Feb. 21, 1933. E. SCHWEIZER 1,898,501

AUTOMATIC BOBBIN WINDING MACHINE IN COMBINATION WITH SPINNING FRAMES

Filed Jan. 20, 1931 4 Sheets-Sheet 1

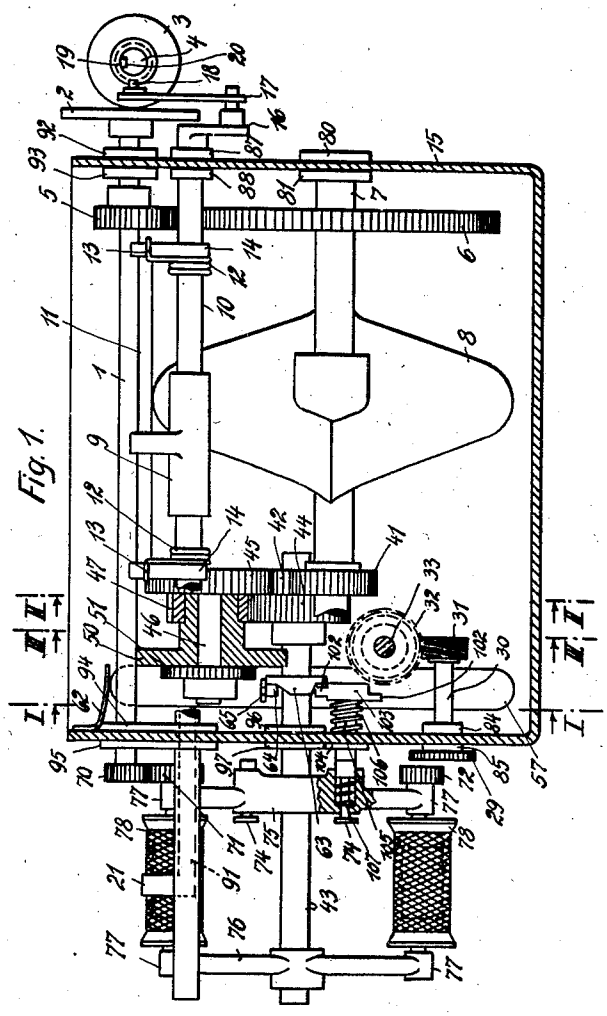


Fig. 1.

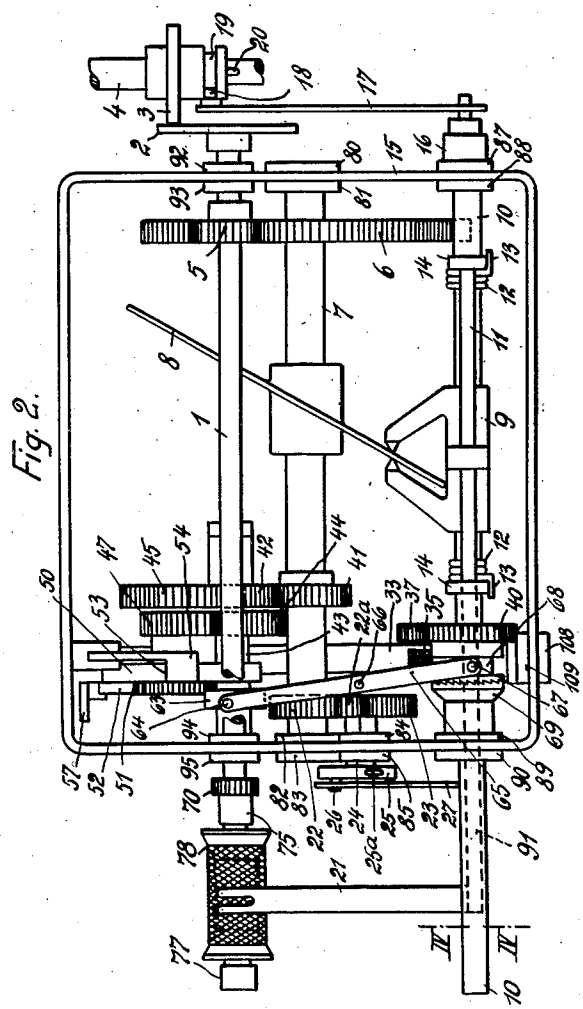
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AUTOMATIC BOBBIN WINDING MACHINE IN COMBINATION WITH SPINNING FRAMES

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Fig. 2.



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AUTOMATIC BOBBIN WINDING MACHINE IN COMBINATION WITH SPINNING FRAMES

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Fig. 3.

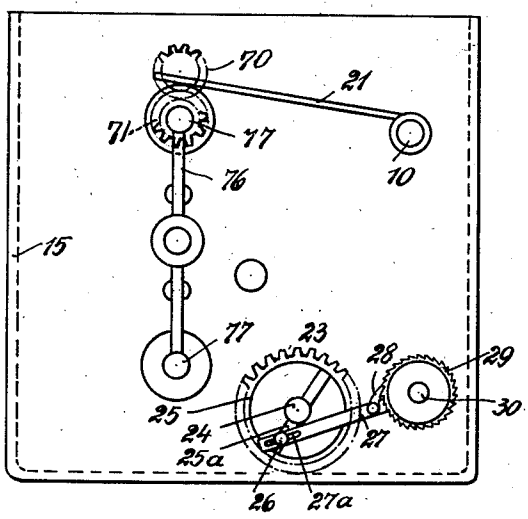
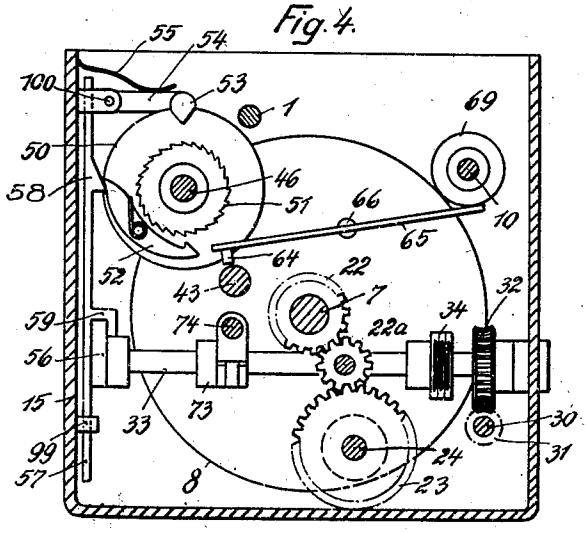


Fig. 4.



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AUTOMATIC BOBBIN WINDING MACHINE IN COMBINATION WITH SPINNING FRAMES

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Fig. 5.

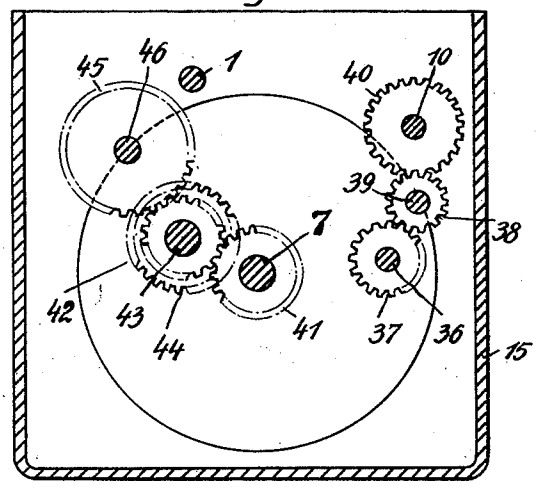


Fig. 6.

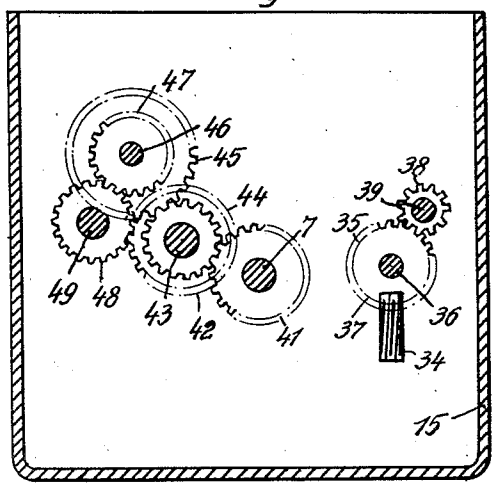
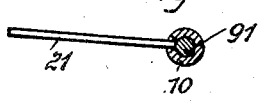


Fig. 7.



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Patented Feb. 21, 1933 1,898,501

UNITED STATES PATENT OFFICE

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AUTOMATIC BOBBIN-WINDING MACHINE IN COMBINATION WITH SPINNING FRAMES

Application filed January 20, 1931, Serial No. 510,021, and in Switzerland December 19, 1929.

This invention relates to bobbin winders, more particularly for use with spinning machines for artificial filaments but also applicable for winding other textile fibres.

An object of the invention is to provide a bobbin winder incorporating novel ratchet mechanism for controlling the winding speed and movements of the thread guide so that the winding is performed under uniform tension irrespective of the diameter and shape of the bobbin and without the necessity for rollers or like members engaging the bobbin.

Another object of the invention is to provide a bobbin winder as aforesaid having means for automatically changing from a full bobbin to an empty bobbin with simultaneous resetting of the winding and thread-guide mechanism.

Another object is to provide a bobbin winder with automatic change-over upon completion of a bobbin, wherein means are provided for temporarily de-clutching the thread-guide member during the change-over from one bobbin to another.

Still another object is to provide as a unitary structure a novel construction of bobbin winder which can be readily fitted to existing spinning machines for artificial filaments without substantially extending the space occupied by the said machines.

Other and further objects of the invention reside in the construction of bobbin winder as set forth more fully in the specification hereinafter following, having reference to the accompanying drawings in which:—

Fig. 1 is a side elevation with a side wall and certain parts removed;

Fig. 2 is a plan of the machine according to Fig. 1;

Fig. 3 is a front elevation of the machine;

Fig. 4 is a section along I—I of Fig. 1 or 2;

Fig. 5 is a section along II—II of Fig. 1 or 2;

Fig. 6 is a section along III—III of Fig. 1 or 2 to show the intermediate and auxiliary drive;

Fig. 7 is a section along IV—IV of Fig. 2.

The necessity for winding bobbins so that the thread is constantly under uniform tension, that is with progressively decreasing winding speed in proportion to the growth of the bobbin, is well known in the textile industry and various mechanisms have been devised to attain this object. Usually the speed regulation depends on a roller or like member in resilient contact with the bobbin during winding so as to cause a relative movement between them as the bobbin grows which movement results in a corresponding movement of one of the members of a friction gear drive. Such an arrangement is not wholly satisfactory since the contact of the roller or like member with the thread is manifestly undesirable particularly in the case of fine or delicate threads. The novel ratchet mechanism of this invention for regulating the winding speed and speed of movement of the thread guide dispenses with the necessity for contacting rollers or like members. Moreover, it enables the speed regulation to be effected in a more nearly perfect manner since the ratchet mechanism is sensitive to even the smallest changes and reduces the idle gear losses to a minimum.

Referring now to the accompanying drawings, the new bobbin winding machine illustrated contains the following principal parts which are mounted in or upon the casing:—

The main drive of the machine; the ratchet mechanism; the intermediate drive; the thread-guide member; the drive for the bobbins; the bobbin carrier; the change gear; and the auxiliary drive.

Main drive

As most clearly seen in Fig. 2, the main shaft 7 of the bobbin-winding machine is mounted in bearings 80, 81 and 82, 83 in the casing 15. In Fig. 1 the lefthand portion of the shaft 7 is cut away, and the bearings 82, 83 and pinion 22 have also been removed in order that other parts may be more clearly seen. In the vicinity of the bearing 81, the shaft 7 carries the spur wheel 6. Said shaft also carries the swashplate 8 and the driving pinions 41 and 22.

Ratchet mechanism

This consists of a rotatable shaft 30 mounted, at 84 and 85, in one wall of the casing 15. Near the inner end, this shaft carries a worm 31 (Fig. 1) and, on the outside of the casing 15, it carries a ratchet wheel 29 (Fig. 3). On the shaft 24 is keyed the wheel 25 which carries a crank rod 27 having a longitudinal slot 27*a* in which the pin 26 slides. This pin is adjustable in the groove 25*a* of the wheel 25. The crank rod 27 also carries a pawl 28, serving to engage the ratchet wheel 29. As can also be seen from Figs. 3 and 4, the inner end of the rotatable shaft 24 carries a spur wheel 23 gearing with the spur wheel 22*a* which in turn gears with the spur wheel 22 of the main drive.

Intermediate drive

This consists of a worm wheel 32 (see Fig. 4), which is seated on the rotatable shaft 33 of the auxiliary drive (to be described later) and gears with the previously described worm 31 of the ratchet mechanism. The worm wheel 32 engages (in the present instance through the worm 34) with the worm wheel 35 on the shaft 36 (Fig. 6), which shaft carries the spur wheel 37. This latter gears with the driving pinion 38 which is mounted on the shaft 39 and, in turn, gears with the spur wheel 40 mounted on the thread-guide shaft 10 as shown in Fig. 5.

Thread guide

The thread-guide shaft 10 is pivotally mounted in the wall of the casing 15 at 87, 88 and 89, 90. The stump projecting outside the casing 15 and 87 carries, on the crank 16, the crank rod 17 provided with the feeler stud 18 (see Figs. 1 and 2). The portion of the shaft 10 that is situated inside the casing 15 is provided with link members 14 and adjacently disposed spiral springs 12, which engage the links 14 at 13 and are firmly seated on the shaft 10 (see Fig. 1). The outer ends of the links 14 carry a guide rod 11. The thread-guide member 9 (which engages the swashplate 8) is adapted to slide on this guide rod 11 and also on the shaft 10. The springs 12 press on the links 14 and therefore on the guide rod 11 carried by them, so that the thread-guide member 9 in its swinging displacement with respect to the swashplate 8 is constantly under the action of the springs. Therefore, the member 9 tends to swing back to its starting point at the periphery of the swashplate and does so at the proper time as hereinafter described. As can be seen from the broken-line marking in Figs. 1 and 2, the portion of the shaft 10 between the links 14 and beyond the bearing 90 is grooved and thus represents, in that portion, a hollow shaft in which a rod 91 is adapted to slide longitudinally. This rod 91 is connected to the thread-guide member 9 on the one hand, and to the thread-guide arm 21 on the other (see also section IV—IV, Fig. 7).

Bobbin drive

This consists of a shaft 1 (see Figs. 1 and 2) mounted in the casing 15 at 92, 93 on the one hand and at 94, 95 on the other. The portion of the shaft that projects out of the casing 15 at 92 carries, on its free end, a friction wheel 2 over which the friction wheel 3 rolls. The friction wheel 3 is mounted on the bush 20 which, in turn, is adapted to slide along the shaft 4 and is provided with a slot 19 engaged by the feeler 18 of the crank rod 17. Inside the casing 15, the shaft 1 carries the driving pinion 5 gearing with the pinion 6 on the main shaft. On the far side of the bearing 95, the shaft 1 carries the spur wheel 70 gearing with the spur wheel 71 of the bobbin carrier (see Fig. 1).

Bobbin carrier

As is chiefly shown in Fig. 1, but also in Fig. 2, the shaft 43 is pivotally mounted in the casing wall at 96 and 97. Outside the casing, it carries the bobbins 78, by means of eyes 77 provided in two cross arms 75 and 76, between which the bobbins 78 are disposed. On the end facing the casing, the bobbin spindles carry pinions 71 and 72. The arm 75 carries the blocking device 74 (also described later). Inside the casing 15, the shaft 43 supports the spur wheel 44 belonging to the intermediate gear, and also the pinion 42 belonging to the change gear.

Change gear

The pinion 42 loosely mounted on the shaft 43 meshes with the driving pinion 41 on the main shaft 7 (see Figs. 5, 6, 1 and 2). The shaft 43 also has secured to it the spur wheel 44 which gears with the spur wheel 48 on the shaft 49 (see Fig. 6). The spur wheel 48 gears with the spur wheel 47 on the hub of a driver plate 50 loosely mounted on the shaft 46, which has secured to it the spur wheel 45. As shown in Fig. 4, the shaft 46 also has secured to it the ratchet wheel 51. Adapted to coact with the ratchet wheel 51 is the pawl 52 mounted on the driver plate 50, the other end 98 of the pawl 52 normally coacting with the nose 58 of the rod 57 whereby the pawl is held from engagement with the ratchet wheel 51. The driver plate 50 has a peripheral groove to be engaged by a stop 53. The change gear also comprises a cam 56 on the shaft 33 of the auxiliary drive to be described later, and on said cam is suspended, by means of the arm 59, the rod 57 which is mounted in an eyelet bearing 99 on the inner wall of the casing 15. Nearer its upper end, the rod carries the previously mentioned nose 58, and terminates in a slot in the link 100 on the casing. To the slotted member 100 is articulated the

lever 54 (controlled by the spring 55) of the cam 53 coacting with the plate 50. The gear also comprises an eccentric groove 63 on the shaft 43 (Fig. 1), in which groove slides the feeler 64 of a two-arm lever 65. This lever is pivoted at 66 and carries on its other arm (as shown chiefly in Fig. 2) a feeler 67 engaging the slot 68 of one member of the clutch 69 which is mounted on the shaft 10. In addition, the eccentric groove 63 is engaged by the feelers 102 on a member 103 (see Fig. 1) seated on the pin 105 in the bearing 104 on the casing 15. Said pin is controlled by a spring 106 disposed between the wall of the casing and the member 103. Outside the bearing 104, the previously mentioned press knobs 74, which are mounted in the cross arm 75 and are controlled by a spring 107, coact with the pin 105.

Auxiliary drive

One end of the shaft 33 (Fig. 2) of the auxiliary drive is mounted at 108 and 109 and the other end is similarly mounted in the walls of the casing 15. In Fig. 2 the part situated higher up in the drawings and covered by the change gear has been omitted for the sake of clearness. As already described, the rotatable shaft 33 carries the intermediate-gear-worm wheel 32 actuated by the worm wheel 31 of the ratchet mechanism, and it also carries the worm wheel 34 gearing with the worm 35 of the intermediate drive (see Fig. 6). As already described, the auxiliary drive also carries the cam disc of the change gear. As its name implies, the auxiliary drive is not unconditionally necessary for the construction of the new automatic bobbin-winding machine; on the contrary, the worm wheel 32 could also gear directly with the member 35 which, in such event, would be a worm.

As a result of its construction the described bobbin-winding machine operates in the following manner.

Operation

The shaft 4, driven by a motor or other means, transmits its energy through the friction wheel 3, the friction wheel 2 and the shaft 1, to the driving pinion 70 which actuates the bobbin 78 that has its pinion 72 in mesh therewith.

The pinion 5 on the shaft 1 actuates the main shaft 7. In revolving, the swashplate 8 on the shaft 7 reciprocates the thread-guide member 9 and therefore the thread guide 21. The rotation of the shaft 7 also actuates the ratchet mechanism through the pinions 22, 22*a* and 23 and the shaft 30. The worm 31 of the ratchet mechanism actuates the intermediate drive up to the pinion 40 on the shaft 10, so as to cause this shaft to turn slowly. This also turns the crank 16, 17, 18 which shifts the position of the friction wheel 3 in relation to the wheel 2. The result is to alter the rotational velocity of the shaft 1, and thus that of the bobbin drive and the bobbin itself, together with all modifications of the speed of the shaft 7 and the entire main drive. The timing of the reciprocating swing of the thread-guide member 9 and thread guide 21 is thereby modified, and this mutual reaction of the members, beginning at the ratchet mechanism, continues until a final position (adjustable on the ratchet mechanism) is attained which corresponds to the completed winding of a bobbin. The mechanism is adjusted in such a way that the worm wheel 32, and therefore the cam 56 makes only one complete turn for each completed bobbin. In the embodiment shown, this adjustment is effected by shifting the pin 26 in the slot 25*a* of the crank disc 25.

When the cam 56 has completed a revolution, so that the cam has been lifted to the highest position above the shaft 33, it lifts the rod 57 by means of the arm 59. In this manner, as shown in Fig. 4, the nose 58 releases the pawl 52 which thereupon engages with the wheel 51, thus carrying with it the attached plate 50 which turns itself free from the cam 53. In consequence of the aforesaid disengagement, the shaft 7 (see Figs. 1 and 6) is now able to actuate the shaft 46 (which has been released from the arrest of the pawl 52) through the pinion 41 and, through 45, 47 and 44, the intermediate drive. The rotation of the spur wheel 44 turns the shaft 43 of the bobbin carrier, and thus the completed bobbin is swung out and a new one swung in. Simultaneously with the carrier shaft 43, the cam disc 63 also begins to move and the feeler 64 sliding thereon rocks the two-arm lever 65 the other feeler 67 of which sets the clutch 68, 69 out of action. Under the influence of the springs 12, which are tensioned by the gradual displacement of the thread-guide member 9, this member swings back into its initial position on the clutch being thrown out, thus releasing the spring tension and at the same time rocking the crank arm 17 which, in turn, moves the friction wheel 3 back into its original position. The bobbin-carrier shaft 43 and the cam disc 63 mounted thereon can continue to move until braked, which occurs after half a turn. When this half-turn has been completed and the fresh bobbin to be wound comes into operative engagement with the pinion 70 of the bobbin drive, the springs 106 and 107 again bear against the member 103 carrying the feeler 102. This feeler, which, at the commencement of the swinging movement, was moved away from the cam disc 63, owing to the relaxation of the spring pressure, and thereby enabled the disc 63 to move, is again pressed against the disc 63, when the fresh bobbin has been engaged, thereby breaking

the movement of said disc and therefore that of the bobbin carrier.

Since the thread-guide member and friction wheel drive have already returned to their original positions in the interim, the feeler 64 slides on the cam disc 63 in the original position, and therefore causes the clutch 68, 69 to slip in again.

This completes a working cycle, a new basic position is automatically attained, and the new winding operation can begin in the same manner.

It may also be mentioned that the figure represents the machine in an intermediate working position.

Although it was stated, in the preamble to the description, that the machine produces the best effects when employed for separate driving, the specification will have shown that there is no need to explain that numerous other advantages can be obtained from the machine when it is used for driving a plurality of bobbins in series. In such case not all, but nevertheless a number of, substantial advantages of the new drive are utilized.

The invention therefore also relates to this method of application, and also to all kinematic equivalents of the selected portions of the driving and ratchet members.

I claim:—

1. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination with friction drive gearing including a displaceable member, a rotatable bobbin drive shaft operatively connected with the friction gearing, a reciprocable thread guide, and means also operatively connected with the friction gearing for reciprocating the thread guide, of ratchet mechanism connected with the friction gearing for positive operation with the rotation of the bobbin drive shaft and reciprocation of the thread guide, means operable by the ratchet mechanism for progressively shifting the displaceable member of the friction gearing, a rotatable bobbin carrier, a plurality of bobbin spindles on the carrier capable of being operatively connected in turn with the bobbin drive shaft by turning the carrier, means for turning the carrier automatically on a predetermined movement of the ratchet mechanism, and means for simultaneously returning the friction gearing to its original position.

2. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination with friction drive gearing including a displaceable member, a rotatable bobbin drive shaft operatively connected with the friction gearing, a reciprocable thread guide, and means also operatively connected with the friction gearing for reciprocating the thread guide, of means for initially adjusting the amplitude of reciprocation of the thread guide, ratchet mechanism connected with the friction gearing for positive operation with the rotation of the bobbin drive shaft and reciprocation of the thread guide, means operable by the ratchet mechanism for progressively shifting the displaceable member of the friction gearing, a rotatable bobbin carrier, a plurality of bobbin spindles on the carrier capable of being operatively connected in turn with the bobbin drive shaft by turning the carrier, means for turning the carrier automatically on a predetermined movement of the ratchet mechanism, and means for simultaneously returning the friction gearing to its original position.

3. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination with friction drive gearing including a displaceable member, a rotatable bobbin drive shaft operatively connected with the friction gearing, a reciprocable thread guide, and means also operatively connected with the friction gearing for reciprocating the thread guide, of ratchet mechanism connected with the friction gearing for positive operation with the rotation of the bobbin drive shaft and reciprocation of the thread guide, means operable by the ratchet mechanism for progressively shifting the displaceable member of the friction gearing, means for varying the effective stroke of the ratchet mechanism, a rotatable bobbin carrier, a plurality of bobbin spindles on the carrier capable of being operatively connected in turn with the bobbin drive shaft by turning the carrier, means for turning the carrier automatically on a predetermined movement of the ratchet mechanism, and means for simultaneously returning the friction gearing to its original position.

4. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination with friction drive gearing including a displaceable member, a rotatable bobbin shaft operatively connected with the friction gearing, a reciprocable thread guide, and means also operatively connected with the friction gearing for reciprocating the thread guide, of means for initially adjusting the amplitude of reciprocation of the thread guide, ratchet mechanism connected with the friction gearing for positive operation with the rotation of the bobbin drive shaft and reciprocation of the thread guide, means operable by the ratchet mechanism for progressively shifting the displaceable member of the friction gearing, means for varying the effective stroke of the ratchet mechanism, a rotatable bobbin carrier, a plurality of bobbin spindles on the carrier capable of being operatively connected in turn with the bobbin drive shaft by turning the carrier, means for turning the carrier automatically on a predetermined

movement of the ratchet mechanism, and means for simultaneously returning the friction gearing to its original position.

5. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination with friction drive gearing including a displaceable member, a rotatable bobbin drive shaft operatively connected with the friction gearing, a reciprocable thread guide, and means also operatively connected with the friction gearing for reciprocating the thread guide, of a crank connected with the friction gearing for positive operation with the rotation of the bobbin shaft and reciprocation of the thread guide, a crank rod having adjustable connection with the crank, a pawl carried by the crank rod, a ratchet wheel rotatable stepwise by the pawl, means operable by the rotation of the ratchet wheel for shifting the displaceable member of the friction gearing, a rotatable bobbin carrier, a plurality of bobbin spindles on the carrier capable of being operatively connected in turn with the bobbin drive shaft by turning the carrier, means for turning the carrier automatically on a predetermined movement of the ratchet mechanism, and means for simultaneously returning the friction gearing to its original position.

6. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination with friction drive gearing including a displaceable member, a bobbin drive shaft operatively connected with the friction gearing, a reciprocable thread guide, a rotatable swashplate also operatively connected with the friction gearing, and a slidably mounted rod carrying the thread guide, of a member on the rod to engage the swashplate, ratchet mechanism connected with the friction gearing for positive operation with the rotation of the bobbin drive shaft and reciprocation of the thread guide, means operable by the ratchet mechanism for progressively shifting the displaceable member of the friction gearing, a rotatable bobbin carrier, a plurality of bobbin spindles on the carrier capable of being operatively connected in turn with the bobbin drive shaft by turning the carrier, means for turning the carrier automatically on a predetermined movement of the ratchet mechanism, and means for simultaneously returning the friction gearing to its original position.

7. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a reciprocable thread guide, friction gearing for driving the bobbin drive shaft and thread guide comprising mutually displaceable members, ratchet mechanism operable by the gearing for progressively displacing its members, a bobbin change device having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, means for automatically changing from one spindle to another on a predetermined movement of the ratchet mechanism, and means for returning the friction gear members to initial position during the change-over.

8. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a reciprocable thread guide, friction gearing for driving the bobbin drive shaft and thread guide comprising mutually displaceable members, ratchet mechanism operable by the gearing for progressively displacing its members, a rotatable bobbin carrier having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, releasable means for holding the carrier in the different operative positions to which it may be turned, and means operable on a predetermined movement of the ratchet mechanism for temporarily releasing the carrier holding means and for turning the carrier and for simultaneously resetting the members of the friction gearing.

9. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a rotatable swashplate, gearing for driving the bobbin drive shaft and swashplate comprising coacting friction members one of which is displaceable to vary the speed, a rockable rod, crank mechanism connecting the rod with the displaceable member, a clutch on the rod, a thread-guide member reciprocable on the rod having engagement with the swashplate, a thread guide carried by the member ratchet mechanism operable by the gearing for rocking the rod through the clutch to progressively shift the displaceable member of the gearing, a bobbin change device having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, means for automatically changing from one spindle to another on a predetermined movement of the ratchet mechanism, means for temporarily releasing the clutch during the change-over movement, and means for returning the displaceable friction gear member to its starting position on the release of the clutch.

10. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a rotatable swashplate, gearing for driving the bobbin drive shaft and swashplate comprising coacting friction members one of which is displaceable to vary the speed, a rockable rod, crank

mechanism connecting the rod with the displaceable member, a clutch on the rod, a thread-guide member reciprocable on the rod having engagement with the swashplate, a thread guide carried by the member, ratchet mechanism operable by the gearing for rocking the rod through the clutch to progressively shift the displaceable member of the gearing, a bobbin change carrier having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, releasable means for holding the carrier in the different operative positions to which it may be turned, means operable on a predetermined movement of the ratchet mechanism for releasing and turning the carrier and also releasing the clutch, and means for returning the displaceable friction gear member to initial position on the release of the clutch.

11. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a reciprocable thread guide, friction gearing for driving the bobbin drive shaft and thread guide comprising mutually displaceable members, ratchet mechanism operable by the gearing for progressively displacing its members, means for varying the effective stroke of the ratchet mechanism, a bobbin change device having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, and means for automatically changing from one spindle to another on a predetermined movement of the ratchet mechanism, and means for returning the friction gear members to initial position during the change-over.

12. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a reciprocable thread guide, friction gearing for driving the bobbin drive shaft and thread guide comprising mutually displaceable members, ratchet mechanism operable by the gearing for progressively displacing its members, means for varying the effective stroke of the ratchet mechanism, a rotatable bobbin change carrier having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, releasable means for holding the carrier in the different operative positions to which it may be turned, and means operable on a predetermined movement of the ratchet mechanism for temporarily releasing the carrier holding means and for turning the carrier and for simultaneously resetting the members of the friction gearing.

13. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a rotatable swashplate, gearing for driving the bobbin drive shaft and swashplate comprising coacting friction members one of which is displaceable to vary the speed, a rockable rod, crank mechanism connecting the rod with the displaceable member, a clutch on the rod, a thread-guide member reciprocable on the rod having engagement with the swashplate, a thread guide carried by the member, ratchet mechanism operable by the gearing for rocking the rod through the clutch to progressively shift the displaceable member of the gearing, means for varying the effective stroke of the ratchet mechanism, a bobbin change device having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, means for automatically changing from one spindle to another on a predetermined movement of the ratchet mechanism, means for temporarily releasing the clutch during the change-over movement, and means for returning the displaceable friction gear member to its starting position on the release of the clutch.

14. In a yarn winding machine for winding at a uniform rate as the diameter of the bobbin increases, the combination of a rotatable bobbin drive shaft, a rotatable swashplate, gearing for driving the bobbin drive shaft and swashplate comprising coacting friction members one of which is displaceable to vary the speed, a rockable rod, crank mechanism connecting the rod with the displaceable member, a clutch on the rod, a thread-guide member reciprocable on the rod having engagement with the swashplate, a thread guide carried by the member, ratchet mechanism operable by the gearing for rocking the rod through the clutch to progressively shift the displaceable member of the gearing, means for varying the effective stroke of the ratchet mechanism, a bobbin change carrier having a plurality of bobbin spindles capable of being operatively connected in turn with the bobbin drive shaft, releasable means for holding the carrier in the different operative positions to which it may be turned, means operable on a predetermined movement of the ratchet mechanism for releasing and turning the carrier and also releasing the clutch, and means for returning the displaceable friction gear member to initial position on the release of the clutch.

In testimony whereof I affix my signature.

ERNST SCHWEIZER.