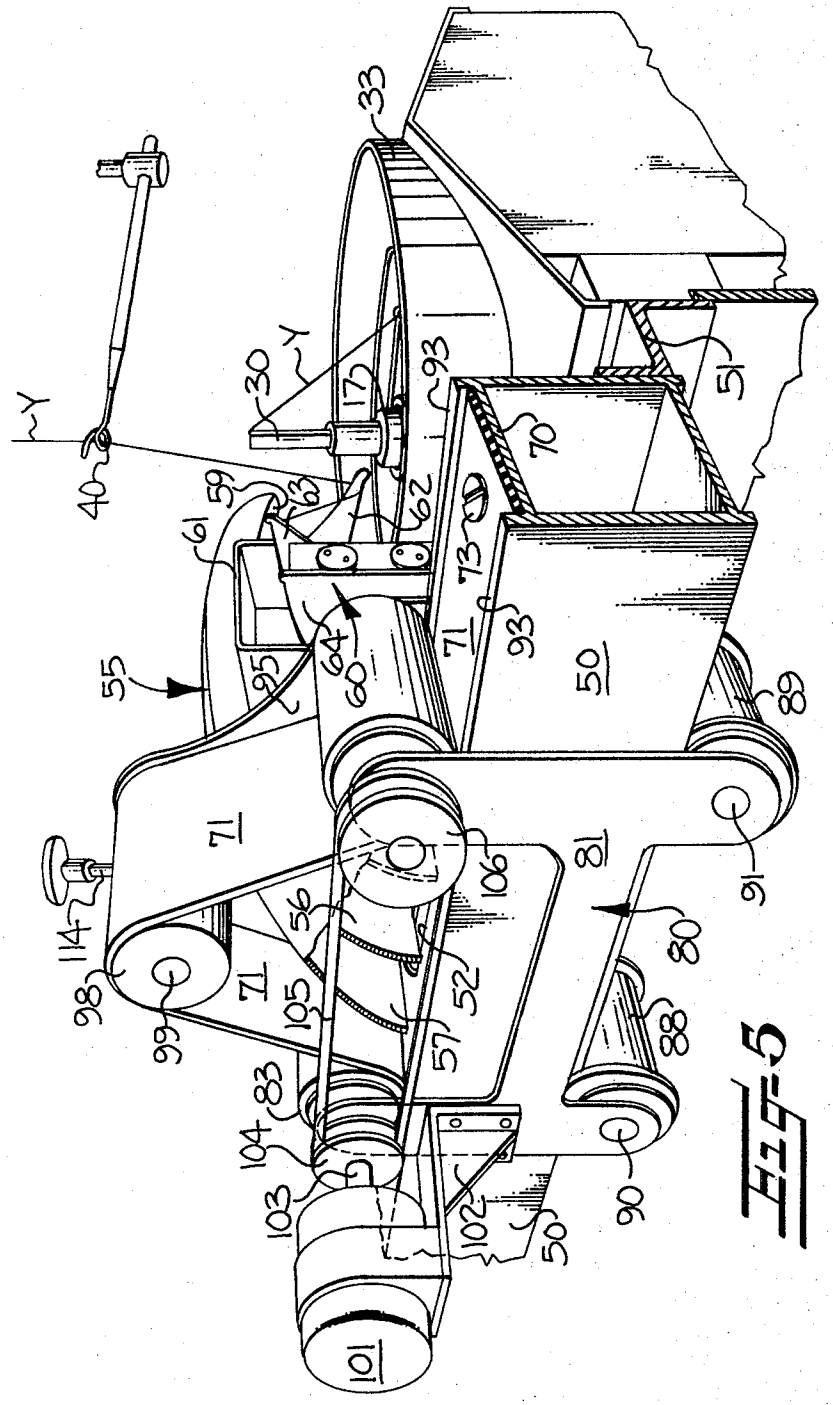

33
30
Y
Y
17
93
51
70
40
59
63
62
61
73
64
60
71
93
50
55
95
89
71
106
81
91
114
56
80
98
71
105
52
88
99
57
83
104
103
102
90
50
101

Fig-5

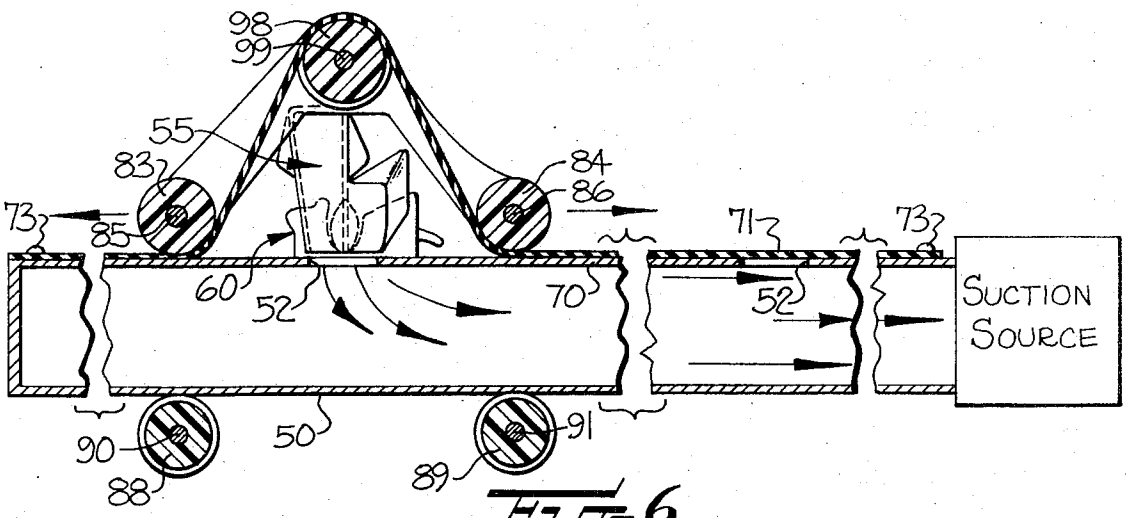


Fig-6

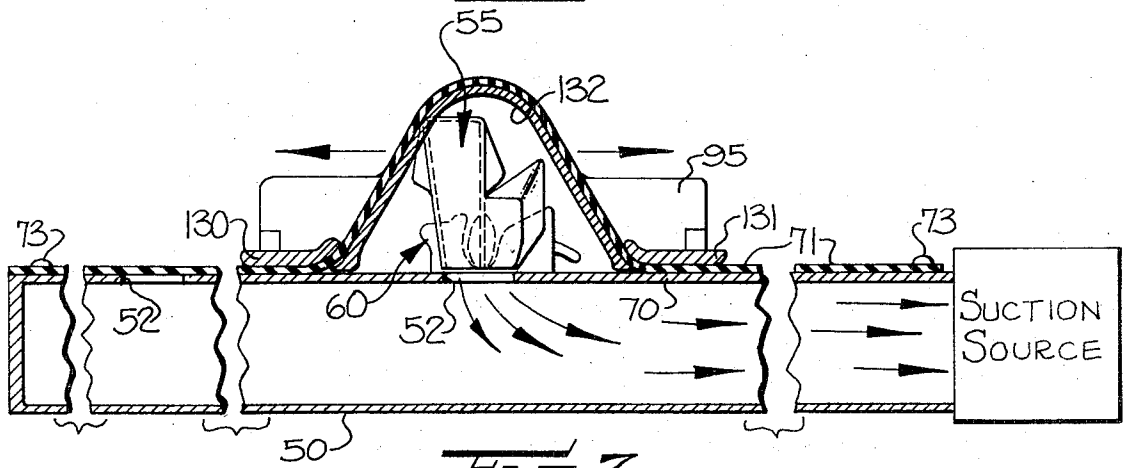


Fig-7

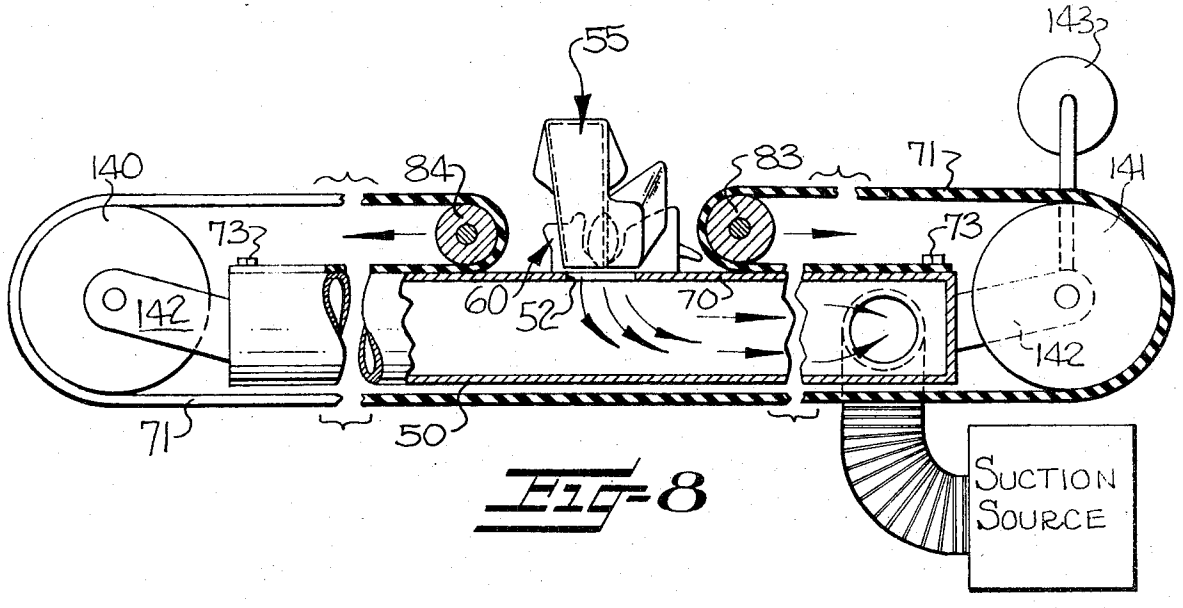


Fig-8

SUCTION MECHANISMS FOR YARN PROCESSING MACHINES

This invention relates to improved suction mechanisms, preferably for a textile yarn processing machine which preferably has a yarn knotter mechanism with pneumatic threading means.

Heretofore, apparatus has been provided for positioning a suction device at selected working locations for performing various working operations. However, this apparatus has not been entirely satisfactory inasmuch as the apparatus, of necessity, was complex and presented problems with loss of suction and in providing adequate closure devices at the non-working locations. These problems were particularly acute in yarn processing machines in which suction devices were required to be selectively positioned in front of various spindle assemblies for performing a working operation at the selected spindle assembly location.

More specifically, in the operation of a textile yarn processing machine in which single ends of yarn are processed at the various spindle assembly locations on the machines, if the yarn broke forming two ends of broken yarn or if the yarn was otherwise separated, it has been customary to use a commercially available, portable, manually operated knotter mechanism for piecing together or knotting together the two ends of separated yarn for further processing at the spindle assembly location. In the use of these portable yarn knotter mechanisms, an operator would customarily bring the knotter mechanism to the spindle assembly and hold the yarn knotter mechanism, while inserting two separated ends of yarn into the mechanism for manually operating the knotter mechanism to knot the two ends of yarn. Thus, the knotting procedure required the operator to hold the knotting mechanism while gripping and placing both of the separated ends of yarn into the mechanism, requiring the operator to exert a grip at three places, for which, however, only two hands are at the operator's disposal.

Accordingly, it is the object of this invention to overcome the above deficiencies of prior suction devices required to be selectively positioned at various working locations, particularly at selected spindle assemblies of the yarn processing machine and to provide suction devices, particularly a suction or pneumatic threading mechanism of a yarn knotter device which may be selectively positioned at the desired working location and preferably at a selected spindle assembly of a yarn processing machine.

It has been found by this invention that the above object may be accomplished by providing suction apparatus comprising, in combination, elongate, stationary, suction conduit means having a negative air stream therethrough. The conduit means includes a plurality of apertures spaced along the length thereof for causing a suction through each of the apertures. A movable suction device is provided which includes means mounting the suction device on the conduit means for movement therealong for selectively positioning the device at a selected one of the apertures and defining an air passageway therein for mating communication with the selected aperture of the conduit means for creating a suction through the air passageway of the device by the negative air stream in the conduit means. Continuous means is provided covering the plurality of apertures in the conduit means not in mating relation with the suction device to prevent loss of suction in the conduit means. Means cooperating with the suction device is provided for uncovering the selected aperture for allowing the mating communication between the uncovered aperture and the air passageway of the suction device.

Preferably, the means mounting the suction device comprises a carriage mechanism carrying the suction device and mounted on the conduit for movement therealong and the means covering the plurality of apertures comprises an elongate flexible belt secured at its ends to the ends of the conduit and positioned to overlie and engage the apertures of the conduit. The suction device carriage mechanism includes means engaging and moving the belt away from the selected aperture when the suction mechanism and the carriage are moved to the selected aperture.

Preferably, the improved suction apparatus of this invention is utilized in a yarn processing machine, such as a twister, spinning frame or the like, having a plurality of spindle assemblies positioned in side-by-side relationship for the processing of yarn. The suction conduit is mounted on the yarn processing machine and extends generally horizontally along the front of the spindle assemblies and the apertures in the suction conduit means are positioned in front of each of the spindle assemblies. The suction device is in the form of a yarn knotter mechanism for knotting together two ends of broken or otherwise separated yarn and includes suction threading means for mating communication with the aperture of the conduit means at the selected spindle assembly. The yarn knotter mechanism is mounted for generally horizontal movement along the conduit means for positioning thereof in front of the selected spindle assembly for a yarn knotting operation. When the pneumatic threading means of the yarn knotting mechanism is in mating relation with the aperture at the selected spindle assembly, a suction is created through the threading means by the negative air stream in the conduit for pulling and threading the separated yarn ends at the selected spindle assembly into and through the knotter mechanism.

If the yarn processing machine includes means operatively connected with each of the spindle assemblies for selectively stopping and starting operation of the respective spindle assemblies, it has been found preferable by this invention for each spindle assembly to include actuating means operatively connected with the respective control means and for the yarn knotter mechanism to include cooperating actuating means for actuating the selected spindle assembly actuating means for in turn actuating the control means to stop operation of the respective spindle assembly for yarn knotting operation. The spindle assembly actuating means is also responsive to deactuation of the knotter mechanism actuating means for actuating the control means to start operation of the respective spindle assembly means for a yarn processing operation.

Also, if the yarn processing machine includes pneumatically-operated yarn threading means operatively associated with each of the spindle assemblies for selectively threading a yarn end through at least a portion of each of the spindle assemblies, it has been found by this invention to be preferable for the spindle assembly actuating means to be operatively connected with the respective pneumatic threading means for starting operation thereof when the yarn knotter actuating

means actuates the spindle assembly actuating means. Likewise, the pneumatic threading means will be deactuated when the knotter mechanism actuating means deactuates the spindle assembly actuating means to stop the pneumatic threading operation.

Some of the objects and advantages of this invention having been stated, other objects and advantages will appear as the description proceeds, when taken in conjunction with the accompanying drawings, in which

FIG. 1 is a partial perspective view taken generally from the front of a portion of a two-for-one twister yarn processing machine including a plurality of spindle assemblies and having the improved apparatus of this invention thereon;

FIG. 2 is an enlarged front elevational view of a portion of the improved apparatus of this invention, i.e. a yarn knotter mechanism with pneumatic threading means, positioned at one of the spindle assemblies of the two-for-one twister of FIG. 1;

FIG. 3 is a sectional view, taken generally along the line 3—3 of FIG. 2;

FIG. 4 is a perspective view of the improved apparatus of this invention, generally as shown in FIG. 2, mounted at one spindle assembly of the two-for-one twister shown in FIG. 1;

FIG. 5 is a view, like FIG. 4, of a slightly modified form of the apparatus according to this invention;

FIG. 6 is a schematic, front elevational, sectional view, with parts omitted, illustrating one form of apparatus according to this invention;

FIG. 7 is a view, like FIG. 6, illustrating a modified form of apparatus according to this invention; and

FIG. 8 is a view, like FIGS. 6 and 7, illustrating a further modified form of apparatus according to this invention.

While the drawings and specific description to follow will be related to a two-for-one twister having a yarn knotting mechanism, which is the preferred form of apparatus utilizing the improvements of this invention, it is to be understood that the improvements of this invention could also be utilized on other machines and other yarn processing machines. By the same token, while the drawings and specific description to follow, will be directed to a yarn knotter mechanism having improved suction threading means thereon as the suction device in accordance with this invention, it is to be understood that the other suction devices for performing specific work functions at desired, selected locations, could be constructed in accordance with this invention.

Referring now to the drawings, there is shown in FIG. 1, a portion of a two-for-one twister yarn processing machine having a pluralty of spindle assemblies, generally indicated at 10, positioned in side-by-side relationship.

A full illustration and description of the entire two-for-one twister yarn processing machines and the various spindle assemblies 10 thereof is not given herein and is not believed to be necessary for an understanding of the present invention, the operation and structure of such a two-for-one twister yarn processing machine and the plurality of spindle assemblies thereof being well understood by those with ordinary skill in the art.

Generally, each of the spindle assemblies 10, which are conventionally mounted in side-by-side relationship in a two-for-one twister, comprises a rotatably driven rotor mechanism, generally indicated at 11. The rotor mechanism 11 includes a whorl 12 suitably rotatably mounted on the twister frame portion 13 and rotated by a continuous drive belt 14. The rotor mechanism 11 further includes a horizontally extending reserve disc device 16 (see FIG. 3) secured to the whorl 12 for being driven thereby and a generally vertically extending hollow axle device 17. The reserve disc 16 and hollow axle 17 define therewithin a vertically extending yarn passageway (not shown) and a horizontally extending yarn passageway mating with each other.

The spindle assembly 10 further includes a yarn carrier mechanism 25 for carrying a hollow package P of yarn Y and being rotatably mounted on the rotor mechanism 11 so that the rotor mechanism may rotate relative thereto. The carrier mechanism 25 includes a basket device 26 which surrounds the package P of yarn Y and is rotatably mounted so that the hollow axle 17 may rotate relative thereto. The carrier mechanism 25 may include a yarn entry tube 30.

The spindle assembly 10 further includes a balloon limitor device 33 surrounding the basket device 26. A yarn guide eyelet 40 is positioned above and in axial alignment with the hollow axle 17 and the yarn entry tube 30. There is further provided a pre-take-up roll 42, a yarn traversing mechanism 43, and a take-up or package roll 44, upon which the yarn Y is wound after being processed or twisted by the spindle assembly 10. The package roll 44 is rotated by a friction drive roll 45.

With the above described mechanisms, the yarn Y passes from the package P and is threaded through the yarn entry tube 30, through the yarn passageway of the hollow-axle device 17 and the reserve disc 16 and out of the reserve disc 16 in a horizontal direction (as shown in FIG. 3). The yarn Y then passes upwardly between the basket device 26 and the balloon limitor 33 to form a balloon of yarn. The yarn Y is then threaded through yarn guide eyelet 40, over pre-take-up roll 42 and is traversed by traversing mechanism 43 onto the package roll 44 to complete its travel through the respective spindle assembly 10. As is well understood by those with ordinary skill in the art, a two-for-one twist is inserted in the yarn during the above noted path of travel.

If during the travel of the yarn, as noted above, the yarn Y breaks or a new supply package P of yarn Y is placed in the spindle assembly 10, two separated ends of yarn Y are formed which must be knotted or pieced together for continued operation of the spindle assembly 10. When the yarn Y passing through the spindle assembly 10 is thus broken or otherwise separated, the separated ends are so positioned that one separated end extends downwardly from the eyelet 40 and the other separated end of yarn Y extends upwardly from between the basket device 26 and the balloon limitor device 33. Conventionally, a portable, manually operated yarn knotter mechanism would be brought into position for receiving the two separated ends of yarn Y and knotting them together.

In accordance with the present invention, an elongate, suction conduit 50 mounted on a frame portion 51 of the two-for-one twister and extends generally horizontally along the front of the spindle assemblies 10. The conduit 50 is connected to a suitable source of suction (see FIG. 6) for creating a negative air stream through the conduit 50. The conduit 50 may be gener-

ally square in cross sectional configuration or may assume other shapes, as desired.

The conduit **50** includes a plurality of apertures **52** in the top thereof in which one aperture is positioned at the front of each of the spindle assemblies **10**. The plurality of apertures may constitute one continuous aperture.

A yarn knotter mechanism, generally indicated at **60**, for knotting together two ends of broken or otherwise separated yarn is mounted on the machine for generally horizontal movement along the suction conduit **50** for positioning the knotter mechanism in front of a selected spindle assembly **10** for a yarn knotting operation. The yarn knotter mechanism **60** and its operation for knotting together two separated ends of yarn is well understood by those with ordinary skill in the art and does not require detailed explanation herein for an understanding of the present invention. Yarn knotter mechanisms are available from many commercial sources, e.g. Wildt Mellor Bromley Ltd., 82 Princess Street, Manchester M. 16 WL, England.

In accordance with this invention, the yarn knotter mechanism **60** is provided with a pneumatic threading mechanism comprising a duct **55** extending around and over the top of the knotter mechanism and forming an air passageway therein. The duct includes a separator baffle **56** separating the air passageway of the duct into two portions **57** and **58** for the reception and passage of the separated ends of yarn Y in the respective portions **57** and **58**. The air passageway portion **57** has an open longitudinally oriented mouth portion **59** extending over the front of the knotter mechanism **60** for the reception of the separated end of yarn passing upwardly from between the basket device **26** and the balloon limitor device **33**. The other passageway portion **57** includes a laterally oriented opening **61** in the side thereof for the reception of the other separated end of yarn Y passing downwardly from the guide **40**. The end of yarn Y passing downwardly from the guide **40** is passed under guide shoulder **62** and over guide shoulders **63** and **64** to be received within the lateral opening **61** and into the passageway portion **58**.

The lower or bottom end of the air passageway portions **57** and **58** of the duct **55** are open for mating engagement with the aperture **52** in the upper portion of the conduit **50** so that when the yarn knotter mechanism **60** is positioned in front of a selected spindle assembly **10** the air passageway portions **57** and **58** of the duct **55** will be in mating engagement with the aperture **52** for creating a suction or negative air stream through the passageway portions **57** and **58** for sucking in the separated ends of yarn Y into the open mouth **59** of the air passageway portion **57** and the lateral opening **61** of the air passageway portion **58** for automatic threading of the yarn knotter mechanism **60** for a yarn knotting operation.

In accordance with this invention, the conduit means **50** includes a flat bearing surface **70** along the top portion thereof in which the apertures **52** are located. Means in the form of an elongate, flexible belt **71** is positioned on the bearing surface **70** for covering the apertures **52** in the conduit **50**. The belt **70** is preferably a continuous belt in which the ends thereof are secured to generally the ends of the conduit **50** by screws **73** or other suitable securing arrangements.

The yarn knotter mechanism **60** is mounted for movement along the conduit **50** on a carriage mechanism, generally indicated at **80**. The carriage mechanism **80** comprises a generally H-shaped frame member **81**. The H-shaped frame member rotatably carries a pair of bearing rollers **83** and **84** by stub shafts **85** and **86** at the upper end thereof. These bearing rollers **83** and **84** engage and move along the top surface of the belt **71** on the bearing surface **70** of the conduit **50**. Another pair of bearing rollers **88** and **89** are rotatably carried on the bottom ends of the H-shaped frame member **81** by stub shafts **90** and **91** and engage and move along the bottom of the conduit **50**. The bearing surface **70** of the conduit **50** includes upwardly extending shoulders **93** on each side of the bearing surface between which the bearing rollers **83** and **84** are guidingly positioned.

The carriage mechanism **80** further includes a plate **95** secured to the other side of the bearing rollers **83** and **84** and on which the yarn knotter mechanism **60** is suitably mounted for being carried by the carriage mechanism **80**. At the top of the plate **95** a third roller **98** is mounted by stub shaft **99** for rotation. As may be clearly seen in FIG. **4**, the belt **71** passes under the bearing rollers **83** and **84** and upwardly and over the roller **98**, so that as the carriage mechanism **80** is moved linearly along the conduit **50**, the rollers **83**, **84** and **98** will engage and move the belt **71** away from the bearing surface **70** of the conduit **50** and away from the aperture **52** between the bearing rollers **83** and **84**. As may be also seen in FIG. **4**, the portion of the duct **55** which is to matingly engage the aperture **52** in the conduit **50** extends between the rollers **83** and **84**.

As shown in FIG. **5**, suitable means may be provided for driving one or both of the bearing rollers **83** and **84** selectively so that the carriage **80** and yarn knotter mechanism **60** may be automatically moved along the conduit **50**. As shown in FIG. **5**, this drive means may include a motor **101** which is suitably, selectively actuated by any electrical circuit or other means and is mounted on the carriage **80** by a bracket **102**. The motor **101** includes a shaft **103** which connects with or is integral with the stub shaft **86** of the roller **84** and carries a pulley **104** thereon. The pulley **104** carries a belt **105** which also passes around a pulley **106** on the end of stub shaft **85** of roller **83**.

Thus, it may be seen, that when the yarn Y becomes broken or otherwise separated, the yarn knotter mechanism **60** may be moved along the conduit **50**, either manually or by the drive mechanism illustrated in FIG. **5**, to a selected spindle assembly. When the carriage mechanism and the yarn knotter mechanism **60** are positioned at the selected spindle assembly, the duct **55** of the pneumatic threading means for the yarn knotter mechanism will be suitably positioned and mate with the uncovered aperture **52** in the conduit **50** so as to establish a suction or negative air stream through the passageway portions **56** and **57** of the duct **55**. The separated ends of yarn Y may then be sucked or pulled into the respective air passageway portions **56** and **57** for automatically threading the yarn knotter mechanism for a knotting operation. Due to the fact that the flexible belt **71** covers the other apertures **52** in the conduit **50**, no loss of suction will occur in the conduit **50** at non-working locations.

Preferably, the two-for-one twister of this invention is equipped with an automatically controlled friction roll **45**, in accordance with U.S. Pat. No. 3,565,356, issued Feb. 23, 1971, and assigned to the assignee of the

present invention, and apparatus for stopping the spindle mechanism in a predetermined position in accordance with U.S. Patent application, Ser. No. 264,816, filed June 21, 1972, now U.S. Pat. No. 3,805,507, issued Apr. 23, 1974, and assigned to the assignee of the present invention. Both of these control mechanisms include, inter alia, electrical and mechanical control systems for stopping operation of the spindle mechanism and the take-up mechanism in predetermined positions when piecing up or knotting of broken yarns or doffing is required.

When the spindle assemblies **10** include these control means for selectively stopping and starting operation of the selective spindle assembly, it is preferable for each of the spindle assemblies **10** to include actuating means **110** suitably operatively connected with these control means. The actuating means **110** may be in the form of an electrical switch **111** which includes an extending push rod **112.** The yarn knotter mechanism **60** and carriage mechanism **80** also include a cooperating actuating means in the form of a plunger **114** which extends from the upper end thereof and is suitably mounted for vertical up and down movement. When the carriage mechanism **80** and the yarn knotter mechanism **60** are suitably positioned at a selected spindle assembly, the cooperating actuating means **114** of the yarn knotter mechanism may be depressed for engaging the rod **112** of the switch **111** and actuating the spindle assembly actuating means which in turn actuates the control means of the above identified patent and patent application to stop operation of the spindle assembly **10.** Likewise, when the plunger **114** or actuating means of the yarn knotter mechanism is deactuated or raised, the actuating means **110** of the spindle assembly will be deactuated to actuate the control means of the above identified patent and patent application for starting operation of the spindle assembly **10.**

Also, it is preferable in accordance with this invention for the two-for-one twister machine to include pneumatically-operated yarn threading mechanisms operatively associated with each spindle assembly **10** for selectively threading a yarn through at least a portion of the spindle assembly upon actuation thereof. Such a pneumatically-operated yarn threading mechanism for a two-for-one twister of this type is disclosed in U.S. Pat. No. 3,731,478, issued May **8, 1973** and assigned to the assignee of the present invention. Reference may be had to that patent for disclosure of the operation of the pneumatically-operated yarn threading mechanism. Generally, this mechanism includes, inter alia, an ejector nozzle which causes a positive air stream to flow through the yarn passageway of the hollow axle **17** for sucking the yarn from the supply package P through the entry tube **30** and the passageway within the hollow axle **17** and blowing the yarn out of the passageway in the reserve disc **16** by a positive air stream. The air stream then engages spoon shaped deflection guide surface **120** (see FIG. **3**) which deflects the air stream and carries it and the yarn Y up through the space between the basket device **26** and the balloon limitor **23** to bring the end of the yarn in position for the knotting operation. At this position, the yarn would be received by the open mouth **59** of the duct **55** of the yarn knotter mechanisms **60** and be drawn in by the negative air stream therethrough for threading of this end of separated yarn Y through the knotter mechanism **60.** The pneumatically-operated yarn threading mechanism of the spindle assembly **10,** in accordance with the above identified patent, includes suitable electrical or mechanical control means for starting and stopping operation thereof.

In accordance with the present invention, the actuating means **110** of each spindle assembly **10** is suitably operatively connected with the pneumatic threading mechanism of the above identified patent for starting operation thereof when actuated by the actuating means **114** of the yarn knotter mechanism **60** and for stopping operation thereof when the actuating means **114** is deactuated, which in turn deactuates the actuating means **110** of the selected spindle assembly **10** to stop operation of the pneumatic threading means.

Referring now to FIG. **7,** there is schematically shown an alternative form of the carriage mechanism **80** illustrated in FIGS. **1–6.** In the embodiment of FIG. **7,** the bearing rollers **83** and **84** are replaced by a pair of bearing shoes **130** and **131.** These shoes **130** and **131** are suitably mounted on a similar frame member **80** (not shown) as utilized in the carriage arrangement of FIGS. **1–6.** These bearing shoes are adapted to engage the upper surface of the belt **71** on the bearing surface **70** of the conduit **50** and slide therealong for movement of the carriage **80** and the yarn knotter mechanism **60.** The upper roller **98** of the carriage mechanism of FIGS. **1–6** is replaced by a hollow, generally concave housing **132** which is suitably secured to a similar plate **95** on the back of the carriage mechanism and which may be closed on its front end to prevent any unnecessary loss of suction through the uncovered aperture **52.** The portion of the duct **55** of the yarn knotter mechanism **60** which mates with the uncovered aperture **52** extends within the concave housing **132** and between the bearing shoes **130** and **131.**

Referring now to a further modified form of apparatus according to this invention, as illustrated in FIG. **8,** the upper roller **98** of the embodiment of FIGS. **1–6** is eliminated and a different arrangement of the belt **71** is provided. Otherwise, the carriage mechanism **80** would be of generally the same construction, as previously described.

In the embodiment of FIG. **8,** the belt **71** is also secured by securing screws **73** to generally the ends of the conduit **50** and extend inwardly under, around and over the bearing rollers **83** and **84** on the carriage mechanism **80** and then outwardly and around the ends of the conduit and under the conduit. There are further provided a pair of rollers **140** and **141** suitably rotatably mounted by arms **142** at the ends of the conduit **50** so that the belt **71** may pass therearound and under the conduit **50.** Thus, with this arrangement of the belt **71,** as the carriage mechanism **80** moves linearly along the conduit **50,** the apertures **52** between the bearing rollers **83** and **84** will be uncovered for mating engagement with the air passageway portions of the duct **55** of the yarn knotter mechanism **60.** If desired, one of the rollers **140** or **141** may be suitably driven by a motor **143,** as schematically illustrated in FIG. **8.**

In both of the embodiments of FIG. **7** and FIG. **8** the bottom rollers **88** and **89** of the carriage mechanism **80** may be utilized, or may be dispensed with, as desired. Other than described above, the embodiments of FIGS. **7** and **8** include all of the apparatus described above in connection with the embodiment of FIGS. **1–6.**

In the drawings and specification there have been set forth preferred embodiments of the invention and, al-

though specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation.

What is claimed is:

1. In a textile yarn processing machine, such as a twister, spinning frame or the like, having a plurality of spindle assemblies positioned in side-by-side relationship for the processing of yarn; the improvement of:

suction conduit means mounted on said machine and extending generally horizontally along the front of said spindle assemblies and having a negative air stream therethrough, said suction conduit means having a plurality of apertures along the length thereof with one of said apertures being positioned at each of said spindle assemblies for causing a suction through each of said apertures;

a yarn knotter mechanism for knotting together two ends of broken or otherwise separated yarn and including means mounting said knotter mechanism on said machine for generally horizontal movement along said suction conduit means for positioning said knotter mechanism in front of a selected said spindle assembly for a yarn knotting operation, said mounting means comprising a carriage mechanism carrying said knotter mechanism and mounted on said conduit means for movement therealong, said knotter mechanism further including suction threading means forming a part thereof for mating communication with said aperture of said conduit means at said selected spindle assembly for creating a suction through said knotter mechanism threading means by the negative air stream in said conduit means for pulling and threading the separated yarn ends at said selected spindle assembly into and through said knotter mechanism; and

continuous elongate flexible belt means covering said plurality of apertures in said conduit means not in mating relation with said knotter mechanism threading means to prevent loss of suction in said conduit and for moving in cooperation with and by engagement of said knotter carriage mechanism for uncovering said aperture at said selected spindle assembly as said knotter mechanism is positioned by said carriage mechanism at said selected spindle assembly for allowing the mating communication between said uncovered aperture and said knotting mechanism threading means.

2. In a textile yarn processing machine, as set forth in claim 1, in which said conduit means includes a flat bearing surface on the top thereof in which said apertures are located and on which said belt is positioned; said carriage means comprises a frame carrying said knotter mechanism, a pair of bearing rollers rotatably carried by said frame and engaging and moving along the top of said belt on said bearing surface for linear movement of said carriage and said knotter mechanism along said conduit, and a third roller carried by said carriage means medially and upwardly of said pair of bearing rollers for passing under said belt and lifting and moving said belt from said apertures as said carriage moves along said bearing surface of said conduit; and the portion of said knotter mechanism threading means mating with said aperture at said selected spindle assembly being positioned on said carriage between said bearing rollers and below said belt moving roller for mating with said uncovered aperture.

3. In a textile yarn processing machine, as set forth in claim 2, including selectively operable drive means connected with at least one of said pair of bearing rollers for driving at least one of said pair of said bearing rollers upon actuation thereof for moving said carriage and said knotter mechanism along said conduit.

4. In a textile yarn processing machine, as set forth in claim 1, in which said conduit means includes a flat bearing surface on the top thereof in which said apertures are located and on which said belt is positioned; said carriage means comprises a frame carrying said knotter mechanism, a pair of bearing shoes carried by said frame and engaging and moving along the top of said belt on said bearing surface for linear movement of said carriage and said knotter mechanism along said conduit, and a hollow generally concave housing carried by said carriage means medially of said pair of bearing shoes and extending upwardly from said belt for passing under said belt and lifting and moving said belt from said apertures as said carriage moves along said bearing surface of said conduit; and the portion of said knotter mechanism threading means mating with said aperture at said selected spindle assembly being positioned on said carriage means between said bearing shoes and within said hollow concave housing for mating with said uncovered aperture.

5. In a textile yarn processing machine, as set forth in claim 1, in which said conduit means includes a flat bearing surface on the top thereof in which said apertures are located and on which said belt is positioned; said carriage means comprises a frame carrying said knotter mechanism, a pair of bearing rollers rotatably carried by said frame and engaging and moving along the top of said belt on said bearing surface for linear movement of said carriage and said knotter mechanism along said conduit; said belt comprising a continuous length having two ends fixed at the ends of said conduit and extending inwardly from each end of said conduit along said bearing surface and over said apertures, under, around and over said bearing rollers and back around the ends of said conduit and under said conduit so that as said carriage mechanism and said bearing rollers are moved linearly along said conduit said belt uncovers the aperture in said conduit between said bearing rollers; and the portion of said knotter mechanism threading means mating with said aperture at said selected spindle assembly being positioned on said carriage between said bearing rollers for mating with said uncovered aperture.

6. In a textile yarn processing machine, as set forth in claim 5, further including a roller positioned at each end of said conduit and around which said belt passes, and selectively operable drive means connected with and driving at least one of said last named rollers upon actuation thereof for moving said belt and therefore said carriage and said knotter mechanism to a selected spindle assembly.

7. In a textile yarn processing machine, as set forth in claim 1, in which said yarn processing machine includes control means operatively connected with each said spindle assembly means for selectively starting and stopping operation of said respective spindle assembly means, and in which each of said spindle assemblies includes actuating means operatively connected with the respective control means and in which said knotter mechanism includes cooperating actuating means for actuating said selected spindle assembly actuating

means for in turn actuating said control means to stop operation of said respective spindle assembly for a yarn knotting operation.

8. In a textile yarn processing machine, as set forth in claim **7**, in which said spindle assembly actuating means is responsive to deactuation of said knotter mechanism actuating means for actuating said control means to start operation of said respective spindle assembly means for yarn processing operations.

9. In a textile yarn processing machine, as set forth in claim **1**, in which said yarn processing machine includes pneumatically-operated yarn threading means operatively associated with each of said spindle assembly means for selectively threading a yarn end through at least a portion of each of said spindle assembly means upon actuation thereof, and in which each of said spindle assemblies includes actuating means operatively connected with said pneumatic threading means and in which said knotter mechanism includes cooperating actuating means for actuating said selected spindle assembly actuating means for in turn actuating said pneumatic threading means for starting operation thereof.

10. In a textile yarn processing machine, as set forth in claim **9**, in which said spindle actuating means is responsive to deactuation of said knotter mechanism actuating means for actuating said pneumatic threading means to stop operation of said respective pneumatic threading means.

11. In a textile yarn processing machine, as set forth in claim **1**, in which said yarn knotter mechanism threading means comprises a duct forming an air passageway therein and mounted generally around and over the top portion of said knotter mechanism, said duct including a separator baffle in at least a portion thereof separating said duct into two portions for the reception and passage of the separated ends of yarn in the respective portions, one of said passageway portions having an open longitudinally oriented mouth portion thereof for reception of one of the separated yarn ends and the other portion of said passageway having a laterally oriented opening therein for the reception of the other separated yarn ends.

12. Suction apparatus comprising in combination:

elongate, stationary, suction conduit means having a negative air stream therethrough, said conduit means including a plurality of apertures spaced along the length thereof for causing a suction through each of said apertures;

a movable suction device including means mounting said suction device on said conduit means for movement therealong for selectively positioning said device at a selected one of said apertures and defining an air passageway therein for mating communication with said selected aperture of said conduit means for creating a suction through said air passageway of said device by the negative air stream in said conduit means, said mounting means comprising a carriage mechanism carrying said suction device and mounted on said conduit means for movement therealong; and

continuous elongate flexible belt means covering said plurality of apertures in said conduit means not in mating relation with said suction device to prevent loss of suction in said conduit and for moving in cooperation with and by engagement of said suction device carriage mechanism for uncovering said selected aperture as said suction device is positioned by said carriage mechanism as said selected aperture for allowing the mating communication between said uncovered aperture and said air passageway of said suction device.

13. In a textile yarn processing machine, such as a twister, spinning frame or the like, having a plurality of spindle assemblies positioned in side-by-side relationship for the processing of yarn; the improvement of

suction conduit means mounted on said machine and extending generally horizontally along the front of said spindle assemblies and having a negative air stream therethrough, said suction conduit means having a plurality of apertures along the length thereof with one of said apertures being positioned at each of said spindle assemblies for causing a suction through each of said apertures;

a suction device including means mounting said suction device on said machine for generally horizontal movement along said suction conduit means for positioning said suction device in front of a selected said spindle assembly for a working operation, said mounting means comprising a carriage mechanism carrying said suction device and mounted on said conduit for movement therealong, said suction device including means forming a part thereof for mating communication with said aperture of said conduit means at said selected spindle assembly for creating a suction through said suction device by the negative air stream in said conduit means; and

continuous elongate flexible belt means covering said plurality of apertures in said conduit means not in mating relation with said knotter mechanism threading means to prevent loss of suction in said conduit and for moving in cooperation with and by engagement of said suction device carriage mechanism for uncovering said aperture at said selected spindle assemblies as said suction device is positioned by said carriage mechanism at said selected spindle assembly for allowing the mating communication between said uncovered aperture and said suction device.

* * * * *