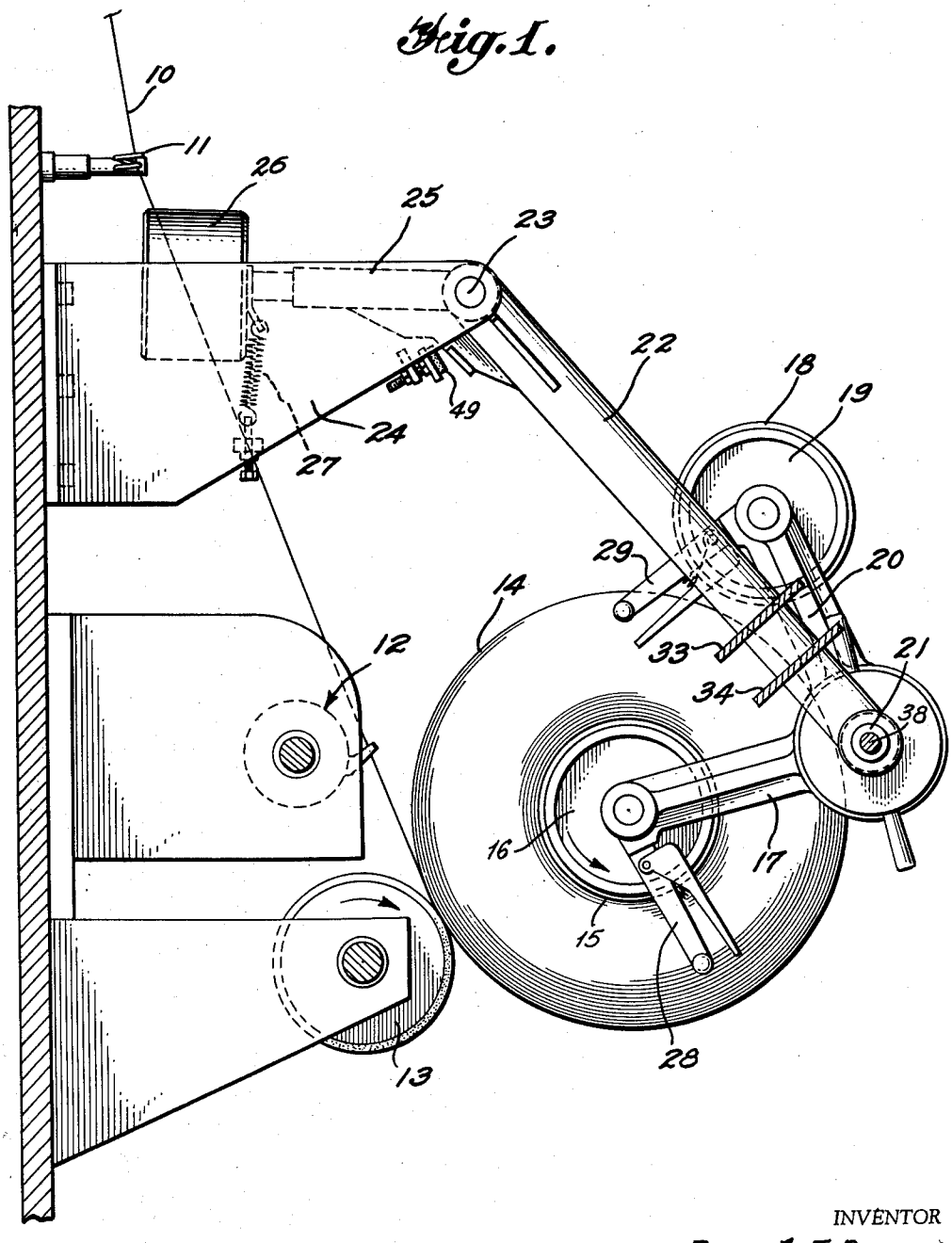
Feb. 5, 1963 R. F. BAER 3,076,614

THREAD WINDING APPARATUS

Filed Sept. 12, 1960 5 Sheets-Sheet 1

Fig. 1.



INVENTOR
Russel F. Baer

BY
Robert L. Broad, Jr.
ATTORNEY

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THREAD WINDING APPARATUS

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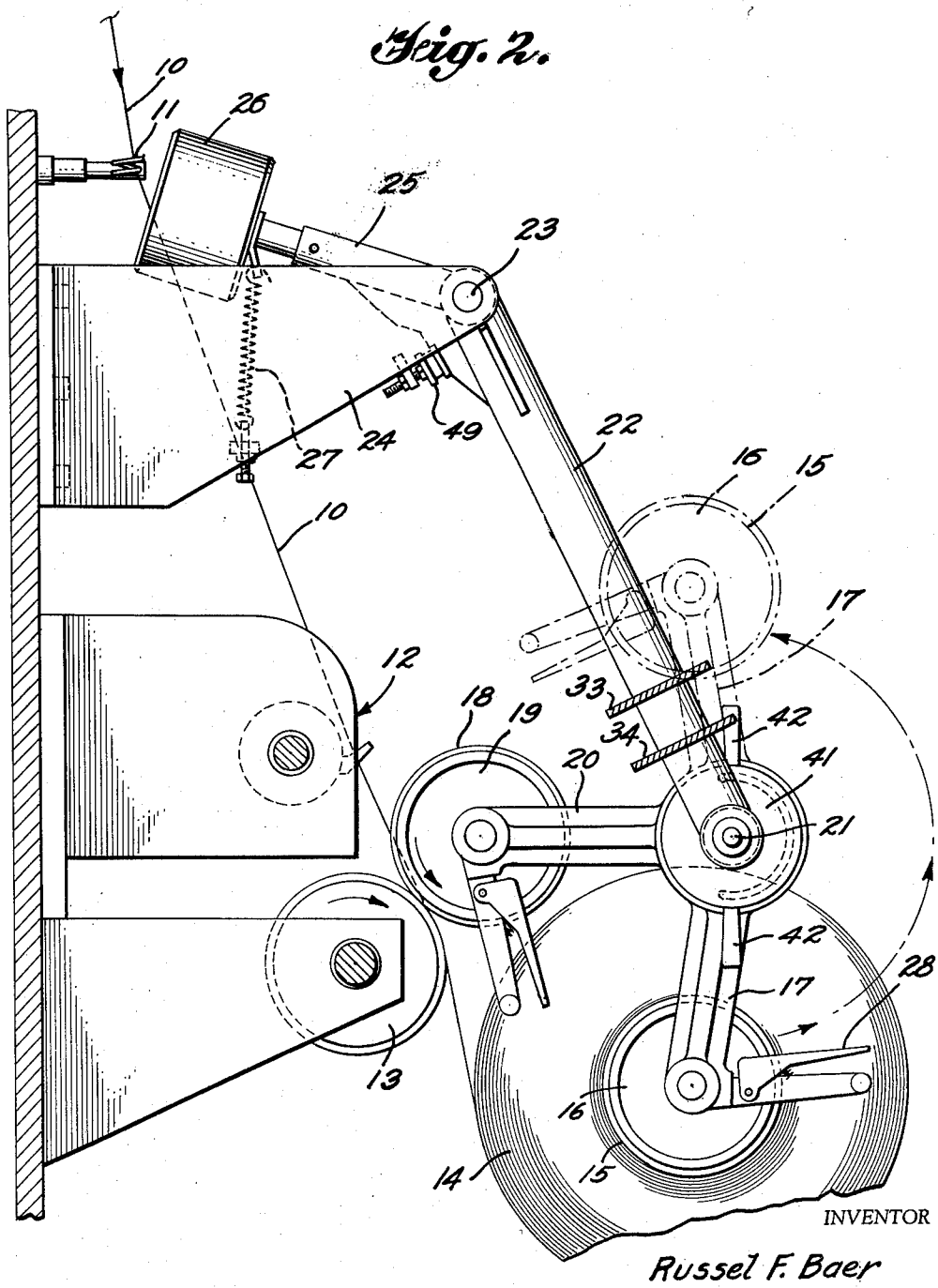
Fig. 2.



INVENTOR

Russel F. Baer

BY Robert L. Broad, Jr.

ATTORNEY

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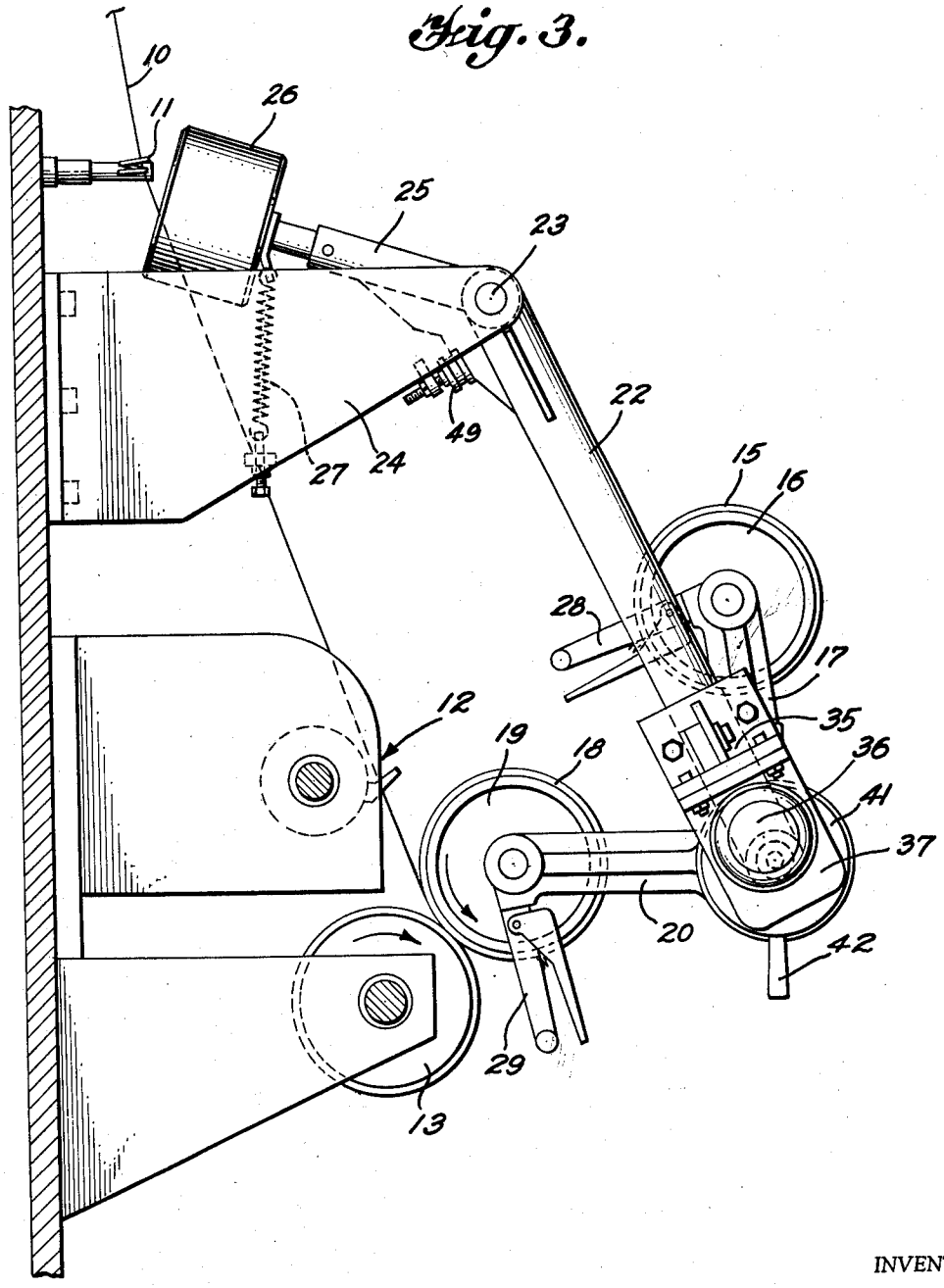
Fig. 3.



INVENTOR

Russel F. Baer

BY Robert L. Broad, Jr.

ATTORNEY

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THREAD WINDING APPARATUS

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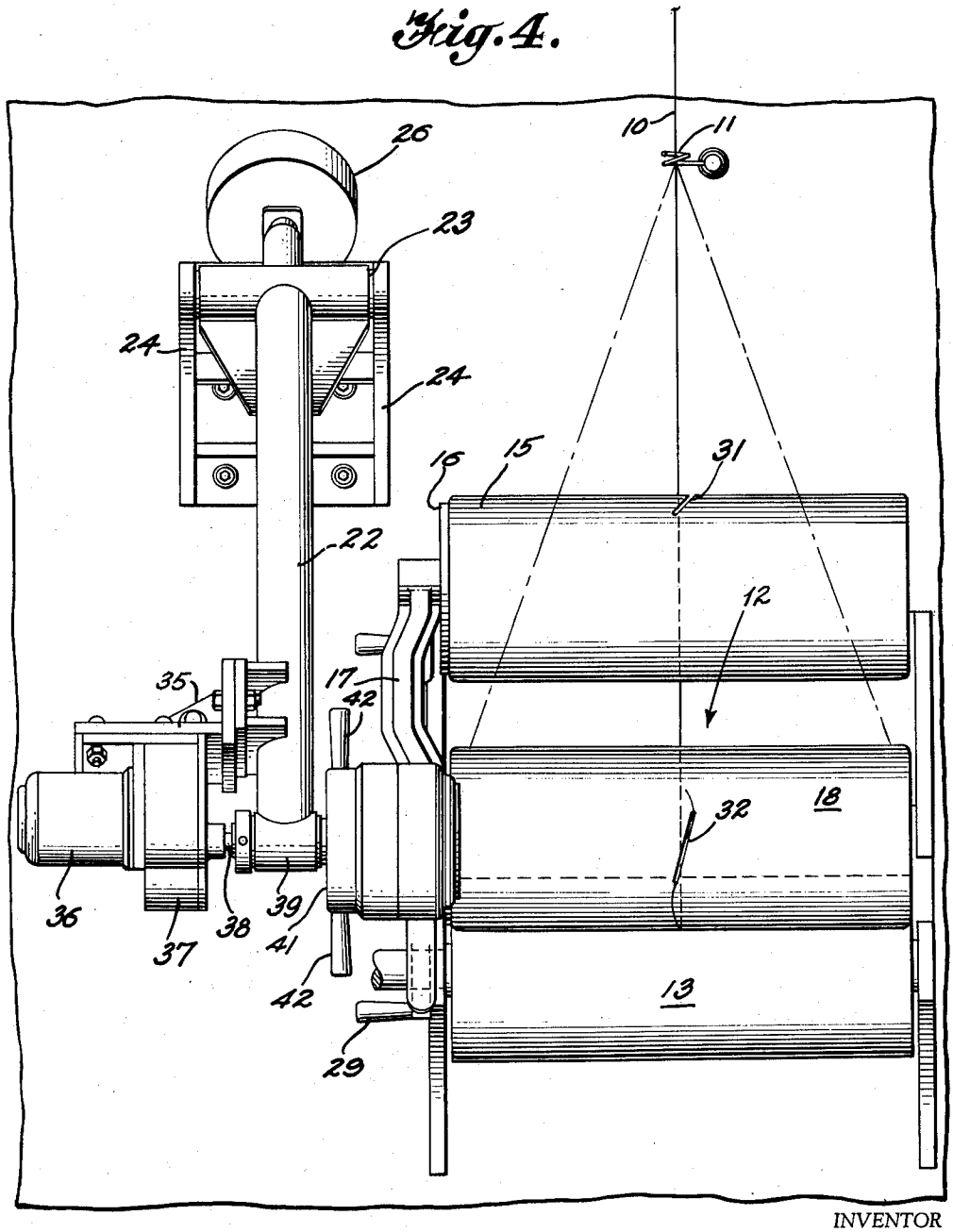
Fig. 4.



INVENTOR

Russel F. Baer

BY Robert L. Broad, Jr.

ATTORNEY

Feb. 5, 1963 R. F. BAER 3,076,614

THREAD WINDING APPARATUS

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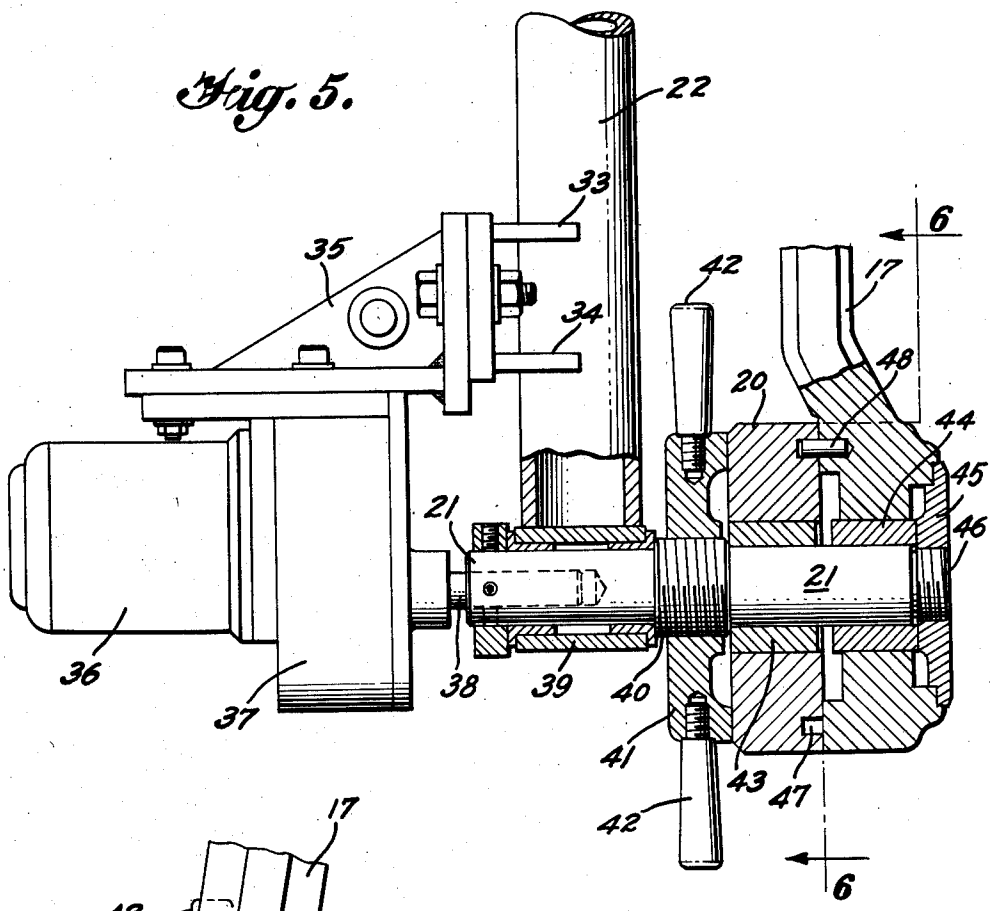
Fig. 5.



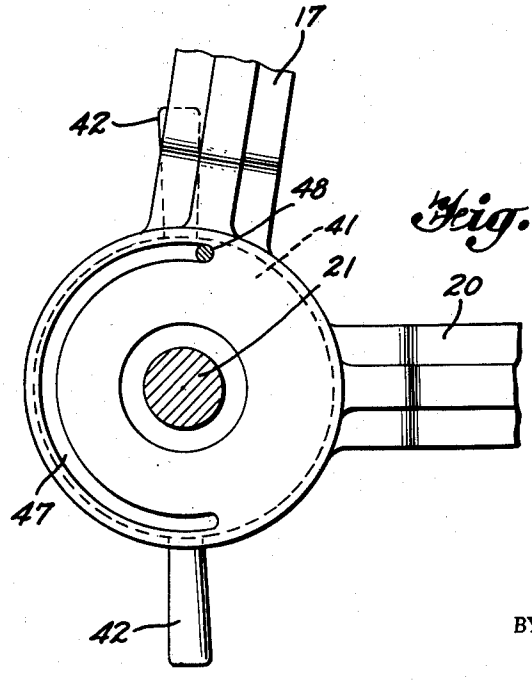


Fig. 6.

INVENTOR

Russel F. Baer

BY Robert L. Broad, Jr.

ATTORNEY

United States Patent Office 3,076,614 Patented Feb. 5, 1963

3,076,614

THREAD WINDING APPARATUS

Russel F. Baer, Decatur, Ala., assignor, by mesne assignments, to Monsanto Chemical Company, a corporation of Delaware

Filed Sept. 12, 1960, Ser. No. 55,506
8 Claims. (Cl. 242—18)

This invention relates to thread winding apparatus and more particularly to apparatus for the safe, rapid and economical preparation of large wound bobbins of high strength continuous filament material such as nylon.

In the preparation of wound bobbins of continuous filament synthetic threads there is always the problem of disposing of the running end of thread at the doff, it being apparent that the longer it takes to replace a full bobbin with an empty one at the winding position, the more yarn will run to waste. With synthetic yarns of no great mechanical strength, this problem was entirely an economic one but, with the advent of synthetics such as nylon, the problem is aggravated by also involving a hazard to the operators. This results from the fact that high strength threads of moderate or high denier are capable of drawing an operator into the running machinery. Thus, not only is it desirable to avoid waste in the doffing phase of the winding of nylon and like high strength yarns, but it is necessary to perform the operation under circumstances such that the operator is not required closely to approach the machine when the thread path is sufficiently out of control that there is danger of being ensnared by the running yarn.

Prior art automatic doffing devices are known but none of them functions adequately in both avoiding waste and protecting the operator in dealing with high strength, continuous filament material.

It is therefore an object of this invention to overcome the foregoing deficiencies and to provide doffing apparatus for handling high strength yarns under safe conditions while at the same time totally avoiding the production of waste incident to the removal of a full bobbin from winding position and the substitution in that position of an empty bobbin.

According to the present invention, bobbin holders are provided which are mounted to rotate sequentially through three stages or positions: a winding-on stage, a doffing stage, and a ready stage. Movements between the ready stage and the doffing stage are entirely automatic, waste-free, rapid and safe. Movement from the doffing stage to the ready stage is manual but is performed under conditions such that the prior action of the machine protects the operator against danger. Furthermore, the time requirements of the movement from the doffing position to the ready position are only that the function be performed before a fully wound package can be produced at the winding station, a matter of some hours.

Other objects and advantages of this invention will be apparent upon consideration of the following detailed description of a preferred embodiment thereof in conjunction with the annexed drawings wherein:

FIGURE 1 is a view in side elevation of a nylon winding machine equipped with the doffing arrangement of the present invention, one bobbin being shown in the ready position and the other in the winding position in the fully wound condition that prevails just before the doff, the motor drive assembly being removed for convenience of illustration;

FIGURE 2 is a view similar to FIGURE 1, but showing a fresh bobbin moved in from the ready position to the winding position and the full bobbin in the doff position;

FIGURE 3 is a view in elevation of the machine of FIGURES 1 and 2 but with the motor drive assembly shown and with the bobbins in the broken line position of FIGURE 2;

FIGURE 4 is a view in front elevation of the machine of FIGURES 1, 2 and 3 with the bobbins in the FIGURE 3 position;

FIGURE 5 is a view partially in side elevation and partially in section showing the connection between the two bobbin supports in the FIGURE 3 position and the manner in which they are mounted for and driven between the ready, winding and doffing positions; and

FIGURE 6 is a view in cross-section taken along the line 6—6 of FIGURE 5.

In FIGURE 1 a high strength synthetic yarn 10 is shown guided by a pigtail guide 11 to a traverse mechanism 12 of conventional construction from which it passes between a bobbin driving cylinder 13 and a yarn package 14 which has been built up on the bobbin 15. Bobbin 15 is a hollow cylinder and is mounted over a cylindrical holder 16 which in turn is pivotally mounted on an arm 17 for free rotation. Another bobbin 18 is similarly mounted on a holder 19 which in turn is pivotally mounted on the end of an arm 20. The arms 17 and 20 have integral hubs at the ends opposite to the ends which support the bobbin holders and these hubs are mounted for pivotal movement about a shaft 21. The shaft 21 is supported from an arm 22 which is pivotally supported at 23 from a bracket 24. An extension 25 of the lever 22 beyond the pivot point 23 is connected to a counter weight 26. It can be seen that the counter weight 26 functions to bias the lever 22 in a counterclockwise direction about its pivot 23, as the machine is viewed in FIGURE 1. A spring 27 connected to a bar running lengthwise of the machine functions to assist the counter weight.

Each of the bobbins 15 and 18 is removable from its respective holder 16 or 19 by a release mechanism of conventional design which serves to shrink the bobbin holder circumferentially sufficiently to permit the bobbin to be removed from the holder. These well-known devices are designated by numerals 28 and 29 respectively.

Before describing in detail the structure by operation of which the bobbins are moved from the winding to the doff to the ready positions, it may be well to refer to the result which is sought to be achieved. In FIGURE 1, the body of thread 14 on the bobbin 15 is about at the diameter desired for a fully wound bobbin. This invention provides a way by which the bobbin 18 can be substituted for the bobbin 15 at the winding position without a waste of yarn or interruption of the running of thread 10 or danger to the operator. To take advantage of this, the operator energizes an electric circuit which causes a motor to move arms 17 and 20 together in fixed angular relationship in an anticlockwise direction until the surface of the bobbin 18 contacts the drive roller 13. By this time the bobbin 15 is in the FIGURE 2 position and the thread path has been stretched to run tangentially between the driving rollers 13 and the surface of the yarn body 14 resulting in engagement thereof with a cutting notch in the surface of the bobbin. Each of bobbins 15 and 18 is provided with such a notch on its surface (see FIGURE 4 at 31 and 32). The yarn is broken when it enters the notch 31 or 32 as the case may be and the notch grips it enough so that the yarn begins to wind onto the bobbin which is in peripheral contact with the driving roller 13. Thus, the bobbin is automatically threaded and winding on commences according to the pattern produced by the traverse 12 which runs continuously throughout the doff.

Once the yarn running to the yarn body 14 is severed and the bobbin 15 ceases to turn, there is no longer any hazard incident to approaching the bobbin 15, the running yarn being at this stage laid up on the bobbin 18. The operator may therefore actuate the release 28 and remove the bobbin 15 from the holder 16, replacing it with a similar empty bobbin. In this case the bobbin on support 16 is designated as bobbin 15 regardless of whether it is full or empty, it being apparent that, after

the doff, the empty bobbin which is placed over support **16** is not actually the very same one which was removed but instead another like it. The doffing operation is now complete and the operator next manually moves the now-empty bobbin **15** up to the ready position shown in broken lines in FIGURE 2.

The equipment by which the foregoing operation is performed will now be described. Concurrent reference is made to FIGURES 4, 5 and 6. It can be seen that the arm **22** carries thereon two brackets **33** and **34**. Bolted to these is a support bracket **35** from which there depends an electric motor **36** and a gear box **37** establishing a drive connection of suitable gear ratio between the motor **36** and an output shaft **38** of the gear box which is keyed to shaft **21**. The gear box **37** contains a worm and pinion gear arrangement so that the output shaft **38** and the shaft **21** cannot be rotated by a heavy bobbin. The shaft **21** is mounted for rotation in a bearing **39** supported from the end of the support arm **22**. Central of shaft **21** is a threaded zone **40** to which there is threaded a manually operable friction clutch **41** which can be moved from left to right on the shaft **21** by rotating it, using for this purpose handles **42**. Bearings **43** mount the integral hub of arm **20** for pivotal movement about the shaft **21** and similar bearings **44** similarly mount the integral hub of the arm **17**. A cap **45** is screwed onto the end of shaft **21** at a threaded area **46** and this cap acts to receive the axial thrust which results from turning the clutch **41** so that it moves toward the cap **45**, left to right as seen in FIGURE 5. As this movement takes place, the hubs of the arms **20** and **17** are squeezed together to such an extent that they move as a unit with shaft **21** when that shaft is actuated by reason of actuation of the motor **36**.

The hub of the arm **20** has an arcuate groove **47** in it which extends for little more than 180°. Set in this groove is a pin **48** which is fixed in and projects from the face of the hub of the arm **17**. The pin **48** and the groove **47** together provide a lost motion connection which is used in transferring a bobbin from the doffing position (the position occupied by the bobbin **15** in FIGURE 2) to the ready position (the broken line position of the same bobbin also in FIGURE 2).

When the full bobbin has reached the desired package diameter as depicted in FIGURE 1, the operator actuates the motor **36** from a switch remote from the apparatus so that the operator is saved the hazard of too closely approaching the running machine during the doff. Operation of the motor **36** causes the shaft **21** to turn in a counterclockwise direction as that shaft is viewed in FIGURE 2. This movement continues until the bobbin **18** peripherally contacts the drive roller **13**, whereupon the motor **36** is either automatically or manually stopped. As soon as the bobbin **18** peripherally contacts the drive roller **13**, it is driven thereby. The thread is cut in the manner previously described and the operator, at his leisure, removes the thread package from the holder **16**. He then releases the clutch **41** by unscrewing it, that is, moving it away from the cap **45** as viewed in FIGURE 5 until the arms **17** and **20** are again freely relatively movable about shaft **21**. Its own weight plus the weight of whatever thread is wound on it holds the bobbin **18** against the drive roller **13** and the bobbin **15** will simply swing relative to it to a vertical position below the shaft **21** until the operator manually moves it counterclockwise through the arc shown by the arrows in FIGURE 2. During this movement the arms **17** and **20** move relatively until the lost motion connection provided by the slot **47** and the pin arrests the movement at the ready position shown in full lines in FIGURE 3 and the broken lines in FIGURE 2. At this point the operator tightens the clutch in preparation for the next doff at which time the cycle is repeated, except that now the full bobbin is bobbin **18** and the empty one is bobbin **15**.

With the motor and gear box mounted on the end of lever **22** and with the relatively heavy package **14** effectively also mounted on arm **22**, it can be seen that the counterweight **26** and spring **27** are necessary to prevent excessive pressures between the bobbin in the winding position and the drive cylinder **13**. Further along these lines, there is provided a stop at **49**, see each of FIGURES 1, 2 and 3, said stop having to limit clockwise movement of the arm **22** about pivot **23**.

From all of the foregoing it can be seen that each of the bobbin supports **16** and **19** moves cyclically through each of three stages or positions in making a single revolution about shaft **21**. Each support **16—19** moves by reason of the drive from motor **36** from the ready position (support **16** in FIGURE 3) to the winding position (support **19** in FIGURE 3) and to the doffing position (support **16** in FIGURE 1). The supports are moved manually in relation to one another from the full line to the broken line positions in support **16** in FIGURE 2. All movements are counterclockwise as viewed in FIGURE 1.

What is claimed is:

1. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of bobbin supports, a bobbin drive, means mounting each of said supports for sequential movement from a winding position in which its bobbin is in driven relation to said drive to a doffing position and then to a ready position, means interconnecting said bobbin supports so that movement of one from the ready position to the winding position is accompanied by movement of the other from the winding position to the doffing position, each bobbin support being independently movable from the doffing position to the ready position, drive means for moving the interconnected bobbin supports from one position to another, means continuously to deliver thread to the bobbin on the support in winding position and means responsive to the movement of a bobbin to the doffing position to sever the thread and cause the running end to be wound onto the bobbin on the support moving into the winding position from the ready position.

2. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of bobbin supports, a bobbin drive, means mounting each of said supports for sequential movement from a winding position in which its bobbin is in driven relation to said drive to a doffing position and then to a ready position, means for locking said bobbin supports together so that movement of one from the ready position to the winding position is accompanied by movement of the other from the winding position to the doffing position, means to drive said locked supports between said ready and doffing positions, each bobbin support being independently movable from the doffing position to the ready position, means continuously to deliver thread to the bobbin on the support in winding position and means responsive to the movement of that bobbin to the doffing position to sever the thread and cause the running end to be wound onto the bobbin on the support moving into the winding position from the ready position.

3. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of bobbin supports, a bobbin drive, means mounting each of said supports for sequential movement from a winding position in which its bobbin is in driven relation to said drive to a doffing position and then to a ready position and means interconnecting said bobbin supports so that movement of one from the ready position to the winding position is accompanied by movement of the other from the winding position to the doffing position, each bobbin support being independently movable from the doffing position to the ready position, means continuously to deliver thread to the bobbin on the support in winding position, remotely controllable means for driving said bobbins in interconnected condition, one of said bobbins moving from the winding position to the doffing position while the other bobbin is moving from the ready position to the winding

position, and means responsive to the movement of a bobbin to the doffing position to sever the thread running to it and to cause the running end to be wound onto the bobbin on the support moving into the winding position from the ready position.

4. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of freely rotatable bobbin supports, a peripheral bobbin drive, arms mounting each of said supports for unidirectional, sequential arcuate movement from a winding position in which the bobbin on the support is in driven relation to said peripheral drive to a doffing position and then to a ready position, a quickly releasable friction clutch interconnecting said arms so that movement of one from the ready position to the winding position is accompanied by movement of the other from the winding position to the doffing position, motor means for driving the arms to carry the bobbins from one position to another, each bobbin support being independently movable from the doffing position to the ready position upon disengagement of said clutch, means continuously to deliver thread to the bobbin on the support in winding position and means responsive to the transfer of that bobbin to the doffing position to sever the thread and to cause the running end to be wound onto a bobbin on the support which moves into the winding position from the ready position.

5. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of freely rotatable bobbin supports, a peripheral bobbin drive, arms mounting each of said supports for unidirectional sequential arcuate movement from a winding position in which the bobbin on the support is in driven relation to said peripheral drive to a doffing position and then to a ready position, a quickly releasable frictional clutch interconnecting said arms so that movement of one from the ready position to the winding position is accompanied by movement of the other from the winding position to the doffing position, remotely controllable motor means for driving said supports through said clutch, each bobbin support being independently movable from the doffing position to the ready position upon disengagement of said clutch, means continuously to deliver thread to the bobbin on the support in winding position and means responsive to the transfer of that bobbin to the doffing position to sever the thread and to cause the running end to be wound onto a bobbin on the support which moves into the winding position from the ready position.

6. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of bobbin supports, means mounting said supports for unidirectional, arcuate movement about a common axis through a winding position, a doffing position and a ready position in repeated cycles, releasable means for locking said supports for movement together about said common axis and means limiting the magnitude of the relative angular displacement of said supports about said axis when said locking means is released, remotely controllable means for concurrently moving one of said supports from the ready position to the winding position while moving the other from the winding position to the doffing position, means automatically to transfer the running thread from the bobbin on the support moving to the doffing position onto the bobbin on the support moving into the winding position whereby the doffing can be accomplished without loss of yarn and without the necessity of the operator to approach the machine.

7. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of bobbin supports, a bobbin drive, an arm, means mounting said arm for limited pivotal movement, means mounting each of said supports from said arm at a point remote from its pivot for sequential movement from a winding position in which its bobbin is in driven relation to said drive to a doffing position and then to a ready position and means interconnecting said bobbin supports so that movement of one from the ready position to the winding position is accompanied by movement of the other from the winding position to the doffing position, each bobbin support being independently movable from the doffing position to the ready position, means continuously to deliver thread to the bobbin on the support in winding position, remotely controllable means for moving said bobbins in interconnected condition, one of said bobbins moving from the winding position to the doffing position while the other bobbin is moving from the ready position to the winding position, and means responsive to the movement of that bobbin to the doffing position to sever the thread and cause the running end to be wound onto the bobbin on the support moving into the winding position from the ready position.

8. A device for waste-free doffing of a continuous filament collecting device which comprises a pair of bobbin supports, an arm, means mounting said arm for limited pivotal movement, means mounting said supports on said arm remote from its pivot for unidirectional arcuate movement about a common axis through a winding position, a doffing position and a ready position in repeated cycles, releasable means for locking said supports for movement together about said common axis and means limiting the magnitude of the relative angular displacement of said supports about said axis when said locking means is released, remotely controllable means for concurrently moving one of said supports from the ready position to the winding position while the other is moved from the winding position to the doffing position, means automatically to transfer the running thread from the bobbin on the support moving to the doffing position onto the bobbin on the support moving into the winding position whereby the doffing can be accomplished without loss of yarn and without the necessity of the operator to approach the machine.

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