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Olson et al.

[11] **3,778,996**

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

[54] **METHOD FOR DOFFING A BOBBIN AND FORMING A TRANSFER TAIL**

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[73] Assignee: **Barber-Coleman Company,** Rockford, Ill.

[22] Filed: **Apr. 13, 1972**

[21] Appl. No.: **243,655**

Related U.S. Application Data

[62] Division of Ser. No. 67,367, Aug. 27, 1970, Pat. No. 3,696,602.

[52] **U.S. Cl.** ..... **57/156,** 57/34 TT, 57/53, 57/54

[51] **Int. Cl.** **D01h 9/10**

[58] **Field of Search** ..... 57/156, 52, 53, 54, 57/131, 34 TT; 242/41, 18 EW, 18 PW

[56] **References Cited**

UNITED STATES PATENTS

1,614,879	1/1927	Colman	242/18 EW
2,932,149	4/1960	Ingham	57/34 TT X
3,546,870	12/1970	Schewe et al.	57/53 X
3,552,110	1/1971	Livingston	57/53

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Assistant Examiner—Charles Gorenstein
Attorney—A. Richard Koch

[57] **ABSTRACT**

A method for simultaneously removing a filled bobbin and its trailing bobbin thread from a spindle in a single operation, winding a new transfer tail on the spindle, and then severing the thread between the spindle and bobbin.

5 Claims, 8 Drawing Figures

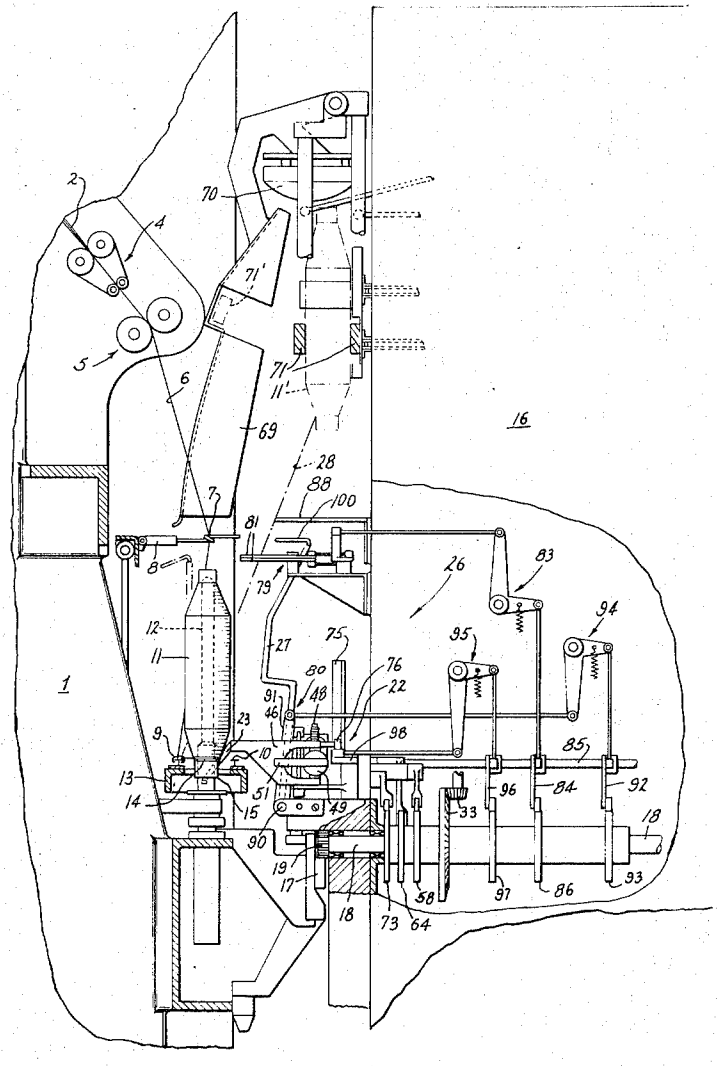


Fig. 1.

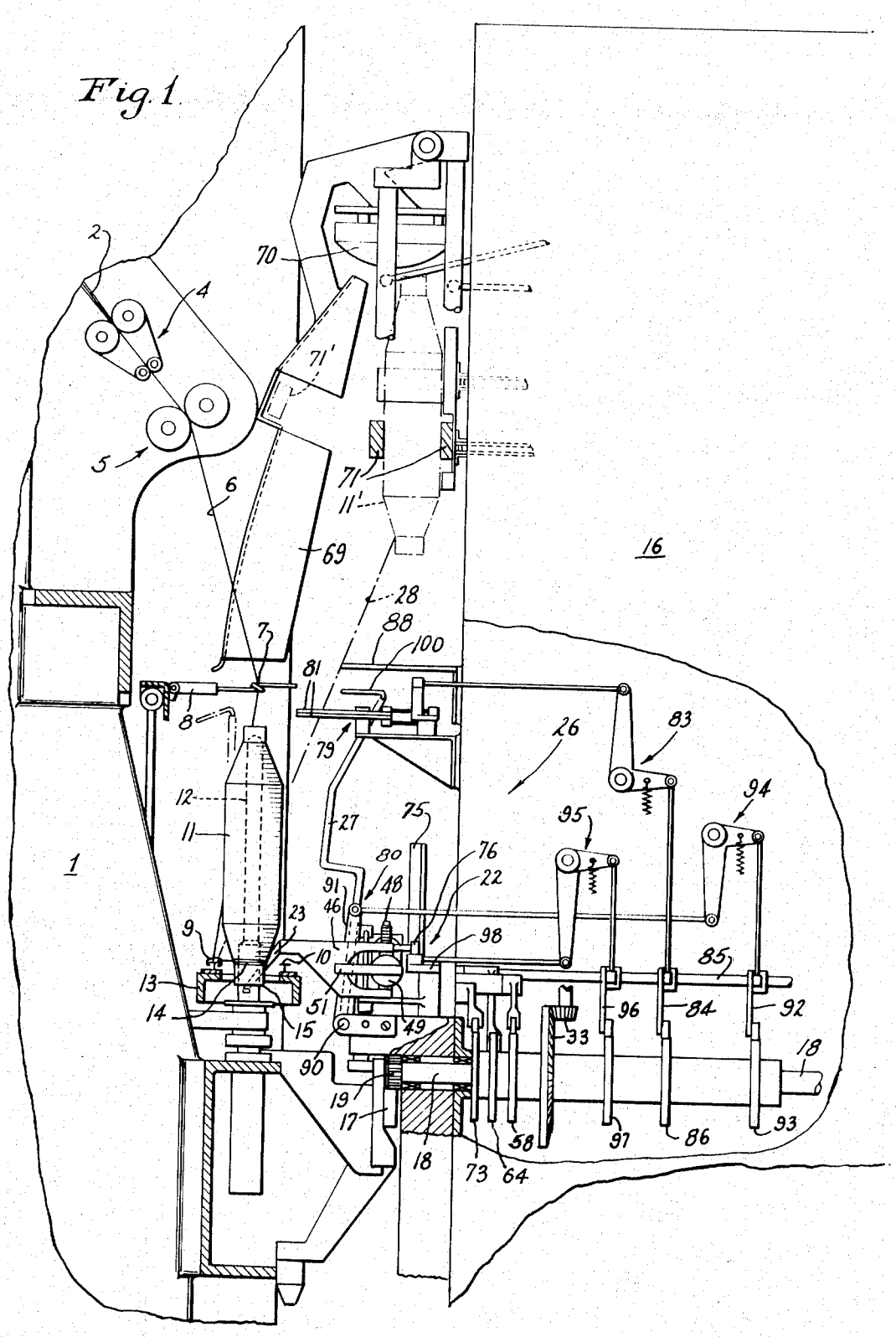

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Fig. 2.

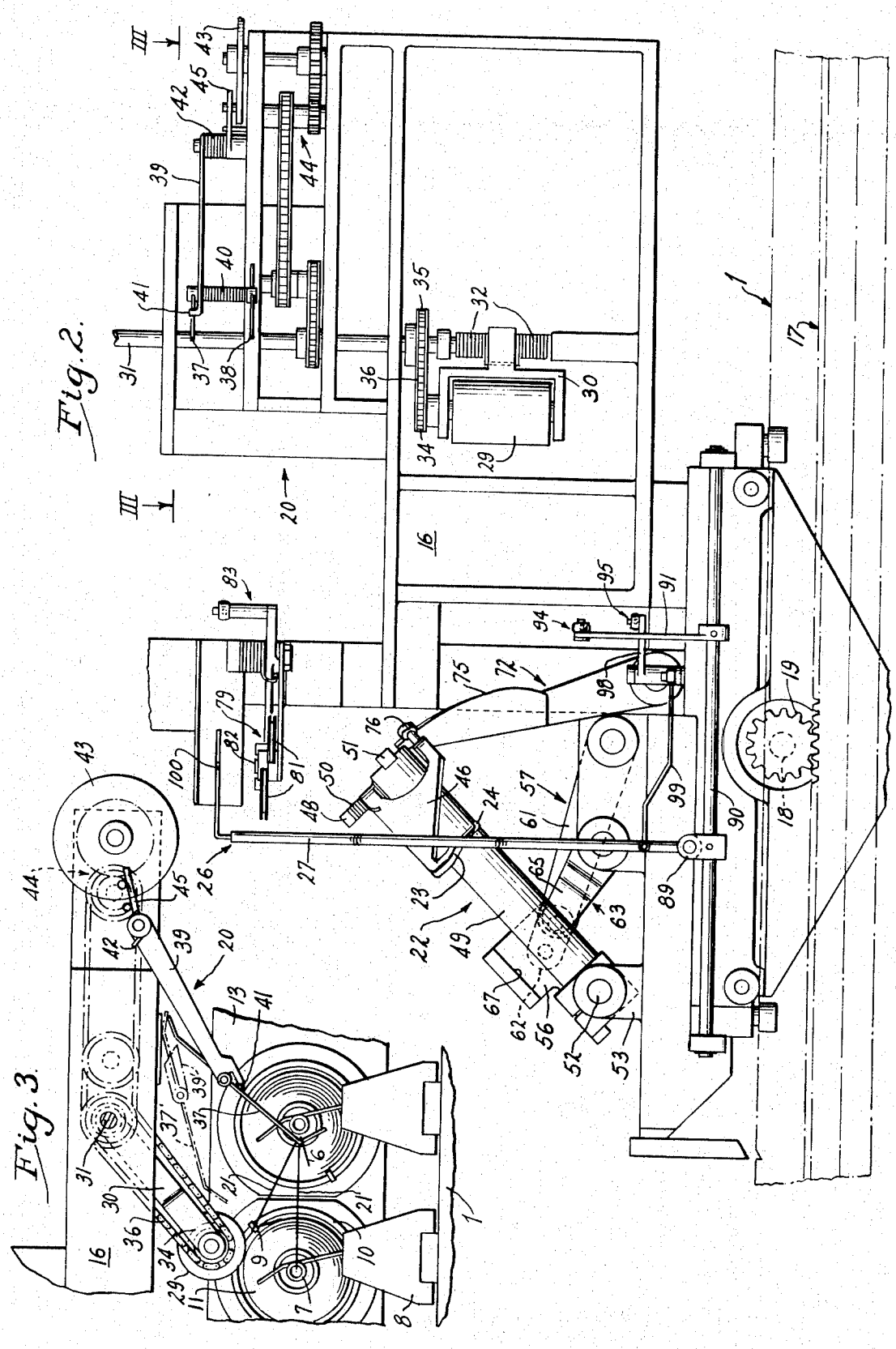


Fig. 3.

Fig. 4.

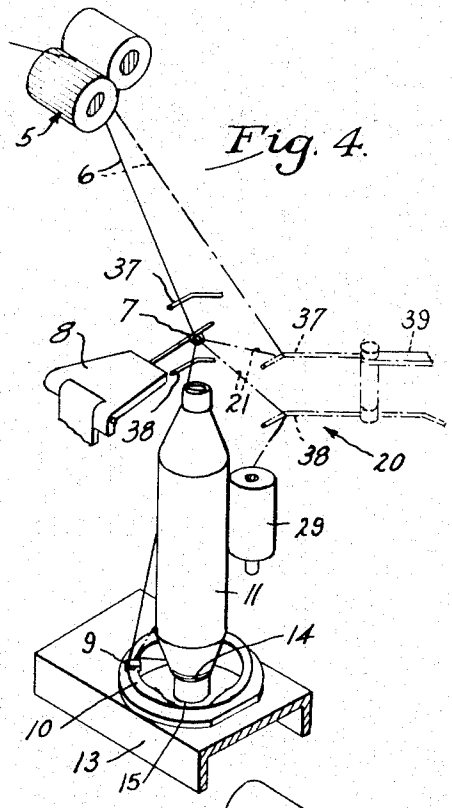


Fig. 5.

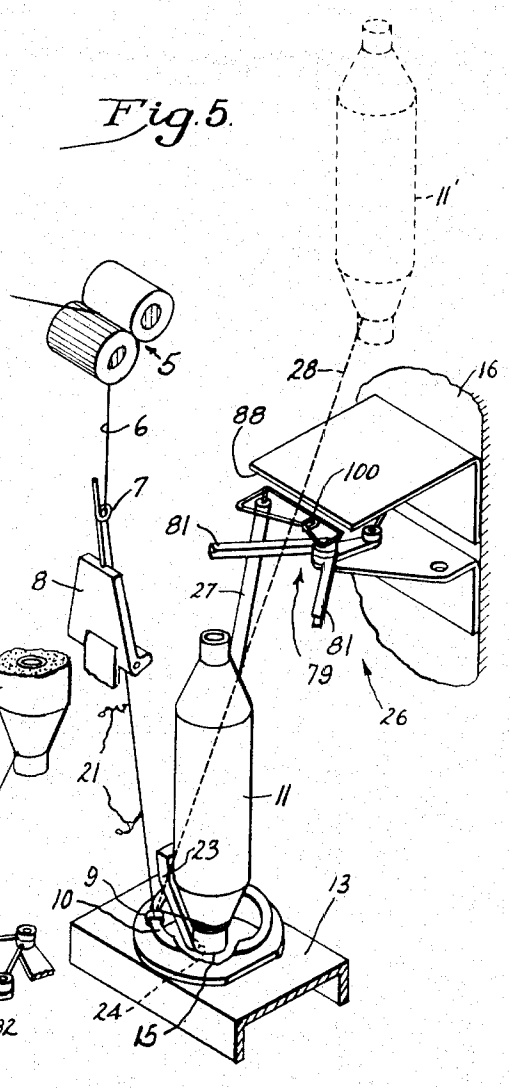


Fig. 6.

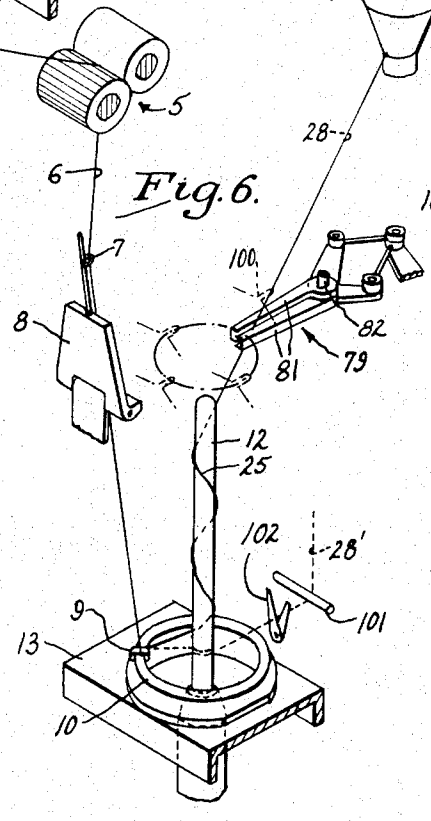


Fig. 7

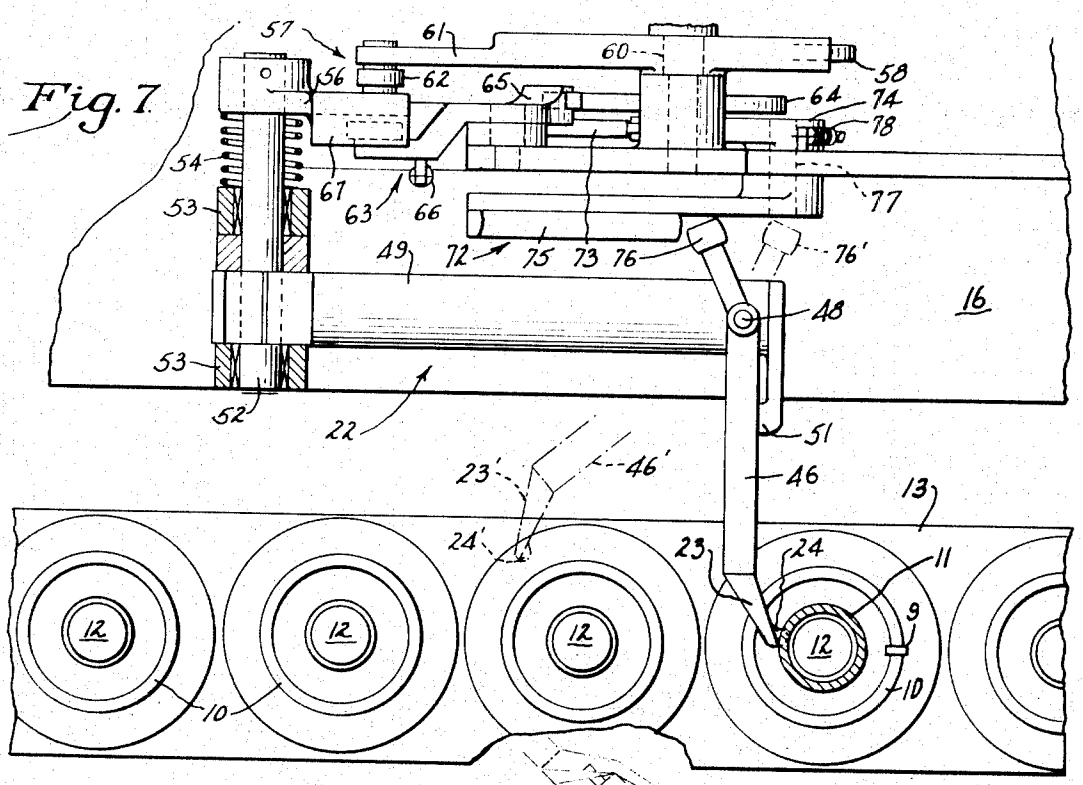
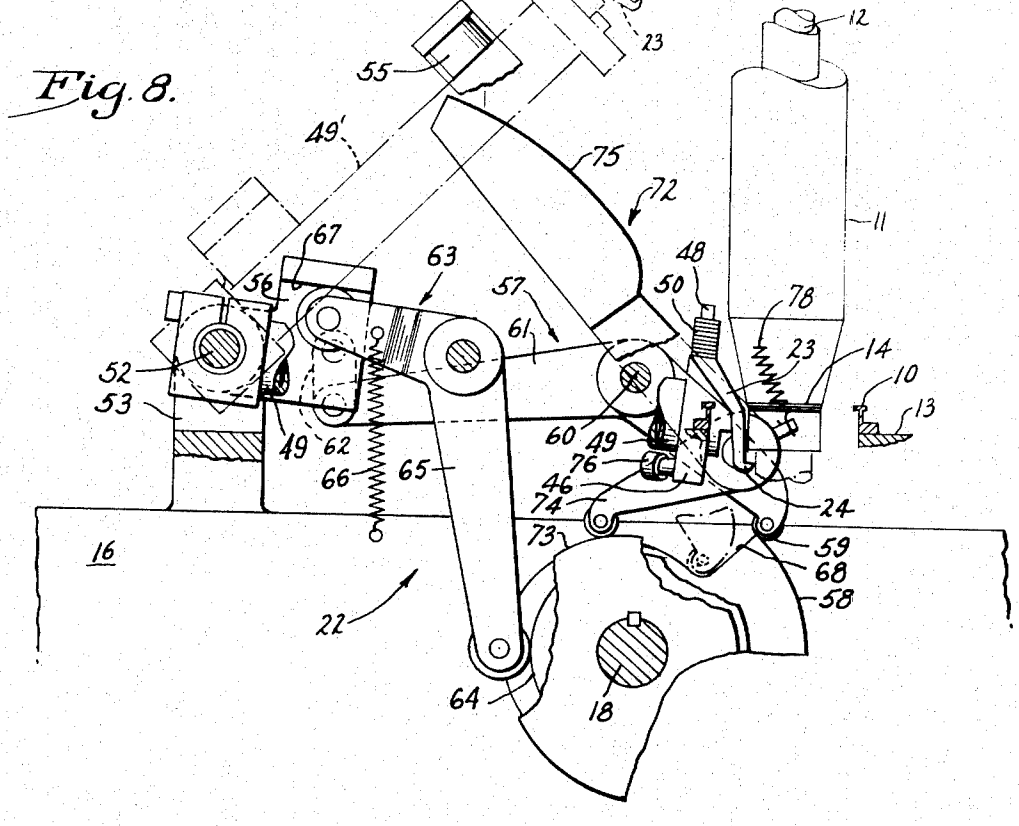

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Fig. 8


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METHOD FOR DOFFING A BOBBIN AND FORMING A TRANSFER TAIL

CROSS-REFERENCES TO RELATED APPLICATIONS

This application is a division of our pending U.S. Pat. application Ser. No. 67,367, filed Aug. 27, 1970, now U.S. Pat. No. 3,696,602, issued Oct. 10, 1972.

BACKGROUND OF THE INVENTION

This invention is concerned with spinning frames in which roving is drawn and spun into thread, the thread being wound on a rotating bobbin for future use. When a bobbin is filled with thread, it is doffed and an empty bobbin is donned. The bobbins are telescoped over and frictionally coupled to rotating spindles, which are stopped while bobbins are being doffed and donned. The thread has been coupled to the empty bobbin by winding several turns of thread as a transfer tail around the spindle in such a position that it is pinched between the spindle and the empty bobbin being donned. Placement of the transfer tail on the spindle has been accomplished automatically, as the filled bobbin was doffed by an impact delivered to the butt end of the bobbin, before the supply yarn was severed. During the doffing, several turns of thread were unwound from the filled bobbin and simultaneously transferred to the spindle to form a new transfer tail as the bobbin was popped off of the spindle. After the new transfer tail was formed, it was severed from the doffed bobbin and the empty bobbin was donned. The old transfer tail, trailing behind the bobbin being doffed, was caught by the turns of the new transfer tail, resulting in breakage of the old transfer tail from the filled bobbin and the accumulation of such old tails on the spindle, where they eventually prevented proper seating of an empty bobbin and had to be removed by hand.

Richard D. Livingston, in a copending U.S. patent application Ser. No. 593,536, filed Nov. 10, 1966, now U.S. Pat. No. 3,552,110, issued Jan. 5, 1971, disclosed a method for removing the old transfer tail from the spindle after each bobbin was doffed. This eliminated the need for periodic removal of the accumulated old transfer tails from the spindle, but required a separate operation to remove it.

SUMMARY OF THE INVENTION

The present invention is concerned with an automatic doffer used in combination with a spinning frame, or the like, for doffing filled bobbins and donning empty bobbins so that there is no accumulation of old transfer yarn tails on the spindles, where they may interfere with the donning of empty bobbins or break the transfer yarn during doffing.

It eliminates the need for periodically removing the accumulated old transfer yarn tails from the spindles.

The number of operations has been reduced.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a fragmental section through a spinning frame and automatic doffer showing the interaction between them in a preferred embodiment of this invention.

FIG. 2 is a partial elevation of the doffer as seen from the side adjacent the spinning frame and showing the driving connection between the doffer and spinning frame.

FIG. 3 is a plan view of the slack forming mechanism of the doffer taken along the line III — III of FIG. 2 and showing the bobbins and related components of the spinning frame.

FIG. 4 is a fragmental isometric view of the relationship between certain components during the slack forming operation.

FIG. 5 is a fragmental isometric view of the relationship between certain components during the doffing operation.

FIG. 6 is a fragmental isometric view of the relationship between certain components during the thread coupling operation.

FIG. 7 is a plan view of the ejection means with the ejector finger in extended position and showing its relationship to certain components on the spinning frame.

FIG. 8 is an elevation of the ejection means, partially broken away, and showing its relationship to certain components on the spinning frame.

Some of the figures have been used to demonstrate a plurality of operations. In such figures, there may not be correspondence between the positions occupied by components employed in one operation and those employed in other operations with respect to time.

DESCRIPTION OF THE PREFERRED EMBODIMENT

While only one embodiment of this invention as applied to a continuously moving automatic doffer in combination with a spinning frame is described, it will be readily apparent to those skilled in the art that many modifications may be made in the described apparatus and that the invention may be adapted for use on automatic doffers that stop at each station and in combination with winders, twisters and similar take-up winding machines in which a transfer tail is used to couple the filament, yarn, wire, etc. to a donned bobbin without departing from the inventive concept, the scope of which is limited only by the claims.

GENERAL DESCRIPTION

Let us assume that a conventional spinning frame **1** is in operation and that, as shown in FIG. **1**, roving **2** is being drawn through drafting rolls **4** by feed rolls **5**, to become supply yarn **6**. The supply yarn is passed through thread eyes **7** on pivoted lappets **8**, and travelers **9** moving on guide rings **10**, before being spun and wound as thread on bobbins **11**. The bobbins are rotated by spindles **12**, driven through clutches (not shown). The guide rings **10** surround respective spindles and are mounted on a ring rail **13**, which is raised and lowered to distribute the thread along the bobbin. When the bobbins are filled, the ring rail **13** is dropped so that a number of turns of thread form a base bunch **14** just above the butt end **15** of the bobbin **11**. The clutches are disengaged to halt spindle rotation while the filled bobbins are doffed and empty bobbins are donned by an automatic doffer **16** moving on a rack **17** down the row of bobbins on the spinning frame. The foregoing is well known in the art and will not be described in further detail.

As the doffer **16** moves along the rack **17**, a camshaft **18** is rotated in synchronism with the progress of the doffer along the rack from station to station on the spinning machine. A pinion **19** fixed on the camshaft and engaging the rack causes the camshaft to make one revolution as the doffer moves from one station to the

next, the distance between stations corresponding to the spacing between successive spindles **12** on the spinning frame **1.** As the doffer **16** passes a predetermined position with respect to each spindle **12,** a slack forming means **20** goes into action to provide slack **21** in the supply yarn **6,** which slack is required for ensuing operations. The method and apparatus employed to provide the slack is described in detail later on.

After the slack **21** has been provided, lappet **8** with attached thread eye **7** is raised to the position shown in FIGS. **5** and **6** by a cam (not shown) on the doffer **16** to prevent interference with the subsequent doffing and donning operations.

An ejection means **22,** mounted on the doffer **16,** comprises an ejector finger **23** that engages the butt end **15** of bobbin **11,** pries the bobbin loose from the spindle **12,** and accelerates it upwardly off of the spindle.

The continuous engagement of the bobbin **11** with the ejector finger **23** throughout its stroke, which is a substantial portion of the full length of the spindle **12,** prevents thread from unwinding from the base bunch **14** beyond the point of contact with the ejector finger. After the ejector finger has been disengaged from the butt end **15** of the bobbin, the remaining travel of the bobbin on the spindle is so short that the trailing bobbin thread **28** cannot form a wrap around the spindle, but slides off freely, and so prevents formation of a new transfer yarn tail **25** on the spindle **12** during the doffing operation. It is because of this that slack **21** had to be provided to prevent breakage and the resultant loss of control of the supply yarn **6.** The new transfer yarn tail must therefore be wrapped on the spindle in a separate operation. The wrapping means **26,** mounted on the doffer **16,** comprises a wrap around finger **27** which guides the trailing bobbin thread **28** between the doffed bobbin **11** and traveler **9** over and around the spindle **12** to wrap a new transfer tail **25** on the spindle.

An empty bobbin **11** is then donned, pinching the tail **25** against the spindle **12** as the bobbin is telescoped over and pressed downward on the spindle in conventional fashion, which, forming no part of the invention, will not be further described.

SLACK FORMING MEANS

As seen in FIG. **2,** a pay off roll **29** is supported for rotation about its axis in a forked bearing **30** pivoting around a vertical shaft **31** parallel with the roll **29** on the doffer **16.** The fork **30** is biased by springs **32** toward the row of bobbins **11,** so that the roll **29** frictionally engages the filled bobbins and follows their surfaces as the doffer moves down the row. The shaft **31** is driven as by mating bevel gears **33** from the camshaft **18,** as seen in FIG. **1.** FIGS. **2** and **3** show sprockets **34** and **35** connected to the roll **29** and the shaft **31** respectively and interconnected by a chain **36,** so that, as the doffer **16** advances to the right, as seen in FIG. **3,** down the row of bobbins **11** on the spinning frame **1,** the roll is continuously rotated in a direction to unwind slack **21** from the base bunch **14** of the bobbin with which it is in engagement.

At substantially the same time that the roll **29** begins to unwind slack **21** from a given bobbin **11,** slack fingers **37** and **38** engage the supply yarn **6** supplied to that bobbin on opposite sides of the thread eye **7.** The slack fingers are pivotally mounted on a slack arm **39** and biased by a torsion spring **40** against a stop **41,** as shown in FIGS. **2** and **3.** The arm **39** is in turn pivotally mounted on the doffer **16** and biased by a torque spring **42** against a stop, as in FIG. **3,** so that the slack fingers will engage the supply yarn **6** and pull along the slack **21** unwound from the bobbin **11** by the pay off roll **29** as the doffer moves down the spinning frame **1.** The spring **40** allows the fingers to hold the slack taut, while providing lost motion between the fingers and the arm **39** to prevent thread breakage if insufficient slack is available to be taken up by the movement of the doffer. A slack release cam **43,** mechanically coupled by any suitable motion transmitting means **44** to shaft **31,** so that it makes one revolution as the doffer moves between adjacent stations, engages an extension **45** of arm **39** to briefly retract the arm to the phantom position **39'** in FIG. **3** and so release the slack **21** from the fingers **37** and **38** before the fingers arrive at a position to engage the next supply yarn **6.** When the slack is released, it temporarily takes the form of the twisted loops seen in FIG. **5.**

EJECTION MEANS

The ejection means **22** is mounted on the doffer **16,** as best seen in FIG. **2,** which shows the ejection means in its inactive position. The ejector finger **23** is on one end of an ejection lever **46,** movable about a point intermediate its ends on a pivot **48,** perpendicular on an ejector arm **49.** A torsion spring **50** biases the lever counterclockwise as seen in FIG. **7,** so that the finger is urged in the direction of movement of the doffer. Counterclockwise movement is limited by an ejector lever stop **51** integral with the ejector arm **49.** The ejector arm is affixed on a rockshaft **52** pivoted in fixed bearings **53,** and is biased to rotate counterclockwise, as viewed in FIG. **2,** by ejector spring **54,** the counterclockwise motion being limited by a resilient stop **55** seen in FIG. **8.** A rocker arm **56** is also affixed to the rockshaft **52.**

An ejector advance mechanism **57,** best seen in FIG. **8,** comprises an advance cam **58** on the camshaft **18,** an advance cam follower **59** pivoted on an axis **60,** and advance arm **61** integral with the follower and extending beyond the axis, and a link **62** connecting the advance arm to the rocker arm **56.** When the cam rises, the link pulls the rocker arm downward, storing energy in the ejector spring **54** and moving the finger **23** downward. The downward movement of the finger is timed so that it enters between the guide ring **10** and bobbin **11** and continues until a lug **24** on the end of the finger is below the butt end **15** for each bobbin as the doffer **16** advances.

After the finger **23** had been lowered to bring the lug **24** below the butt end **15,** the continued movement of the doffer **16** to the right as seen in FIG. **7** brings the lug under and the finger into lateral contact with the butt end. Thereafter, until the bobbin **11** and its old transfer tail **25** have been ejected from the spindle **12,** continued movement of the doffer results in clockwise movement of the lever **46** as permitted by the torsion spring **50** while the finger maintains contact with the butt end. The contour of the advance cam **58** permits the ejector spring **54** to raise the lug **24** into contact with the butt end **15** and to maintain such contact while the bobbin **11** is being pried loose from the spindle **12.**

The bobbin **11** is loosened from the spindle **12** by a pry mechanism **63** consisting of a pry cam **64** on the crankshaft **18,** and a bellcrank **65** following the contour

of the pry cam in response to the urging of tension spring **66** and engaging a flange **67** on the rocker arm **56.** The contour of the pry cam is such that a rise exerts a positive upward pressure on the flange through the bellcrank and so moves the lug **24** positively upward to pry the bobbin loose from the spindle after the ejector advance mechanism **57** has raised the lug into contact with the butt end **15.**

At approximately the same time as the bobbin **11** is pried loose from the spindle **12,** the advance cam follower **59** goes over a drop off **68** on the advance cam **58,** releasing the ejector spring **54** to accelerate the ejector arm **49** upwardly in an arc and so move the ejector finger **23** and lug **24** upward parallel to the spindle. The lug carries the bobbin **11** upward with the same accelerated motion. When the upward stroke of the lug is terminated by contact of the arm with resilient stop **55** at the position identified as **49'**, the momentum of the bobbin carries it off the spindle **12,** through a chute **69,** seen in FIG. **1,** and against a dampener **70,** which brings it to a cushioned stop in position to be seized by clamp jaws **71** in their extended positions **71'**. The stroke is long enough to prevent the trailing bobbin thread **28** from wrapping around the spindle as the bobbin is ejected.

As the lug **24** reaches the end of its upward stroke, the ejector lever **46** is retracted by a retract mechanism **72** to the position identified as **46'** in FIG. **7** to prevent the lug from marking the spindle **12** as the doffer **16** advances. The retract mechanism **72,** as seen in FIGS. **7** and **8,** comprises a primary cam **73** on the camshaft **18,** a primary cam follower **74,** a retractor cam **75** rigid with the primary cam follower, and a retractor cam follower **76** on the other end of the ejection lever **46.** The primary cam follower pivots on an axle **77** and is pressed against the primary cam by a bias spring **78.** When the time to retract the lever arrives, a rise on the primary cam rotates the retractor cam **75** clockwise to the position in FIG. **2.** This results in the retractor cam follower moving to position **76'** and retracting the ejector lever. After the doffer has moved far enough so that the lug will clear the spindle, a dip in the primary cam permits bias spring **78** to return the retractor cam to its normal position, and so allows the ejector lever to resume its extended position.

WRAPPING MEANS

The wrapping means **26** comprises a thread locating mechanism **79** and a wrap around mechanism **80.**

A pair of thread locating fingers **81** in the locating mechanism **79** are pivoted on a stud **82** affixed to the doffer **16** and operated in scissor-like fashion through a series of links and levers **83** from the locating cam follower **84,** pivoted on lever shaft **85** and riding on locating cam **86** on camshaft **18.** After the bobbin **11** has been doffed and seized by the clamp jaws **71,** the jaws are moved by mechanism not shown to bring the bobbin into the position **11'**, as seen in FIGS. **1** and **5,** with the trailing bobbin thread **28** between the normally open locating fingers and against an abutment **88.** The fingers are then closed loosely on the thread in response to motion of the cam to definitely locate the thread at a definite position between the closed fingers.

In the wrap around mechanism **80,** seen principally in FIGS. **1** and **2,** the wrap around finger **27** is pivoted about one axis on a hinge **89** for movement in a plane parallel to the direction of movement of the doffer **16.** The hinge is fixed on a shaft **90** providing a second axis journaled on the doffer **16** and moved to cause movement of the finger in a plane perpendicular to movement of the doffer by a perpendicular arm **91** in response to a perpendicular cam follower **92,** pivoted on lever shaft **85** and riding on perpendicular cam **93,** the motion being transmitted through an assembly of links and levers **94.** A similar combination of links and levers **95** transmits motion from a parallel cam follower **96,** pivoted on lever shaft **85** and riding on parallel cam **97** to a parallel bellcrank **98** connected by a parallel link **99** to the wrap around finger **27.** The upper end of the wrap around finger **27** is formed as a shallow V in a substantially horizontal plane above the locating fingers **81.** There is a notch **100** at the nadir of the V to retain the trailing bobbin thread **28,** as will be explained later. The wrap around finger is normally positioned so that the notch **100** is directly behind the trailing bobbin thread as positioned by the locating mechanism **79.** After the thread has been located, the finger is moved forward by the perpendicular cam **93** to catch the thread in the notch, after which continued forward movement of the finger pulls the thread from between the locating fingers. The contours of the perpendicular and parallel cams **93** and **97** are such that the notch is moved forward and backward and from side to side above the end of the cleared spindle **12** in such a relationship that the thread is wrapped around the spindle at least once to create a transfer tail **25** as the doffer **16** progresses. Because the position of the traveler **9** is not fixed, it is necessary that the notch make at least two circles around the spindle in order to assure a transfer tail of at least one turn.

After the new transfer tail **25** has been created, the locating fingers **81** are opened and the wrap around finger **27** is withdrawn to its normal position, freeing the trailing bobbin thread **28.** A bar **101** engages the thread above the spindle **12** and drags it down to the position **28'**, where it is severed by a scissors type shear **102** near said spindle. An empty bobbin **11** is then donned, pinching the transfer tail **25** against the spindle to couple the supply yarn **6** to the bobbin, after which the lappet **8** and attached thread eye **7** are lowered and the clutch is engaged to restart the spinning operation. The mechanism for dragging down and severing the trailing bobbin thread, donning the bobbin, and lowering the lappet are mounted on the doffer and are conventional well-known apparatus that form no part of the invention, so they will not be described. An example of such mechanisms, operated by cam controlled arms, may be found in the aforesaid Livingston patent. The clutch is on the spinning frame and also forms no part of this invention.

Although the preferred embodiment is concerned with spinning yarn, the invention has other applications as previously noted involving filament, wire, etc. Realizing that "filament" has been used in the textile industry in reference to extruded or drawn plastics, it is to be understood that, when "filament" is used in the claims, it is in the generic sense to cover yarn, thread, cord, string, rope, strand, fiber, wire, strip, or any other elongated flexible part that may be wound on a bobbin, or the like, whether the filament is unitary or comprised of a plurality of components.

We claim:

1. A method for automatically forming on a spindle a new transfer tail from a filament wound on a bobbin

mounted upon said spindle without accumulating an old transfer tail on said spindle, comprising the steps of doffing from said spindle the bobbin having said filament wound thereon, maintaining said filament on the bobbin until the same is substantially clear of the spindle to prevent transfer of said filament from the bobbin to said spindle during said doffing, wrapping a turn of said filament around the spindle to form said new transfer tail, and severing said filament between the spindle and said bobbin to leave said new transfer tail on the spindle.

2. A method according to claim **1** further comprising an initial step of providing slack in the filament trailing from said bobbin to prevent breakage of the filament as said bobbin is doffed and the new transfer tail is wound on the spindle.

3. A method according to claim **1** wherein said maintaining comprises contacting both the bobbin and the filament trailing from said bobbin, inhibiting unwinding of the filament from said bobbin, and maintaining said contact while accelerating said bobbin and the filament simultaneously off of the spindle.

4. A method according to claim **1** wherein said doffing comprises prying the bobbin loose from said spindle and accelerating the bobbin off of said spindle.

5. A method according to claim **1** wherein said wrapping comprises catching a portion of the filament trailing from the doffed bobbin and moving said trailing portion around the spindle.

* * * * *