

[54] AUXILIARY YARN PIECING EQUIPMENT

[75] Inventors: **Albert D. Harmon**, Clemson;
Charles R. Martin, Seneca; **Luther A. Cleland, Jr.**, Westminster, all of S.C.

[73] Assignee: **Saco-Lowell Corporation**, Greenville, S.C.

[22] Filed: **Jan. 23, 1974**

[21] Appl. No.: **435,712**

[52] U.S. Cl.:..... **57/34 R**
[51] Int. Cl.²:..... **D01H 15/00**
[58] Field of Search:..... **57/34 R, 22, 156, 159, 57/52-54**

[56] References Cited

UNITED STATES PATENTS

| | | | |
|-----------|---------|----------------------|---------|
| 3,540,200 | 11/1970 | Tsukumo et al. | 57/34 R |
| 3,591,951 | 7/1971 | Urano et al. | 57/34 R |
| 3,640,059 | 2/1972 | Lutovsky et al. | 57/34 R |
| 3,695,017 | 10/1972 | Hori et al. | 57/34 R |
| 3,728,852 | 4/1973 | Anderson et al. | 57/34 R |
| 3,807,155 | 4/1974 | Miyazaki et al. | 57/34 R |

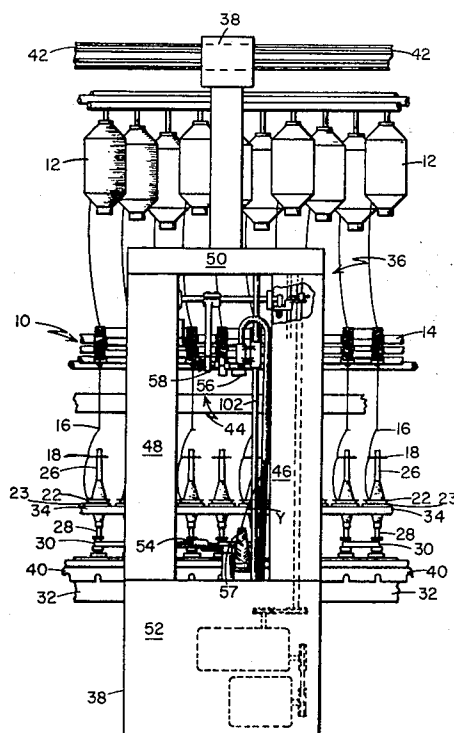
Primary Examiner—John Petrakes

[57]

ABSTRACT

Textile yarn piecing apparatus having a servicing assembly positionable in a first location for supplying a free end of auxiliary yarn from an auxiliary yarn bobbin to a revolving spindle having a bobbin onto which said free end is to be wrapped and with a surrounding ring having a traveller which is to be threaded onto said auxiliary yarn and positionable in a second location for piecing an intermediate portion of said auxiliary yarn to roving issuing from roving delivery rolls and cutting the auxiliary yarn to again provide a cut free end thereof. The servicing assembly has a yarn feeding tube for conveying of yarn from the auxiliary yarn bobbin and an air suction yarn storage tube for storing a substantial length of the free end of the auxiliary yarn. The mouth openings of the yarn feeding and storage tubes are spaced from one another to provide a free yarn zone therebetween. There is also provided a yarn release air jet adjacent the free yarn zone, in the first location providing a release jet of air for removing the free end of yarn from the storage tube and propelling it toward the bobbin for wrapping therearound, the air suction yarn storage tube in the second location providing air suction for retrieving the cut free end of auxiliary yarn and storing it in the storage tube.

7 Claims, 12 Drawing Figures



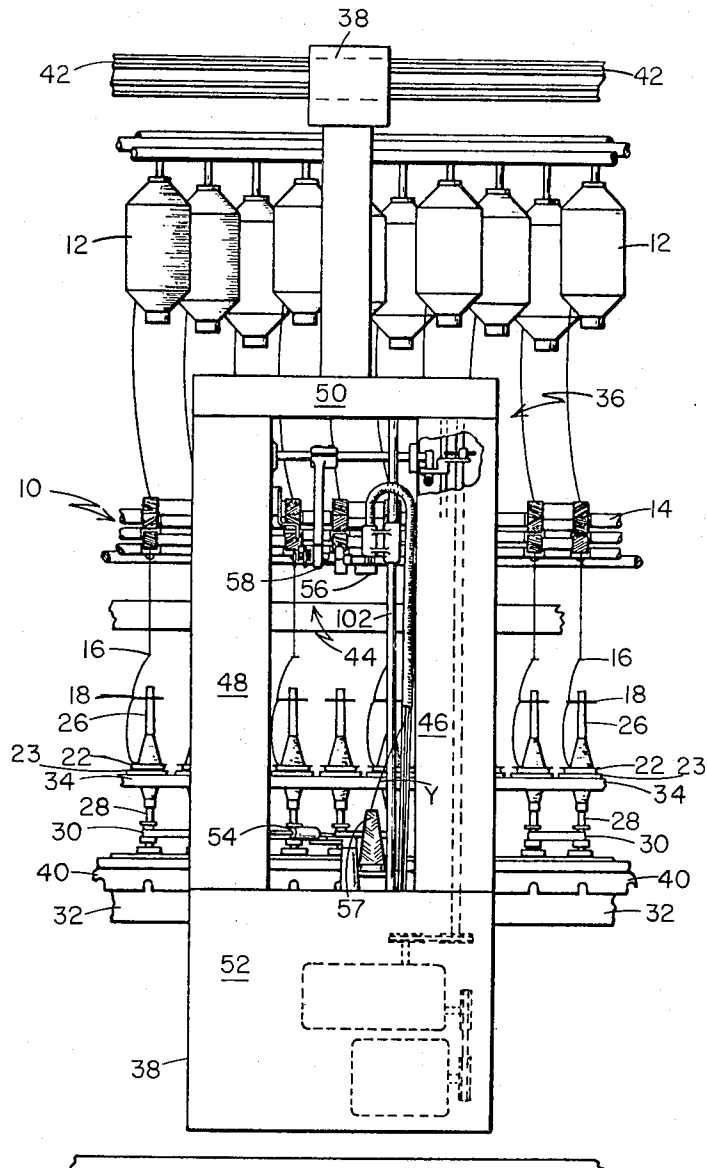
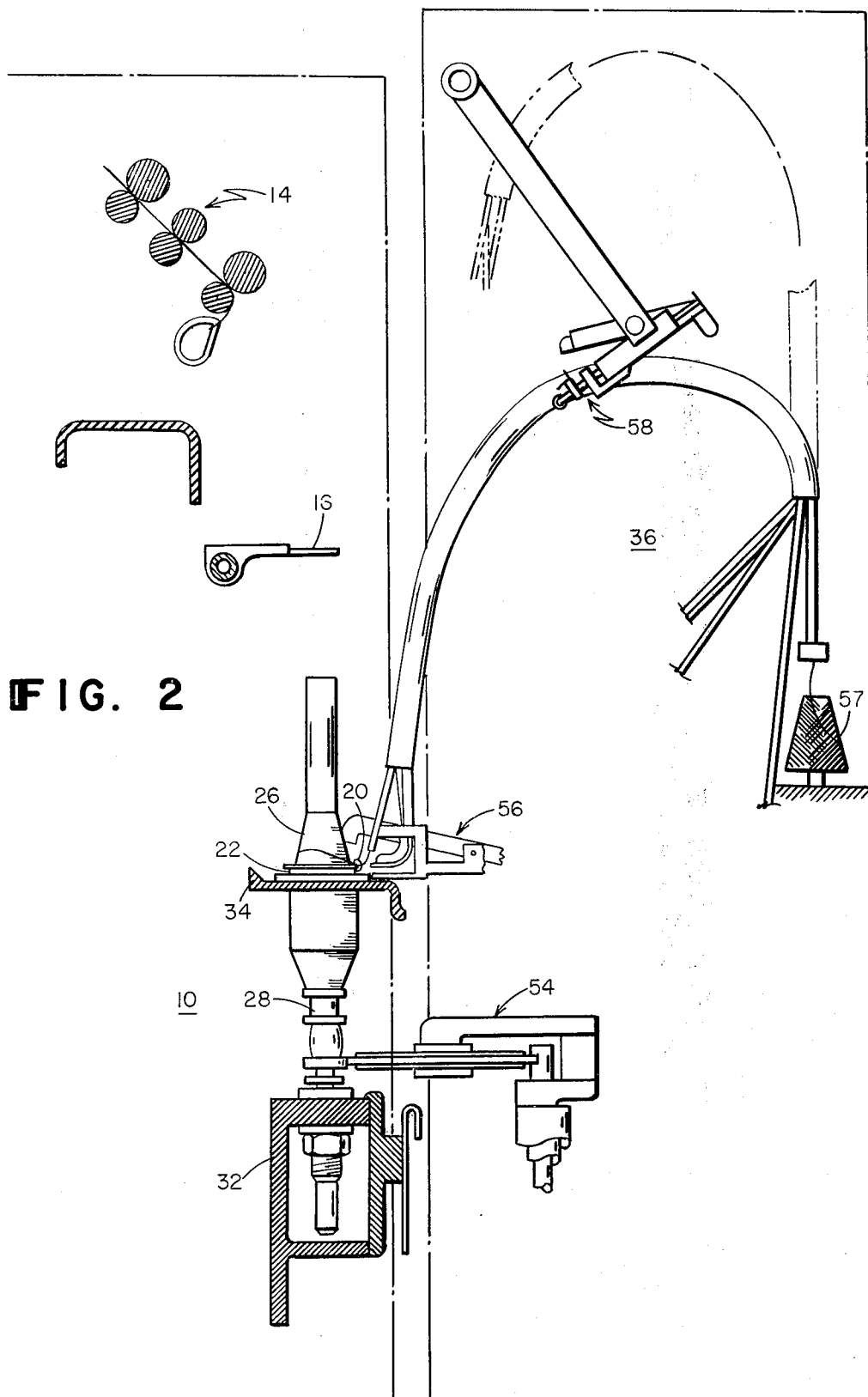


FIG. 1



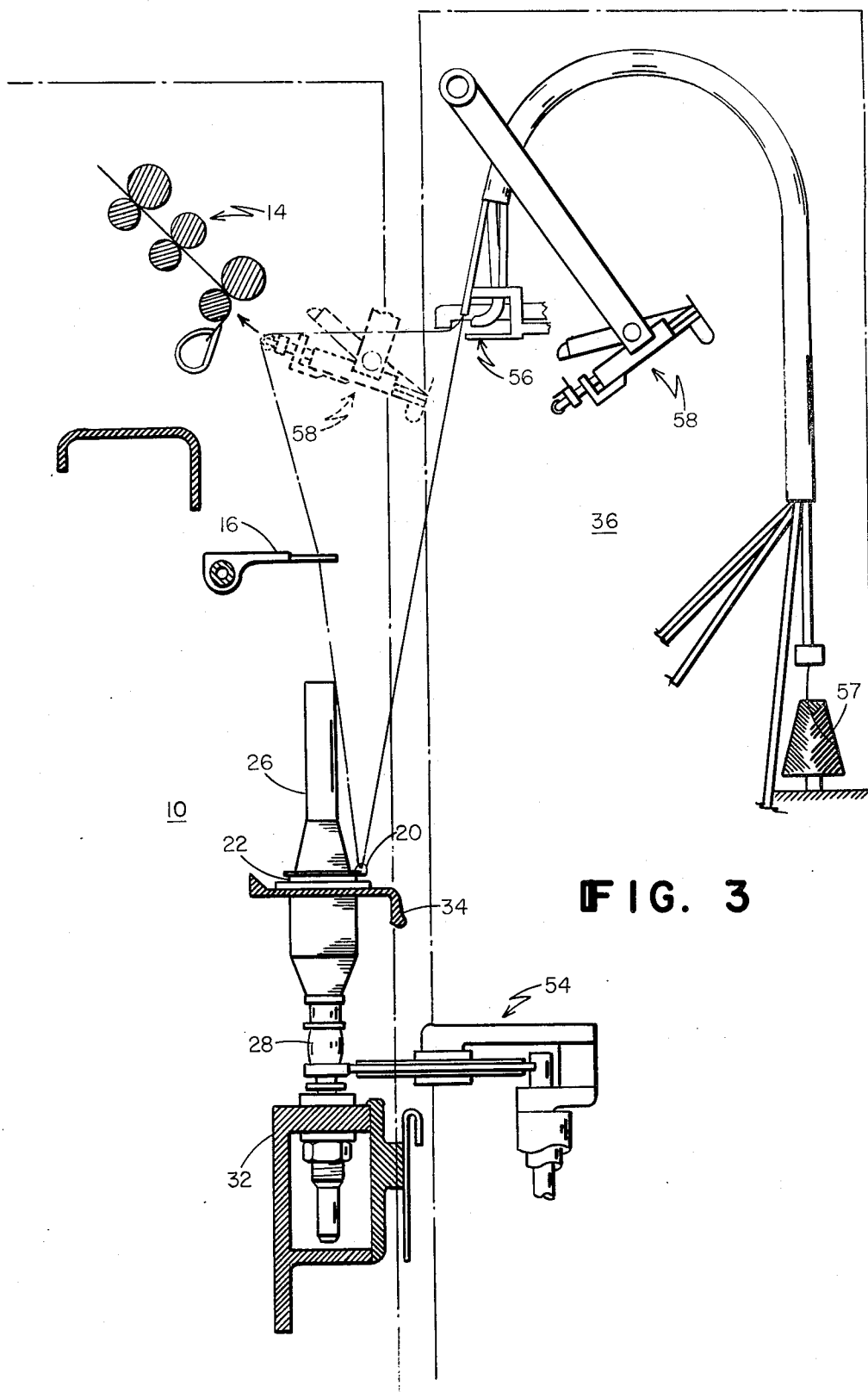
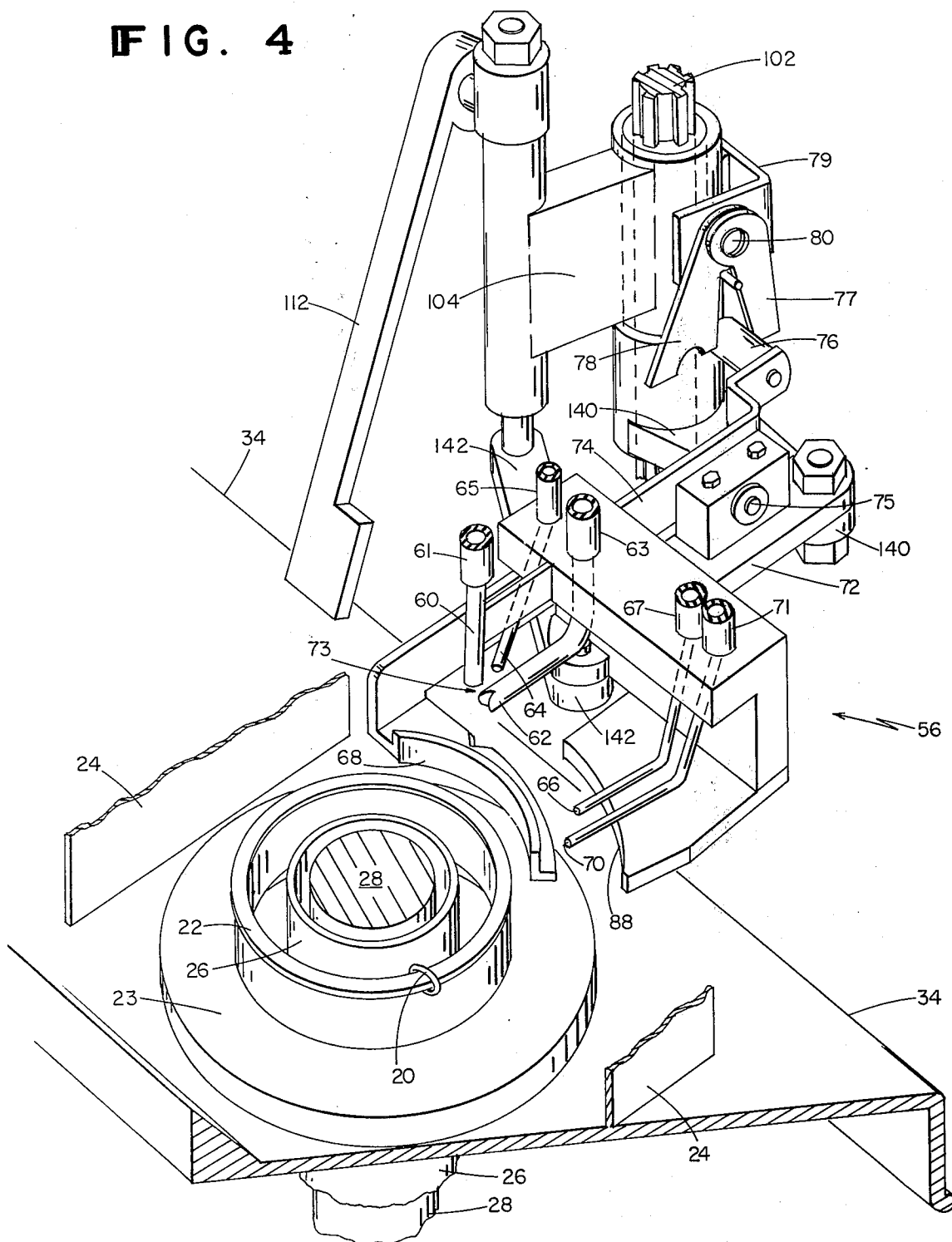
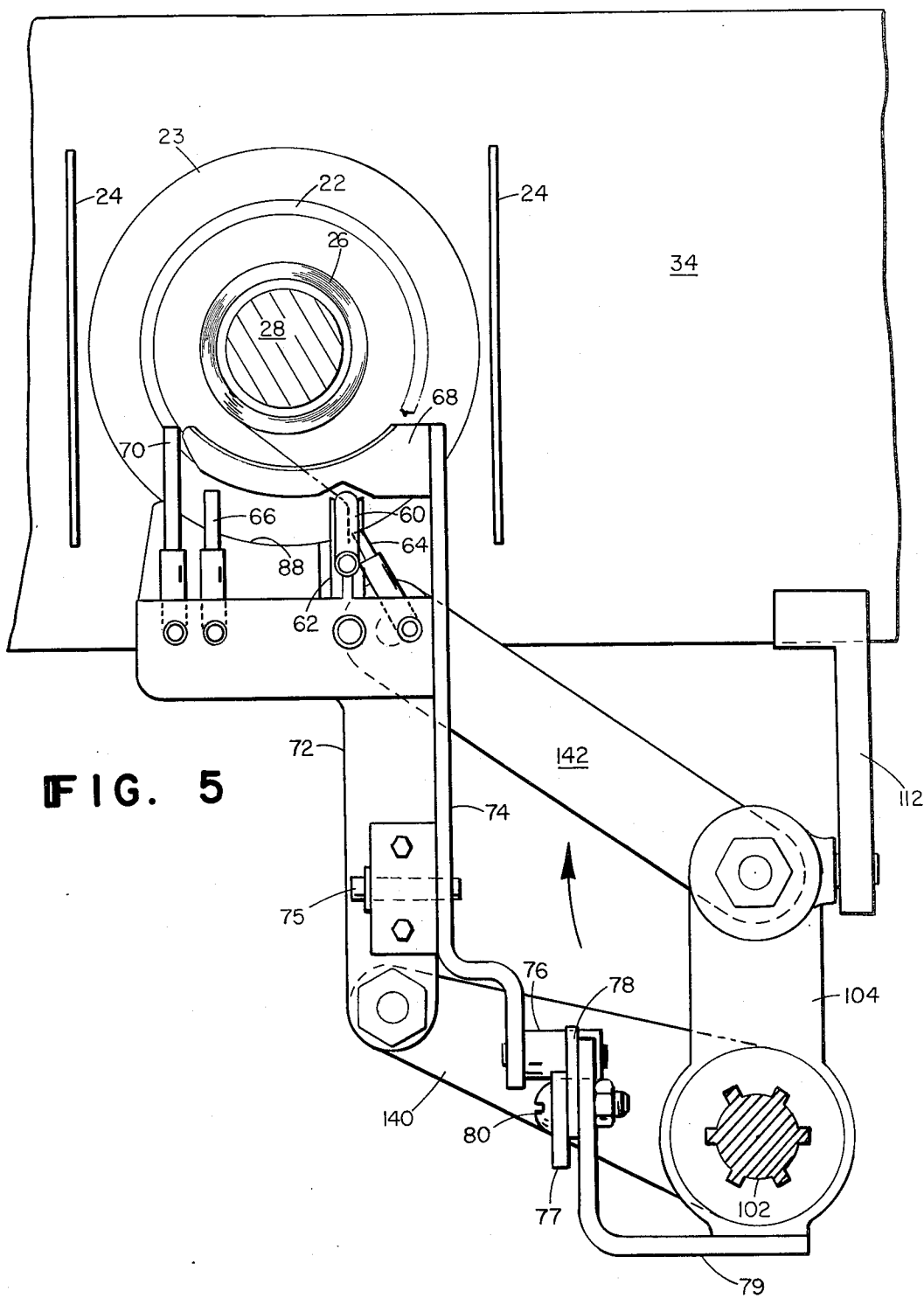
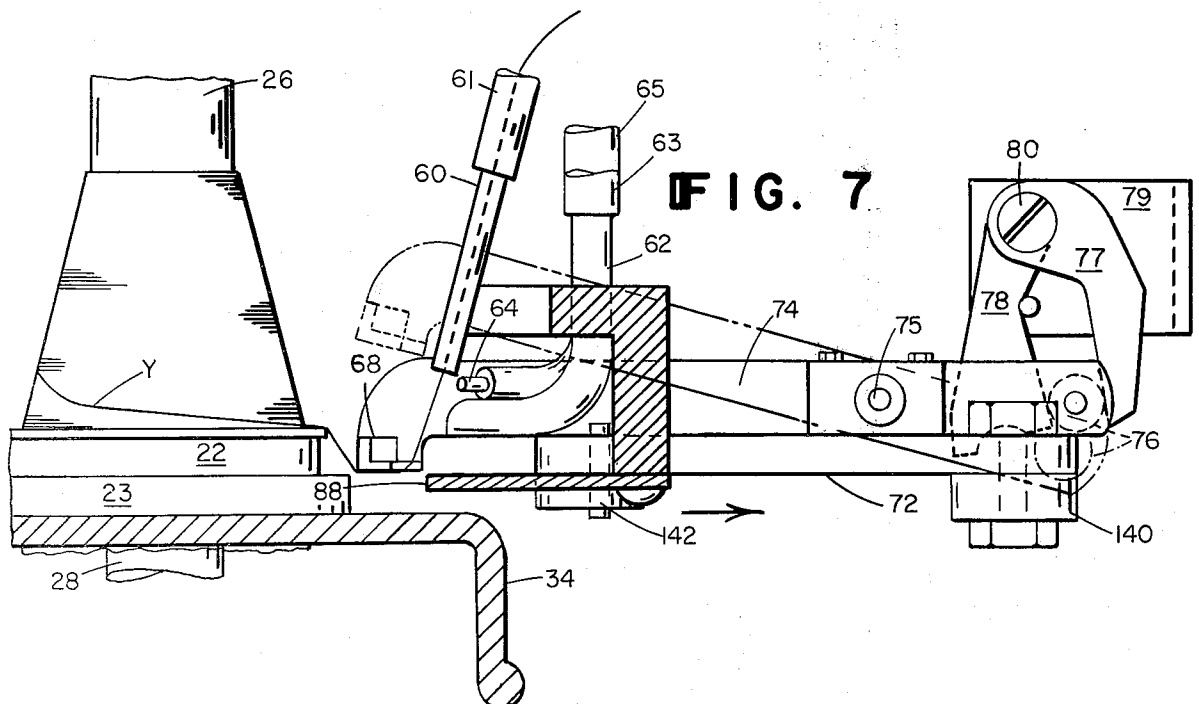
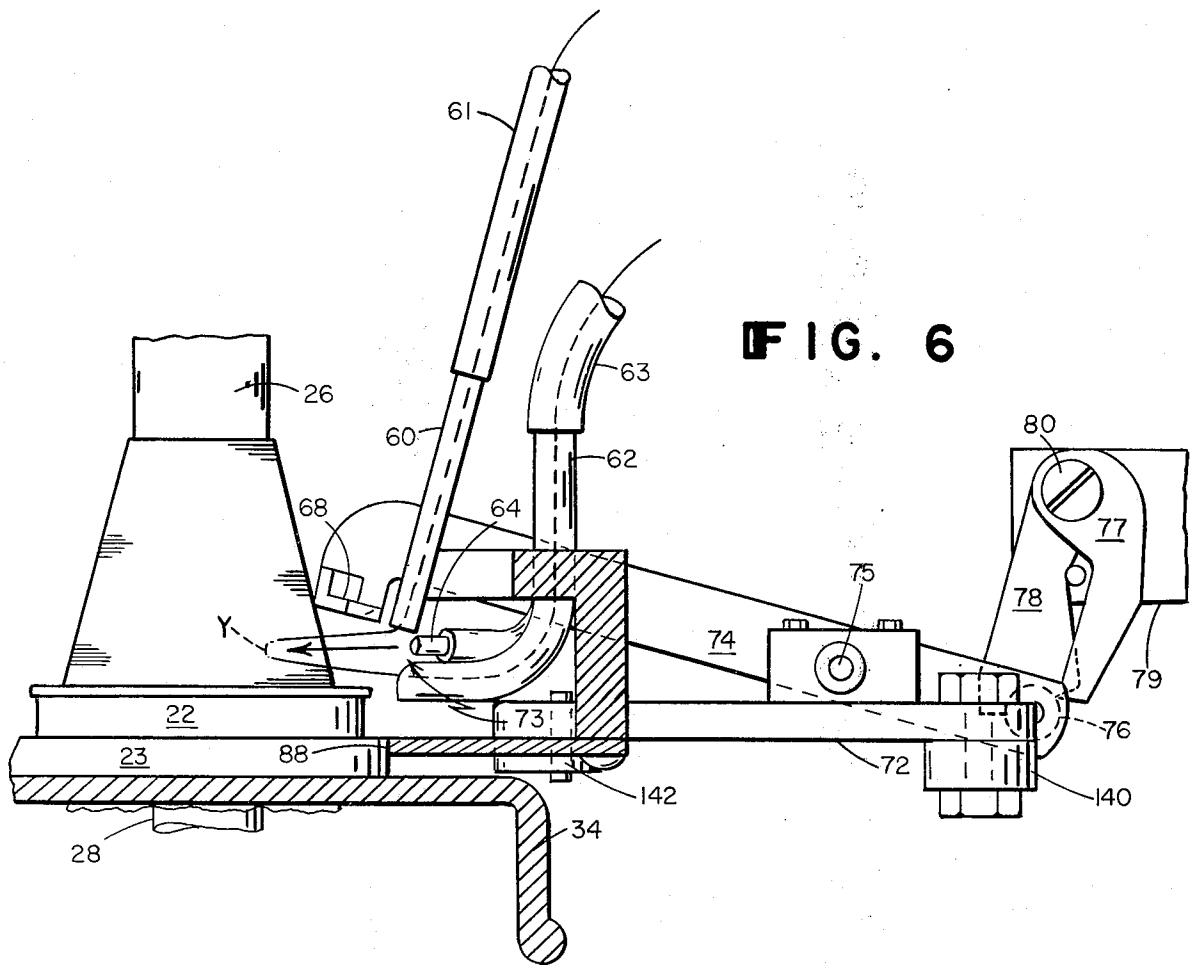


FIG. 4







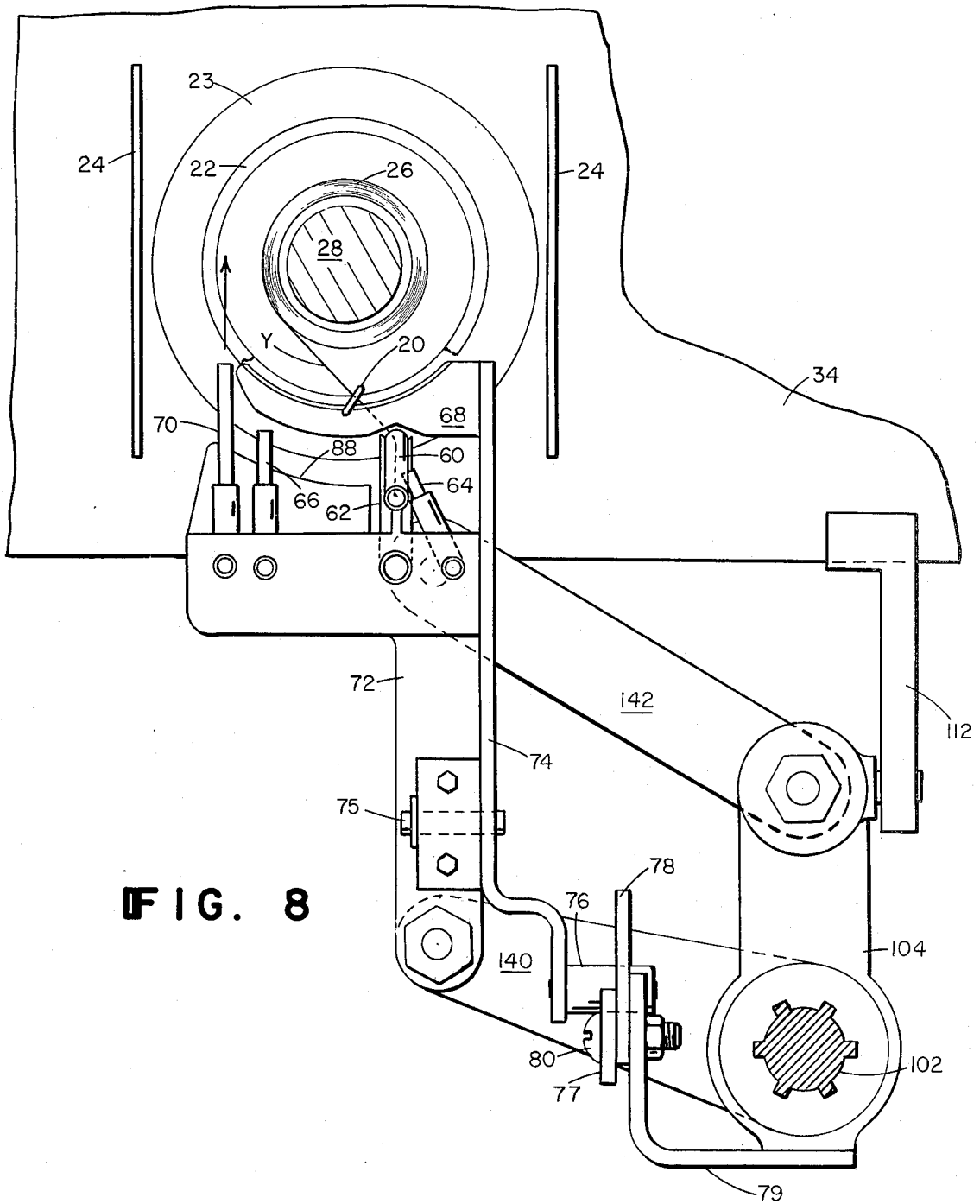
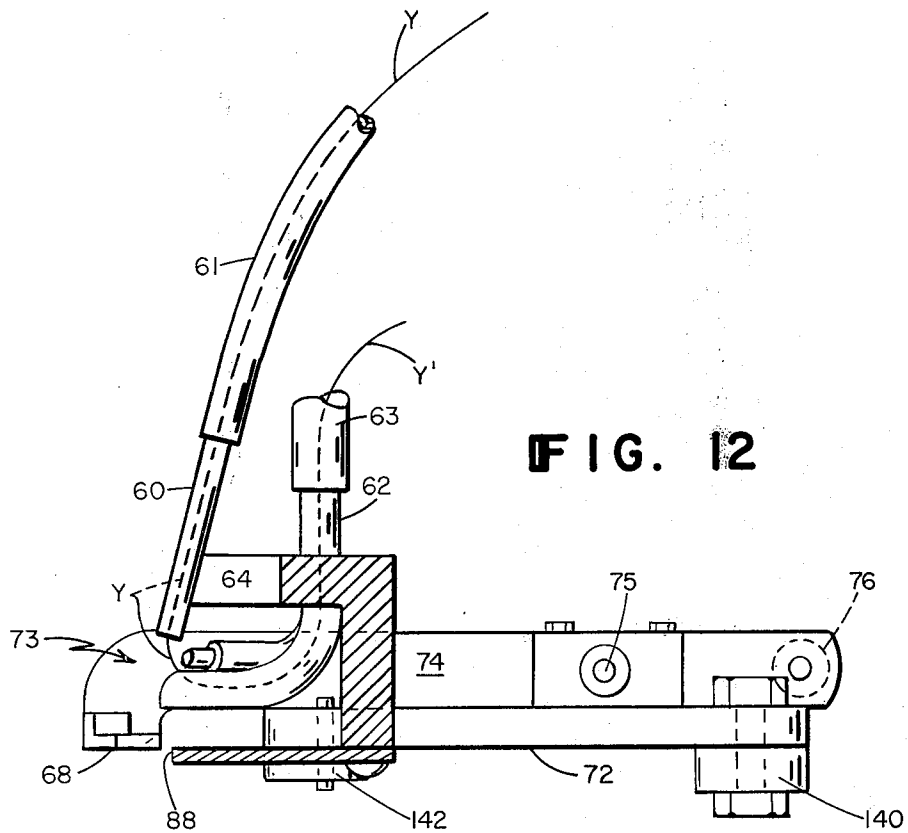
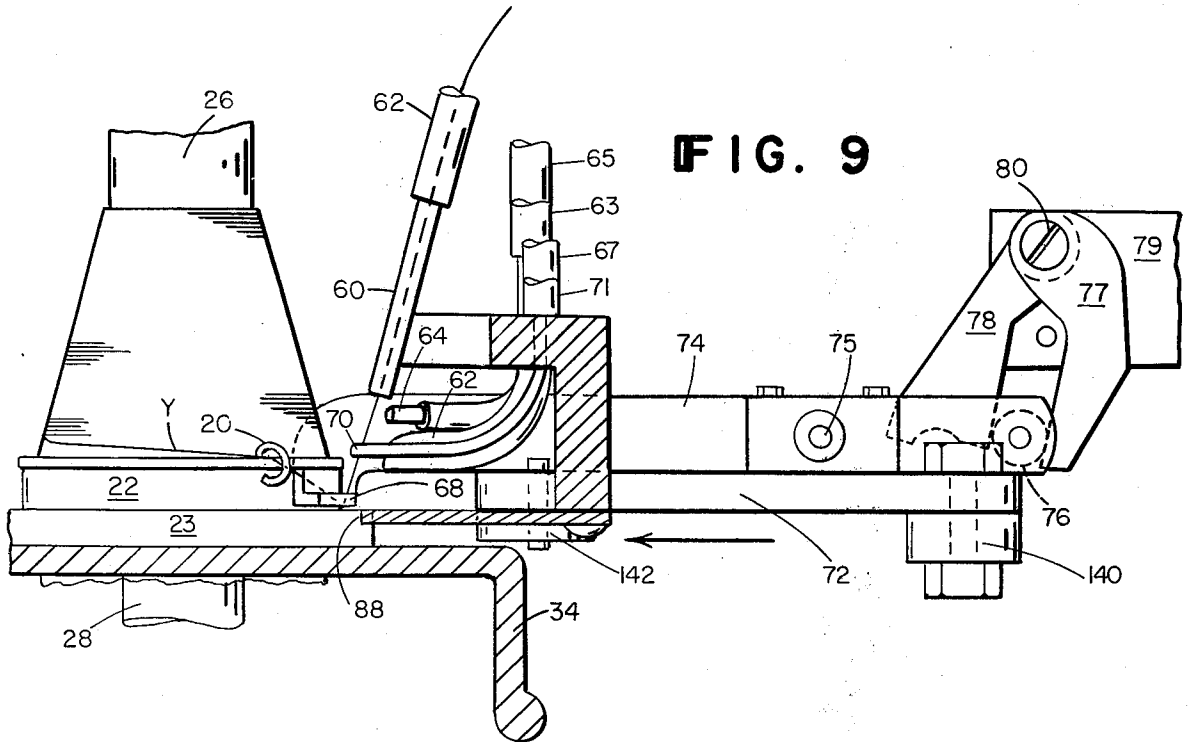
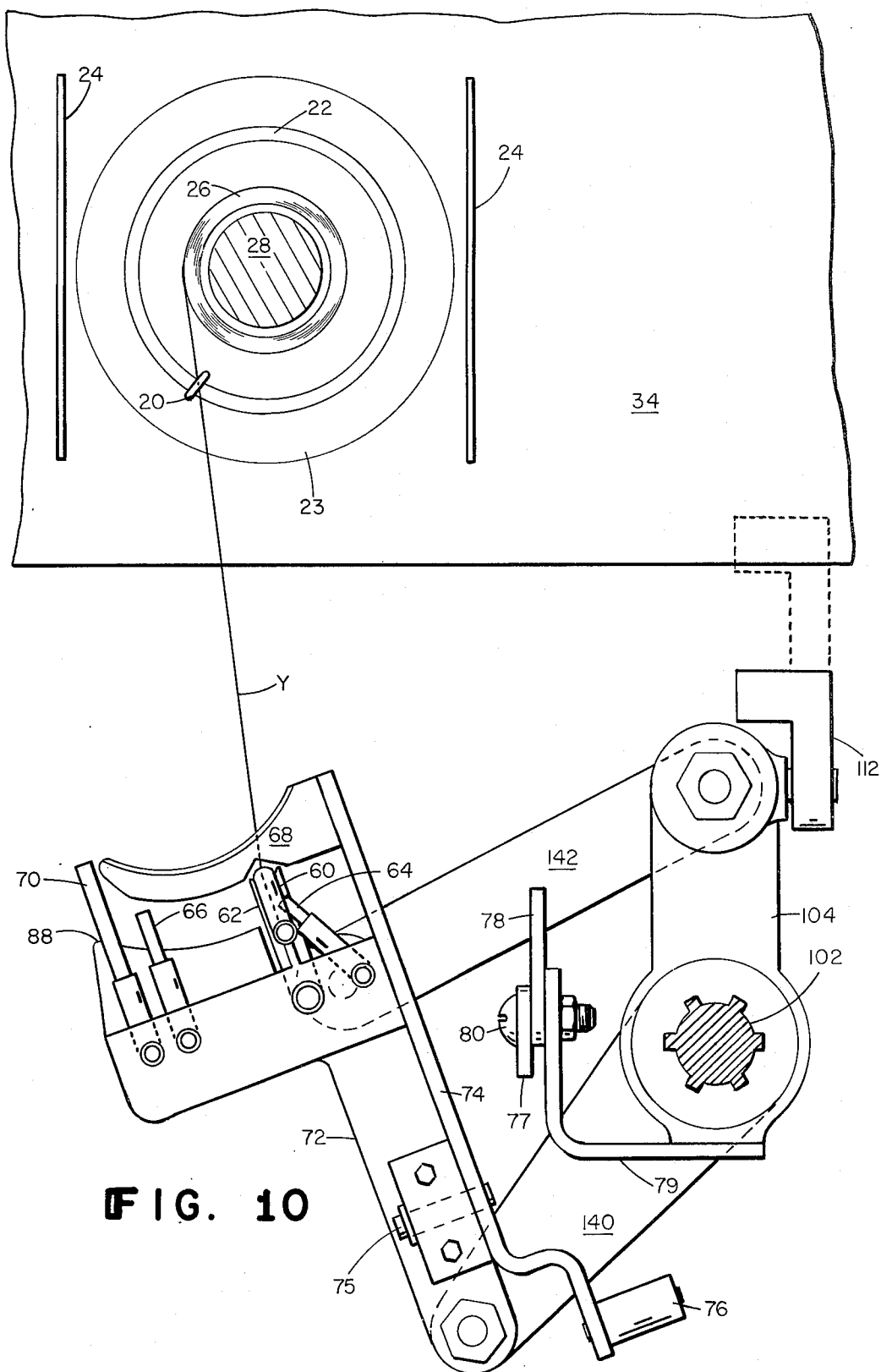
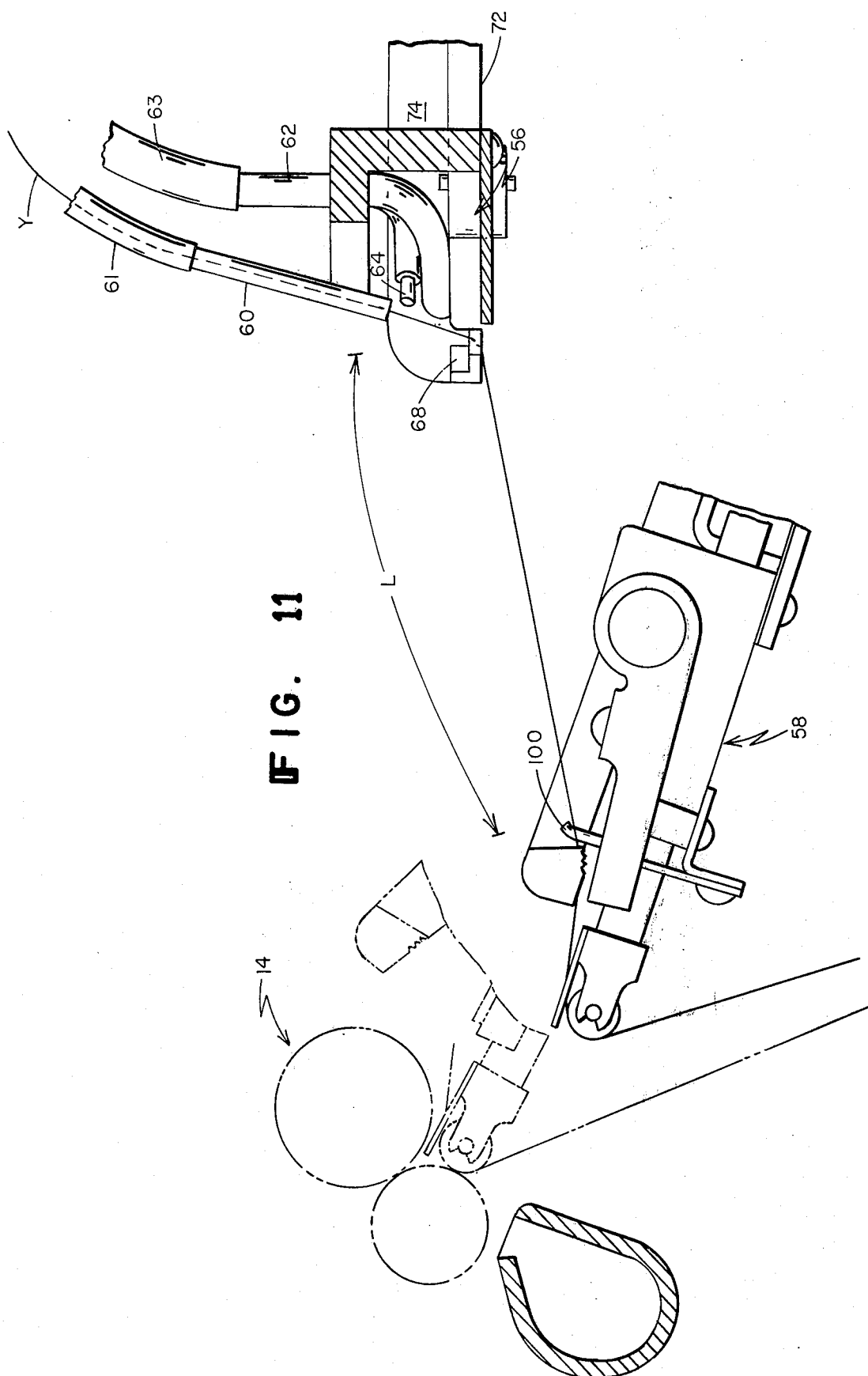


FIG. 8







AUXILIARY YARN PIECING EQUIPMENT

BACKGROUND OF THE INVENTION

This invention relates to automatic yarn piecing for textile spinning frames and the like, and more particularly to auxiliary or "seed" yarn piecing.

The heretofore known auxiliary yarn piecing equipment, such as is disclosed, for example, in U.S. Pat. Nos. 3,540,200 and 3,591,951, is of a type which required that the auxiliary yarn end be handled largely by mechanical devices in order to present it for winding on the bobbin and threading the traveller.

One of the major problems which was present in such prior art was that of transporting or conveying slack yarn lengths to the cop; this problem manifested itself in having either loose wraps, and/or wraps of bunched yarn (folded upon itself), and/or snarled yarn wrapped (snarled upon itself such as by bunching or folding upon itself, or snarled in having a small section of bunched yarn or sections thereof wrapped onto the cop and thereafter subsequent sections of this yarn wrapped thereover); loose wraps provide for very poor package stability and invite snarls with subsequent wraps of yarn wound after piecing; snarls invite subsequent yarn breakages during the rewinding processes in a winder to form a larger package, whereas poor package stability leads to making the entire package unusable for subsequent rewinding by a sloughing of yarn layers from the cop during intermediate handling; all of the foregoing lead to either wastage of materials (yarn) and increased processing time and consequent economic losses. The known art relevant to this invention invariably employed apparatus which permitted the placement of slack yarn onto the bobbin cop.

These system also required the constant maintenance for many mechanical adjustments under mill conditions, and, this being difficult to achieve, they were deficient and hence more unreliable than was desired.

SUMMARY OF THE INVENTION

Accordingly, it is a major object of the present invention to provide yarn piecing much less subject to the above-mentioned deficiencies.

The present invention accomplishes this by providing, in yarn piecing apparatus having a servicing assembly positionable in a first location for supplying a free end of auxiliary yarn from an auxiliary yarn source to a winding instrumentality such as a revolving spindle having a bobbin providing a winding surface onto which the free end is to be wrapped and with a surrounding ring having a traveller which is to be threaded onto the auxiliary yarn and positionable in a second location for piecing an intermediate portion of the auxiliary yarn to roving issuing from roving delivery rolls and cutting said auxiliary yarn to again provide a cut free end thereof, both methods and apparatus for storing a substantial length of the free end of yarn within a storage means therefor in such manner that said length and a subsequent length of said yarn extending between said means and said supply thereof are under sufficient tension to maintain them in a taut, nonslack condition and removing said stored length of yarn from said storage means and propelling it towards the winding surface of said instrumentality in a taut, nonslack condition, changing the direction of the propelled length of yarn to one substantially tangential to said winding surface; and winding the propelled length of

yarn onto the winding surface. Preferably, such storing is accomplished by applying air suction to the free end of yarn to place said substantial length within an air suction conduit under said sufficient tension, and said removing and said changing the direction of said yarn are by applying a plurality of pressurized jet streams of gas to said yarn intermediate the mouth of said storage means and said winding surface.

In more specific aspects of the present invention, there may be provided a yarn feeding tube for conveying yarn from the auxiliary yarn source; an air suction yarn storage tube for storing a substantial length of the free end of the auxiliary yarn, the mouth openings of the two tubes being spaced from one another providing a free yarn zone therebetween, and a yarn release air jet adjacent the free yarn zone in the first location providing a release jet of air for removing the free end of yarn from the storage tube and propelling it toward the bobbin for wrapping therearound, the air suction yarn storage tube providing air suction for retrieving the cut free end of the auxiliary yarn and storing it in the storage tube. Preferably, there is also provided a yarn wrapping air jet transversely spaced from the yarn release air jet in the first location, providing a wrapping jet of air at an angle to the release jet of air and generally tangential to the bobbin for aiding wrapping of the free end of auxiliary yarn on the bobbin. Also, there may be provided yarn depressing means for depressing a wrapped auxiliary yarn over the edge of the ring and a traveller jet of air generally tangential to and within the ring for threading the traveller onto the wrapped auxiliary yarn.

DESCRIPTION OF THE DRAWINGS

The foregoing and other objects and features of the invention will be apparent from the following description of a preferred embodiment thereof, together with the accompanying drawings, in which

FIG. 1 is an elevational view of yarn piecing apparatus according to the invention for practicing the methods thereof, connected to a textile spinning frame or the like;

FIGS. 2 and 3 are, respectively, diagrammatic side views showing the servicing assembly of the yarn piecing apparatus of FIG. 1 positioned in a lowered location for supplying a free end of auxiliary yarn from an auxiliary yarn source to a revolving bobbin onto which said free end is to be wrapped and with a surrounding ring having a traveller which is to be threaded onto said auxiliary yarn and positioned in raised location for piecing an intermediate portion of said auxiliary yarn to roving issuing from roving delivery rolls and cutting said auxiliary yarn to again provide a cut free end thereof;

FIG. 4 is an enlarged isometric view of the servicing assembly of FIGS. 2 and 3, illustrating its operating elements in conjunction with those of the spinning frame;

FIGS. 5 and 6 are, respectively, top and sectional side views of the servicing assembly of FIGS. 2 and 3 in yarn wrapping position;

FIG. 7 is a sectional side view, with certain parts omitted for clarity, of the assembly in a position with the yarn depressor dropped into its operative position;

FIGS. 8 and 9 are, respectively, top and sectional side views, with certain parts omitted for clarity, of the assembly in traveller threading position;

FIGS. 10 and 11 are, respectively, top and side views of the assembly in raised retracted position before piec-

ing, as in FIG. 3, also with certain parts omitted for clarity, and

FIG. 12 is a side view, with certain parts omitted for clarity, of the assembly in inoperative retracted position with the free yarn end stored in the yarn storage tube.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The spinning frame 10, in part shown in FIG. 1, is of a conventional type having a plurality of yarn processing deliveries along each of its opposite sides. At each delivery of frame 10, yarn as roving normally passes downwardly from creel 12 through sets of drafting rolls 14, a guide member 16, a balloon control ring 18, and a traveler 20 (FIGS. 2-4) movable about a spinning ring 22 supported on a cylindrical base 23. The spun yarn is then wound upon a bobbin 26 projecting axially upwardly through ring 22, such bobbin being removably seated upon an upright spindle 28 which is rotated at its lower end portion by a drive tape 30. On the side of frame 10, as shown in FIG. 1, all spindles 28 are supported by a stationary spindle rail 32, and all spinning ring bases 23 are supported by a ring rail 34 which is moved vertically relative to spindle rail 32, spindles 28 and bobbins 26 to traverse the yarn longitudinally of bobbins 26 as it is wound thereon following passage through travelers 20. The same arrangement of components is present on the opposite side of frame 10 not shown in FIG. 1.

The yarn piecing apparatus 36 shown in FIGS. 1 through 3 comprises a mobile carriage 38 connected in any suitable manner, as by a track 40 and overhead rail 42, to spinning frame 10 (and possibly to other similar machines) for movement longitudinally of and closely adjacent at least one side of the frame, and preferably past at least one end thereof, to any one of its yarn processing deliveries requiring servicing by reason of an end-down condition. Carriage 38 includes an open center section 44 and four enclosed housing-like sections 46, 48, 50, 52, the sections 46, 48 being disposed on opposite sides of open center section 44 and the sections 50, 52 being above and below the same. Repair of the yarn discontinuity at a delivery of frame 10 requiring servicing is effected by various servicing mechanisms which are mounted within open center section 44 of carriage 38 for movement therefrom toward and away from frame 10. These include a spindle rotation control mechanism 54 operable adjacent the elevation of the machine's spindle rail 32 for controlling the directions and speeds of rotation of the spindle 28 and bobbin 26 at the delivery undergoing servicing; a yarn handling servicing assembly 56 for supplying a free end of yarn from an auxiliary yarn supply bobbin 57, wrapping it around a bobbin 26 and traveller threading it and for thereafter extending such yarn upwardly to an elevation adjacent that of the spinning frame drafting rolls 14 and a yarn end joining mechanism 58 operable adjacent the elevation of the frame's drafting rolls 14 for joining the aforesaid length of auxiliary yarn to the roving issuing from such rolls at the delivery. Many of these mechanisms are disclosed in U.S. Pat. Nos. 3,628,320; 3,712,040; 3,728,852; and 3,673,780.

The present invention is directed to yarn handling servicing assembly 56 and its immediately associated components. The remaining components of piecing apparatus 36 may be of any desired construction, and no

restriction to those shown and described for purposes of illustration is intended or should be made.

Referring now also to FIGS. 4 through 12, the servicing mechanisms of assembly 56 include a yarn feeding tube 60 for the conveying of yarn from auxiliary yarn supply bobbin 57, an air suction yarn storage tube 62 for storing a substantial length of the free end of auxiliary yarn, a yarn release air jet 64 for removing the free end of yarn from the storage tube and propelling it toward bobbin 26 for wrapping therearound; a yarn wrapping air jet 66 for aiding the wrapping, a yarn depressor 68 and a traveller threading air jet 70. Yarn storage tube 62 and air jets 64, 66 and 70 extend to suitable air suction and compressed air sources within the enclosed sections of carriage 38 and are actuable by associated controls to produce, at desired times and for purposes subsequently discussed, a suction air-flow in yarn storage tube 62 and emission of a jet of air from the open ends of air jets 64, 66 and 70. The aforesaid air sources and drive means and their related controls may be of any suitable type, and are not shown in the drawings.

As best shown in FIG. 4, the servicing assembly elements are all carried directly by a supporting frame 72 of assembly 56 for movement together as a unit toward and away from and vertically upward and downward relative to spinning frame 10. More specifically, yarn feeding tube 60 extends generally vertically at the front of frame 72 which faces spinning frame 10, with its mouth opening downwardly adjacent to spinning ring 22 and bobbin 26 when assembly 56 is in an operating position. A conduit 61 extends from the other end of yarn feeding tube 60 for conveying yarn Y from auxiliary bobbin 57 mounted on top of the lower section 52 of mobile carriage 38 (FIGS. 1, 2 and 3). Air suction yarn storage tube 62 has its upper portion extending generally vertically, with its lower end generally horizontal and its mouth opening facing frame 10. An air suction conduit 63 extends from the upper end of yarn storage tube 62 for supplying air suction to said tube for storing therein a substantial length of the free end of the auxiliary yarn from yarn feeding tube 60. The mouth openings of said tubes are closely spaced from one another, providing a free yarn zone 73 therebetween, across which yarn Y normally extends. Yarn release air jet 64, extending generally horizontally, is provided adjacent said free yarn zone facing frame 10, generally tangentially to the surface of bobbin 26 when in operating position. An air pressure conduit 65 is provided for a yarn release air jet 64, for providing a release jet of air across free yarn zone 73 for removing the free end of yarn Y from yarn storage tube 62 and propelling it toward bobbin 26 for wrapping therearound.

In addition, mounted on frame 72, there is also provided a yarn wrapping air jet 66 with its air conduit 67 and a traveller threading air jet 70 with its air conduit 71. Yarn wrapping air jet 66, also generally tangential to the surface of bobbin 26, is transversely spaced from yarn release air jet 64 to provide a wrapping jet of air at an angle to the release jet of air to aid in completing wrapping of the free end of auxiliary yarn Y on bobbin 24. Traveller threading air jet 70 is generally tangential to and directs its jet of air within spinning ring 22 for threading traveller 20 onto the wrapped auxiliary yarn.

As set forth in U.S. Pat. No. 3,728,852, depressor 68 is mounted for pivotal movement in a substantially ver-

tical plane relative to the aforesaid components by mounting means best shown in FIGS. 4 through 12. Such mounting means includes an arm 74 pivotally mounted on frame 72 by pivot pin 75 and carrying depressor 68 at its forward end and cam follower 76 at its rearward end for movement between the elevated and lowered positions of the depressor, respectively shown in phantom lines and solid lines in FIG. 7. Depressor 68 has an arcuate shape (best shown in FIG. 4) complementary to spinning rings 22 and normally occupies the lower inoperative position shown in FIGS. 7 and 12, being retained there by gravity. It is raised by cam mechanisms hereinafter described operating in cooperation with its cam follower 76. An arcuate stop surface 88 is provided on the side of supporting frame 72 facing spinning frame 10 for contacting ring base 23.

The other components of piecing apparatus 36 which are provided in association with assembly 56 for operating it are, with certain exceptions later described, shown and described in U.S. Pat. No. 3,728,852. Briefly, they consist generally of the following: assembly mounting means including an upright splined shaft 102 and a compound bracket 104, including parallel arms 140 and 142 mounting assembly 56 upon and for multidirectional movement relative to carriage 38; assembly moving means for imparting movement to the assembly; releasable latching means for releasably maintaining assembly 56 when inoperative in an elevated position above the maximum elevation of ring rail 34 of spinning machine 10 and assembly stop means including lever 112 adapted to at desired times engage ring rail 34.

Preferably, as shown in FIGS. 4, 6 and 7, the yarn depressor cam follower 76 is operated by means of a pair of cams pivotally mounted on bracket 104. These include a rise cam 77 and a holding cam 78 both pivotally mounted on support plate 79 by a common pin 80 for cooperation with cam follower 76 of yarn depressor 68 as hereinafter explained.

The operating elements of shaft 102 for operating bracket 104 and its operating arms 140 and 142 to move support frame 72 of servicing assembly 56 toward and away from spinning frame 10, as well as to otherwise move and latch bracket 104 as required, are all shown and described in detail in U.S. Pat. No. 3,728,852, so that it is unnecessary to describe such elements herein.

MODE OF OPERATION

When piecing apparatus 36 is not engaged in a yarn piecing operation, servicing assembly 56 occupies its vertically elevated and horizontally retracted inoperative location as shown in FIGS. 1, 3, 11 and 12 with the free end of the auxiliary yarn stored in yarn storage tube 62 (FIG. 12) in readiness for the next piecing operation. At the outset of such operation, operation of the apparatus, as explained in U.S. Pat. No. 3,728,852, causes servicing assembly 56 to be lowered until lever 112 engages ring rail 34 and then be advanced from its retracted position of FIG. 10 to its location as shown in FIGS. 2, 4, 5 and 6 for supplying a free end of auxiliary yarn Y from supply bobbin 57 to a spinning frame bobbin 26.

The aforesaid advancement of assembly 56 is arrested by arcuate stop surface 88 (FIGS. 4, 5, 6, 7 and 8) mounted upon supporting frame 72 and adapted to engage the cylindrical outer surface of the spinning ring

base 23 of the yarn processing delivery of machine 10 undergoing servicing, at an elevation below the path of travel of the traveller 20 about the conventional traveller flange provided at the ring's upper edge.

The engagement of surface 88 with spinning ring base 23 both halts the advancement of assembly 56 and, if necessary, laterally realigns the assembly so that its elements are disposed closely adjacent the surface of the spun yarn wound upon bobbin 26 immediately above the spinning ring 22, as shown in FIG. 6.

According to the present invention, while assembly 56 is positioned as shown in FIGS. 2, 5 and 6, with yarn depressor 68 raised by the operation of rise cam 77 and holding cam 78 to move cam follower 76 downward and spindle rotation mechanism 54 has been operated to rotate bobbin 26 in the direction to wind the auxiliary yarn thereon, yarn release air jet 64 is operated to provide a release jet of air across free yarn zone 73 for removing the free end of yarn Y from storage tube 62 and propelling it toward the rotating bobbin 26 for wrapping therearound. FIG. 6 shows said yarn Y in a loop partially removed from storage tube 62, while FIG. 5 shows it wrapped around bobbin 26. At the same time, a jet of air from yarn wrapping air jet 66 aids in completing wrapping of the free end of auxiliary yarn Y on bobbin 26. The operation of storing and wrapping the auxiliary yarn end around the spinning frame bobbin solely by the use of jets of air from jets fixed on assembly 56 without the necessity of yarn grasping mechanical elements provides uniquely tensioned yarn handling such that the storing is provided in a manner whereby the yarn length extending between the yarn supply and the place of storage is held under sufficient tension that upon executing the step of wrapping about the cop no slack yarn is wrapped or transported (by the air jet) in a slack condition to the cop, rather, the yarn is always kept in a taut, non-slack condition. By so doing, the present invention provides a simple and effective auxiliary yarn wrapping operation as well as one which is highly reliable, especially by reason of eliminating slack yarn and also by reason of the elimination of mechanical yarn end handling mechanisms and the necessity of keeping them in adjustment.

After completion of the aforesaid operations, servicing assembly 56 is moved to a partly retracted position, illustrated in FIG. 7, for the purpose of dropping yarn depressor 68, by rotating shaft 102 as explained in U.S. Pat. No. 3,728,852. The movement of assembly 56 to its partly retracted position causes release of depressor arm cam follower 76 from holding cam 78 and rearward movement of rise cam 77, so that it is free to rise, releasing arm 74 so that yarn depressor 68 falls by gravity from its elevated position (shown in phantom) into its depressed position (shown in solid). As depressor 68 descends, the arcuate flange at its free end passes closely adjacent the operating elements of assembly 56 and into overlying engagement with the length of spun yarn, designated Y in FIG. 7, then extending from bobbin 26 into yarn feeding tube 60.

Assembly 56 is now again advanced for traveller threading purposes and, as is shown in FIGS. 8 and 9, toward spinning frame 10, by rotation of splined shaft 102 in a clockwise direction, and is halted by abutment of the arcuate flange of depressor 68 with the cylindrical outer surface of spinning ring 22. The yarn Y extending from bobbin 26 and beneath the depressor flange is caused by the depressor flange to pass closely over and

partially about the uppermost flange of spinning ring 22 which supports the traveller 20 to be threaded with such yarn.

After assembly 56 has assumed its position of FIGS. 8 and 9, a blast of air then emitted from air jet 70 thereof (FIG. 8) propels traveller 20, in a clockwise direction about the traveller flange of ring 22 and into threaded relationship with the length of yarn Y held as aforesaid by depressor 68 in engagement with such flange. Assembly 56 is then returned horizontally to its normal retracted position (FIG. 10) by rotating splined shaft 102 in a counterclockwise direction, which also serves to disengage yarn depressor cam follower 76 from cams 77 and 78. It is then moved upwardly to its raised position as shown in FIGS. 1, 3 and 11.

While assembly 56 is maintained in its elevated position, the now traveller-threaded length of yarn Y extending from feeding tube 60 is taken therefrom and joined to the roving issuing from the drafting rolls 14 (FIGS. 1 and 11) at the delivery of spinning frame 10 undergoing servicing. This is accomplished by yarn end joining or piecing mechanism 58 (FIGS. 1 and 11) of apparatus 36, which is movable toward and away from drafting rolls 14 along a path of travel closely adjacent the elevated assembly 56 to join the auxiliary yarn Y to said roving. (FIG. 11) and then cut it to provide a cut free end thereof of a predetermined length L extending from the cutting element 100 of piecing mechanism 58.

After cutting, according to the invention, air suction yarn storage tube 62 immediately retrieves said cut free end of auxiliary yarn and stores it in yarn storage tube 62 (FIG. 12).

All components of the servicing assembly 56 are then ready for another piecing operation.

What is claimed is:

1. Yarn piecing apparatus for supplying a free end of auxiliary yarn to a winding instrumentality onto which said free end is to be wound, said apparatus including supply means for supplying auxiliary yarn from an auxiliary yarn source
air suction means for storing a substantial length of said free end of yarn
said supply means and said air suction means supporting said auxiliary yarn in a free yarn zone therebetween and
release air jet means operable to provide a release jet of air in said free yarn zone for removing said free end of yarn from said air suction means and propelling it toward said winding instrumentality for winding therearound.
2. Yarn piecing apparatus as claimed in claim 1, further comprising
yarn wrapping air jet means transversely spaced from said yarn release air jet means providing a wrapping jet of air at an angle to said release jet of air and generally tangential to said winding instrumentality for aiding wrapping of said free end of auxiliary yarn thereon.
3. Yarn piecing apparatus having a servicing assembly
positionable in a first location for supplying a free end of auxiliary yarn from an auxiliary yarn source to a revolving spindle having a bobbin onto which said free end is to be wrapped and with a surrounding ring having a traveller which is to be threaded onto said auxiliary yarn and

positionable in a second location for piecing an intermediate portion of said auxiliary yarn to roving issuing from roving delivery rolls and cutting said auxiliary yarn to again provide a cut free end thereof

said apparatus comprising:

yarn feeding means for conveying yarn from said auxiliary yarn source

air suction yarn storage means for storing a substantial length of the free end of said auxiliary yarn

said yarn feeding and yarn storage means being spaced from one another providing a free yarn zone therebetween

yarn release air jet means adjacent said free yarn zone in said first location providing a release jet of air thereacross for removing said free end of yarn from said storage means and propelling it toward said spindle and bobbin for wrapping therearound
yarn depressing means for depressing a wrapped auxiliary yarn over the edge of said ring and

traveller threading air jet means providing a traveller threading jet of air generally tangential to and within said ring for threading said traveller onto said wrapped auxiliary yarn

said yarn storage means in said second location providing air suction for retrieving said cut free end of auxiliary yarn and storing it in said storage means.

4. Yarn piecing apparatus as claimed in claim 3, further comprising

yarn wrapping air jet means peripherally spaced from said yarn release air jet means in said first location providing a wrapping jet of air at an angle to said release jet of air and generally tangential to said bobbin for aiding wrapping of said free end of auxiliary yarn on said bobbin.

5. Yarn piecing apparatus having a servicing assembly

positionable in a first location for supplying a free end of auxiliary yarn from an auxiliary yarn source to a revolving spindle having a bobbin onto which said free end is to be wrapped and with a surrounding ring having a traveller which is to be threaded onto said auxiliary yarn and

positionable in a second location for piecing an intermediate portion of said auxiliary yarn to roving issuing from roving delivery rolls and cutting said auxiliary yarn to again provide a cut free end thereof

said apparatus comprising:

a yarn feeding tube for conveying yarn from said auxiliary yarn source

an air suction yarn storage tube for storing a substantial length of the free end of said auxiliary yarn

the mouth openings of said tubes being spaced from one another providing a free yarn zone therebetween and

a yarn release air jet adjacent said free yarn zone in said first location providing a release jet of air thereacross for removing said free end of yarn from said storage tube and propelling it toward said spindle and bobbin for wrapping therearound

said air suction yarn storage tube in said second location providing air suction for retrieving said cut free end of auxiliary yarn and storing it in said storage tube.

6. Yarn piecing apparatus as claimed in claim 5, further comprising

9

yarn depressing means for depressing a wrapped auxiliary yarn over the edge of said ring and a traveller threading air jet providing a traveller threading jet of air generally tangential to and within said ring for threading said traveller onto said wrapped auxiliary yarn. 5

7. Yarn piecing apparatus as claimed in claim 6, further comprising

10

a yarn wrapping air jet transversely spaced from said yarn release air jet in said first location providing a wrapping jet of air at an angle to said release jet of air and generally tangential to said bobbin for aiding wrapping of said free end of auxiliary yarn on said bobbin.

* * * * *

10

15

20

25

30

35

40

45

50

55

60

65