

April 2, 1935.

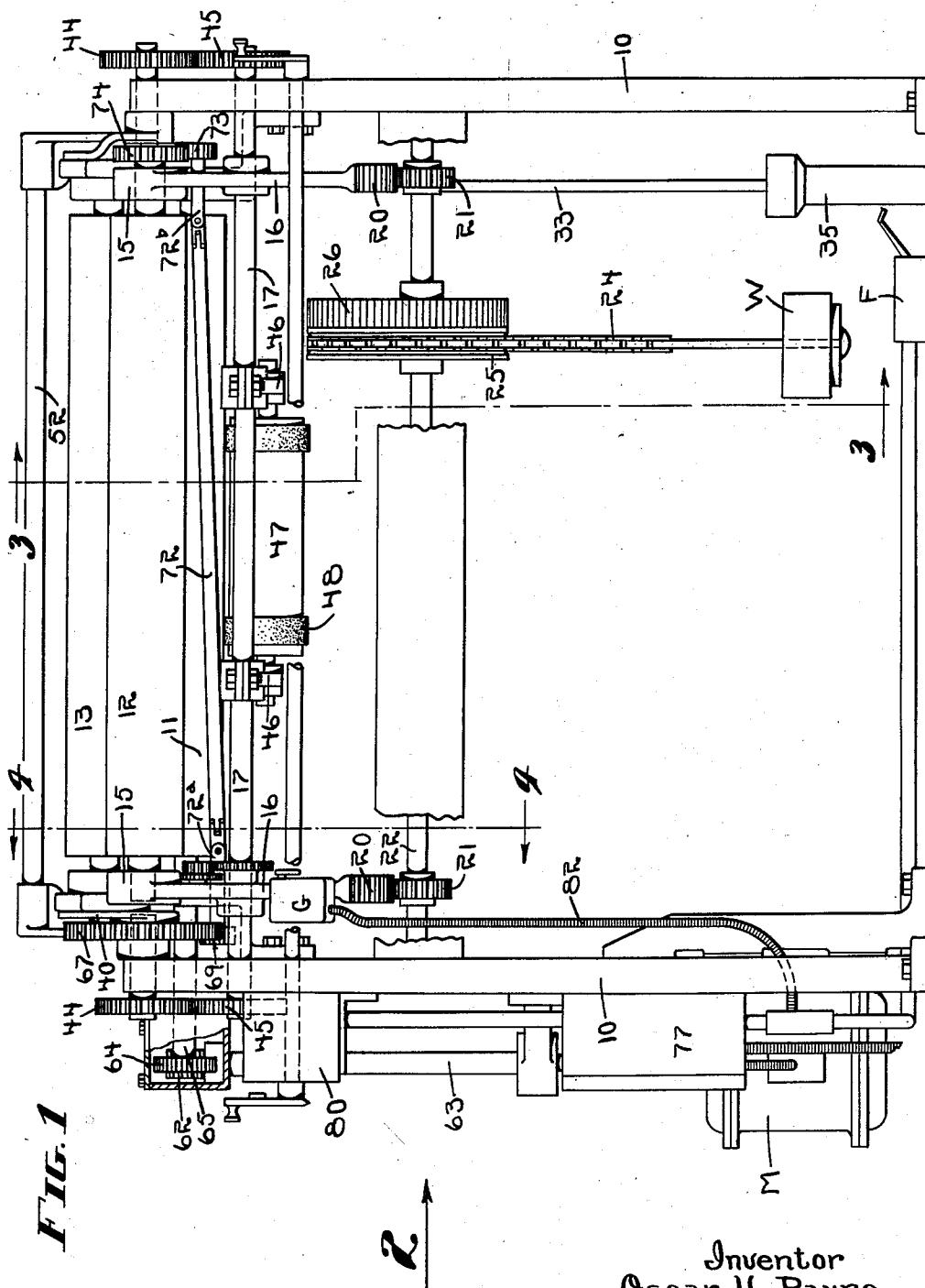
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1,996,305

YARN WINDING MECHANISM

Filed Dec. 9, 1932

7 Sheets-Sheet 1



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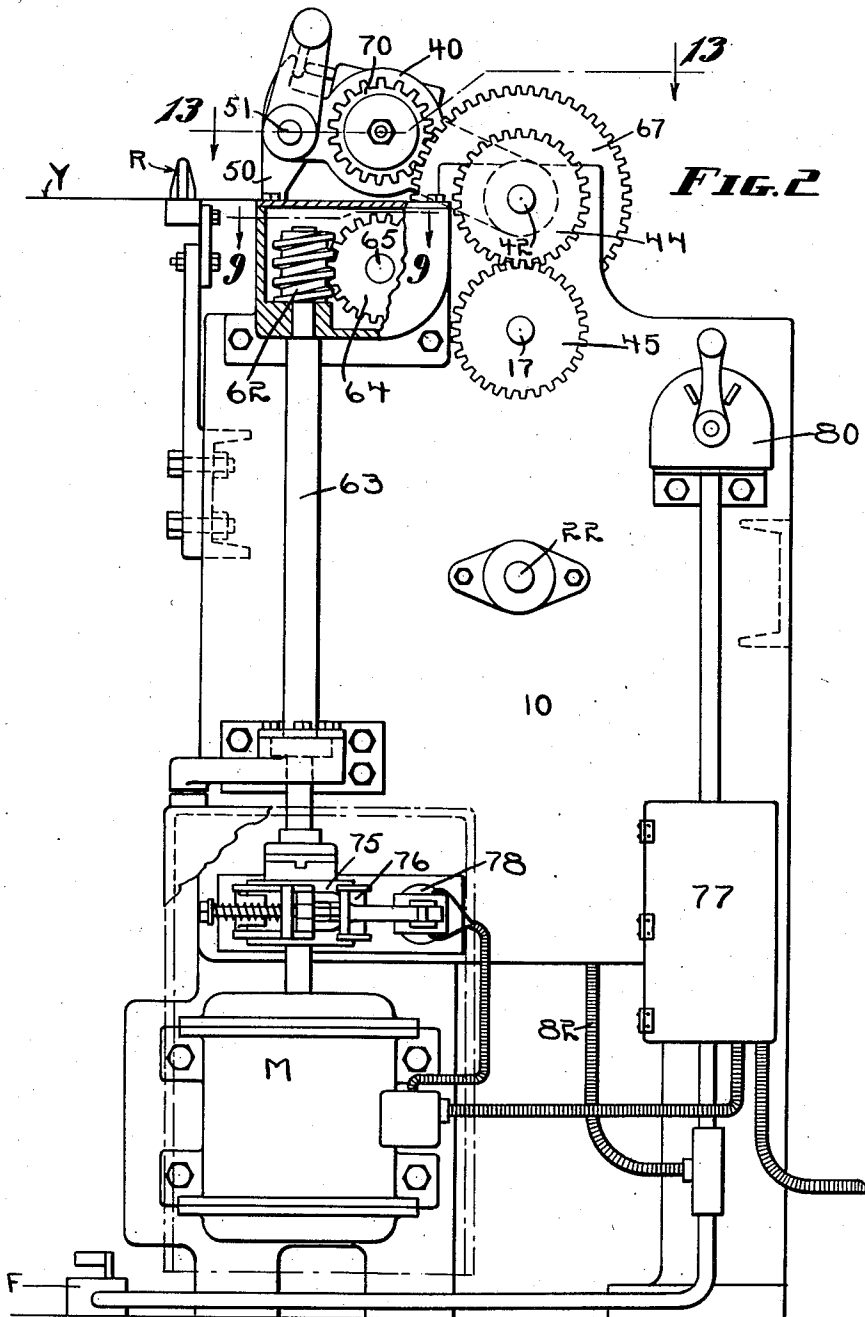
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YARN WINDING MECHANISM

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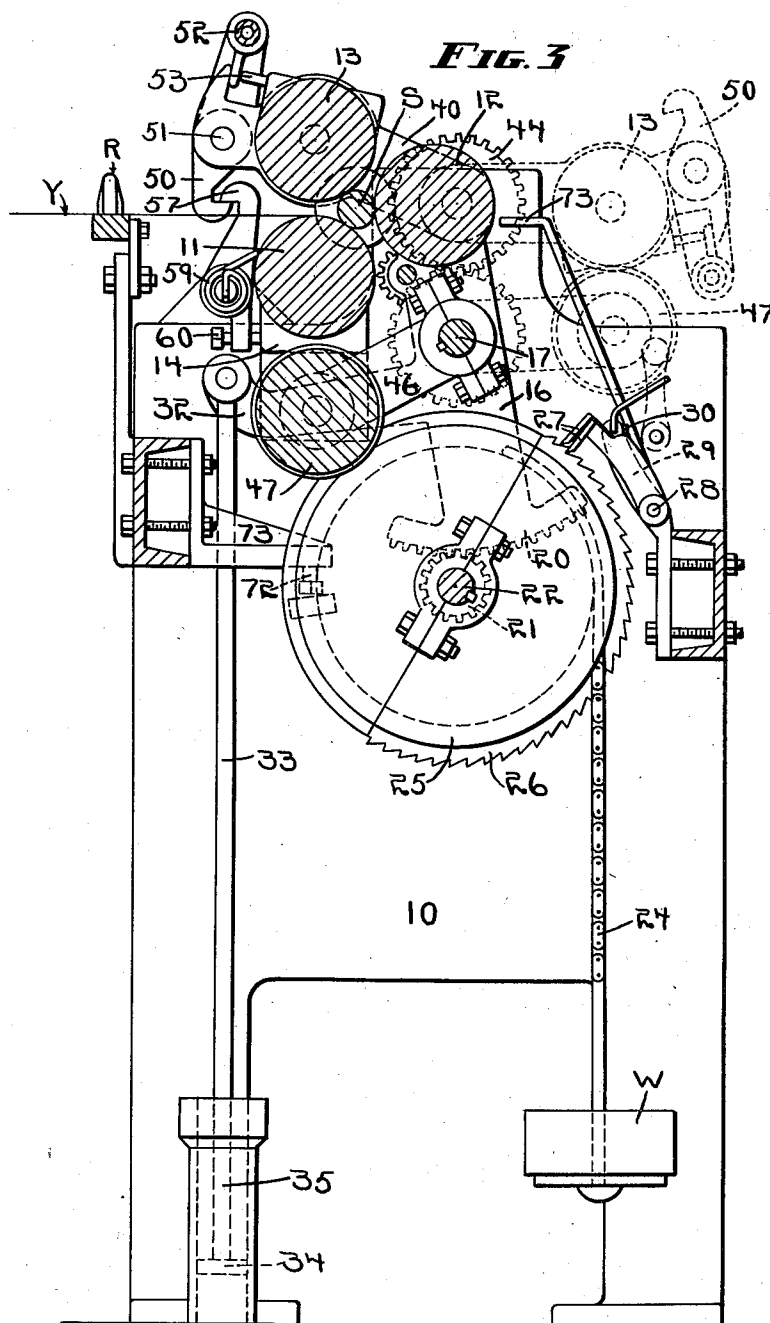
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YARN WINDING MECHANISM

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7 Sheets-Sheet 3



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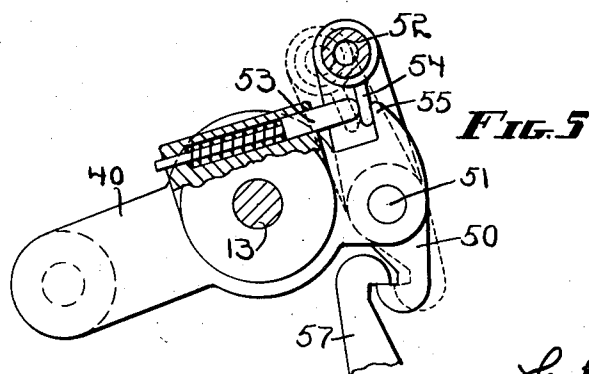
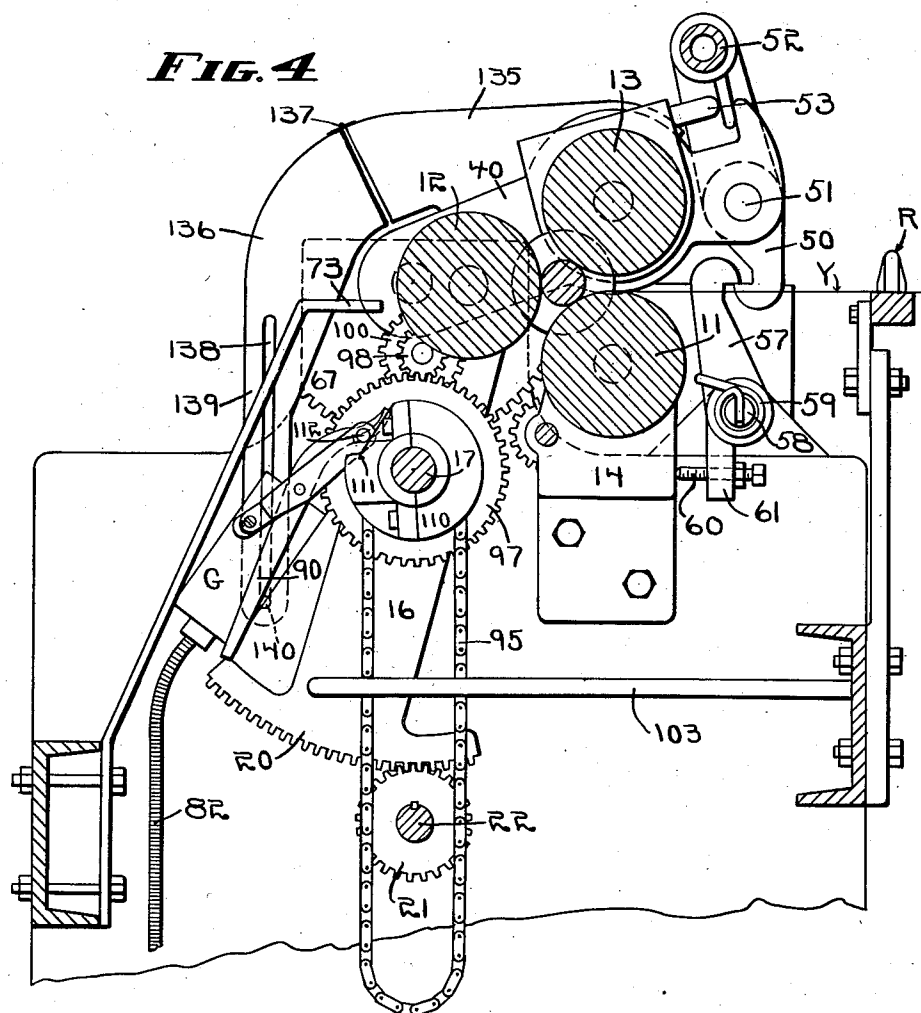
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YARN WINDING MECHANISM

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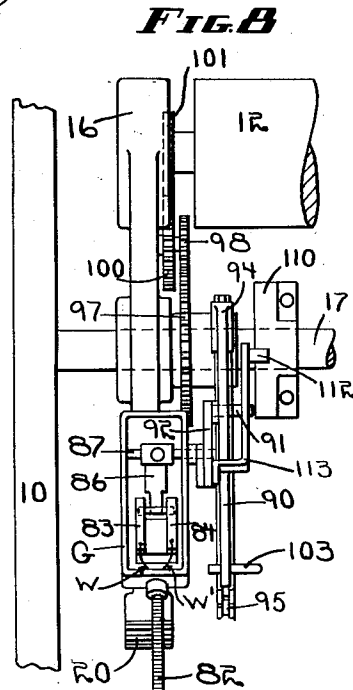
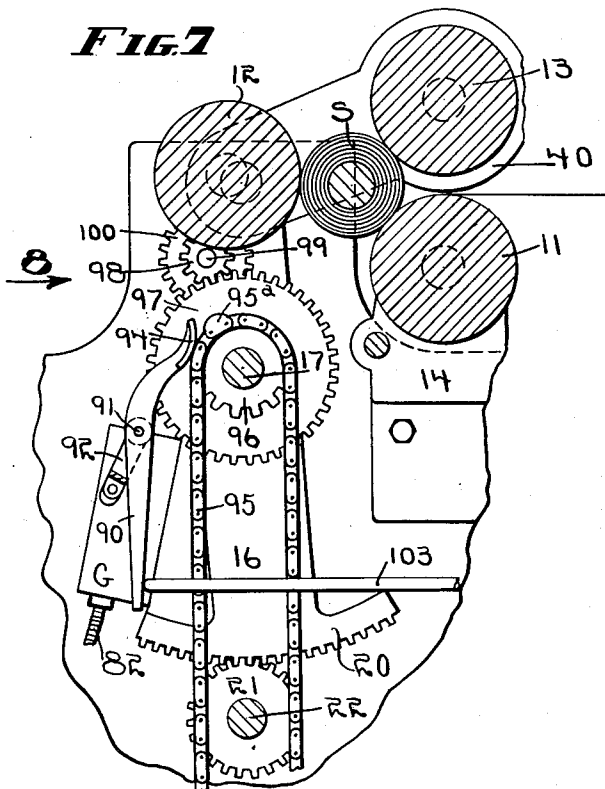
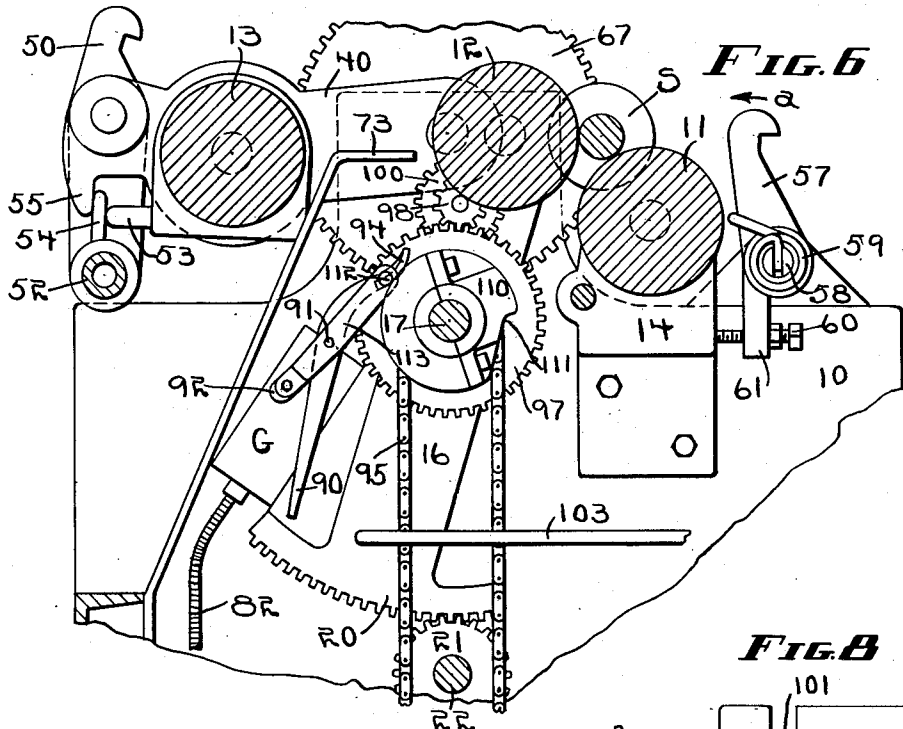
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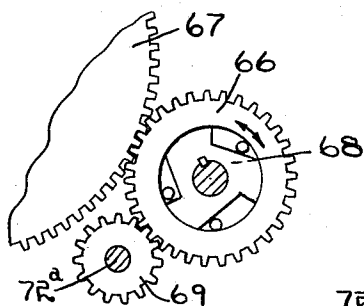
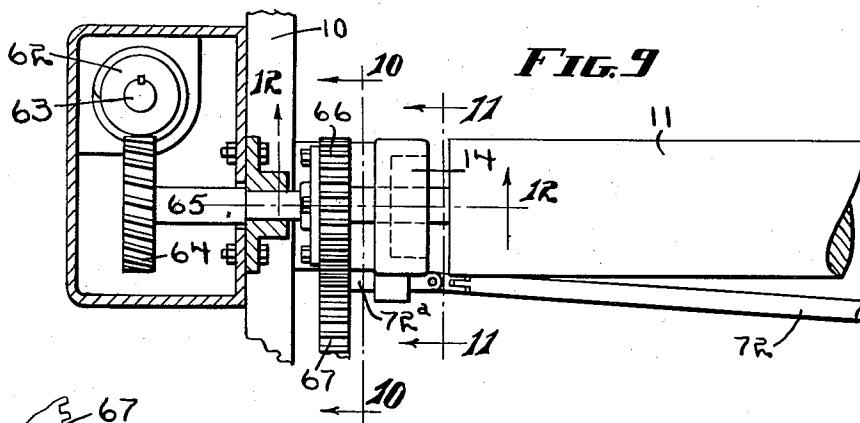


FIG. 10

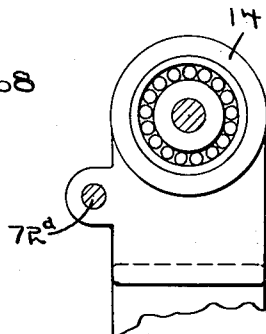


FIG. 11

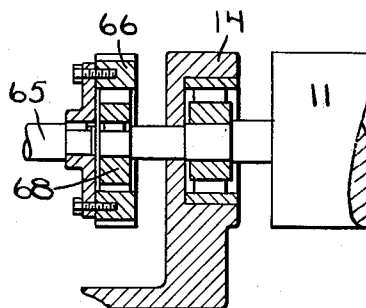


FIG. 12

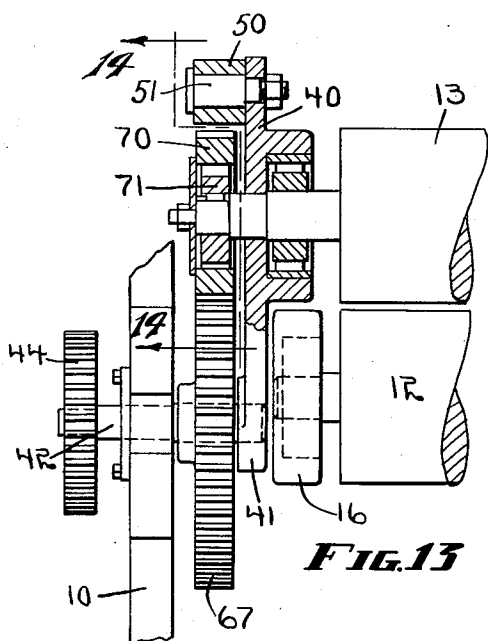


FIG. 13

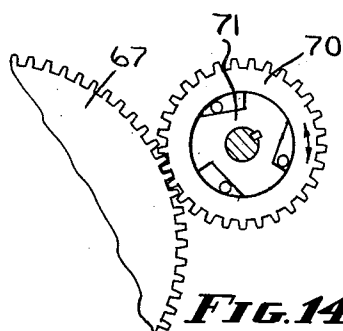


FIG. 14

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UNITED STATES PATENT OFFICE

1,996,305

YARN WINDING MECHANISM

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Application December 9, 1932, Serial No. 646,554

19 Claims. (Cl. 28—55.5)

This invention relates to a machine for winding a plurality of strands of yarn on a yarn spool such as is used in Axminster looms. It is necessary that the yarn strands be wound on such rolls in closely parallel relation and that the rolls be firmly compacted during winding, with a uniform length of yarn on each yarn spool.

It is the general object of my invention to provide a yarn winding machine of improved construction, so designed that the spools may be rapidly and firmly wound and that all operations on the machines may be conveniently performed.

An important feature of the invention relates to the provision of a machine in which two of the three winding rolls rotate about fixed axes and are selectively driven, while the third or tension roll is movably mounted and continuously driven.

A further feature of the invention relates to the mounting of one of the selectively driven winding rolls in such manner that it may be released and removed to inoperative position during spool replacement.

I also provide measuring and stopping mechanism actuated from the continuously rotated tension roll, and equally effective when the machine is winding in either direction. I also provide means to prevent operation of the machine when the movable selectively driven roll is out of operative position.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is a front elevation of my improved winding machine;

Fig. 2 is a left-hand side elevation thereof, looking in the direction of the arrow 2 in Fig. 1;

Fig. 3 is a sectional side elevation, taken along the line 3—3 in Fig. 1;

Fig. 4 is a partial enlarged sectional side elevation taken along the line 4—4 in Fig. 1;

Fig. 5 is a side elevation, partly in section, of one of the holding latches;

Figs. 6 and 7 are detail views similar to Fig. 4, but showing certain parts in different positions;

Fig. 8 is a detail front elevation of certain driving mechanism, looking in the direction of the arrow 8 in Fig. 7;

Fig. 9 is a detail sectional plan view, taken along the line 9—9 in Fig. 2;

Figs. 10, 11 and 12 are detail sectional views, taken along the lines 10—10, 11—11, and 12—12 in Fig. 9 respectively;

Fig. 13 is a plan view of certain driving mechanism, partly in section and taken along the line 13—13 in Fig. 2;

Fig. 14 is a detail sectional elevation, taken along the line 14—14 in Fig. 13;

Fig. 15 is a diagrammatic view, showing certain electric circuits;

Figs. 16 and 17 are diagrammatic views illustrating the processes of winding rolls in either of two directions, and

Fig. 18 is a diagrammatic view, showing the method of replacing a full spool by an empty one.

Referring to Figs. 1 and 3, my improved winding machine comprises a frame 10 on which a plurality of winding rolls 11, 12 and 13 are rotatably mounted. The winding roll 11 is mounted in bearings 14 (Fig. 6) fixed to the machine frame 10 and thus rotates at all times about a fixed axis. The roll 12 is the tension roll and is continuously rotated in movable bearings 15 (Fig. 1) at the upper ends of three-armed levers 16 (Fig. 3) loosely mounted on a cross shaft 17. The shaft 17 is rotatably mounted in fixed bearings in the frame 10.

The lower portions of the levers 16 are provided with segmental gear portions 20 (Fig. 4) engaging pinions 21 fixed to a cross shaft 22 rotatable in bearings fixed on the frame 10. A counterweight W (Figs. 1 and 3) is suspended from a chain 24 secured to a segmental winding pulley 25 keyed or otherwise secured to the shaft 22.

A segmental ratchet gear 26 (Fig. 3) is also fixed to the shaft 22 and is normally engaged by one or more pawls 27 mounted upon a fixed pivot 28. A release arm 29 is mounted to swing about the axis of the stud 28 and is provided with shoulders engaging pins 30 on the pawls 27. As the weight W is raised during the operation of the machine, return movement of the weight W is prevented by the pawls 27, which may, however, be manually released when desired by means of the release arm 29, as will be hereinafter described.

The segment gears 20 and pinions 21 not only form a gear connection between the levers 16 and the shaft 22, but also insure parallel motion of the bearings 15, thus keeping the roll 12 in parallel relation to the rolls 11 and 13 in every position thereof.

The levers 16 are also provided with rearwardly extending arms 32 (Fig. 3) connected by links 33 to pistons 34 in cushioning cylinders or dashpots 35. These cushioning connections prevent

too rapid return movement of the parts when the latches 27 are released.

The upper roll 13 is mounted in bearings in arms 40 (Fig. 13) having hub portions 41 secured to short shafts 42 supported in fixed bearings in the upper part of the frame 10. Gears 44 are fixed to the shafts 42 and rotate in unison with the arms 40. The gears 44 engage similar gears 45 (Fig. 2) fixed on the ends of the cross shaft 17 previously described and on which the three-armed levers 16 (Fig. 3) are loosely mounted. Arms 46 (Figs. 1 and 3) are fixed to the shaft 17 and support a counterweight in the form of a cylinder 47 preferably having cushioning bands 48 (Fig. 1) of leather about its end portions.

The counterweight cylinder 47 offsets the weight of the upper roll 13 as the roll is moved from the full line to the dotted line positions indicated in Fig. 3, and the gears 44 and 45 insure parallel motion of the roll 13 to and from operative position. The inoperative position is determined by engagement of the roll 13 with the leather bands 48 on the cylinder 47.

During the operation of the machine, the upper roll 13 is held in the fixed position indicated in Figs. 3 and 4 by latches 50, pivoted at 51 in the ends of the arms 40 which support the roll 13. Upward extensions of the latches 50 at opposite sides of the machine are connected by a cross rod 52 (Fig. 1) so that the latches at opposite sides of the machine may be simultaneously released.

Spring-actuated plungers 53 (Fig. 5) are slidably mounted in bearings in the arms 40 and engage flanges 54 (Fig. 5) on the upper portions of the latches 50. The plungers normally hold the flanges 54 in engagement with abutments 55 at the outer ends of the arms 40 and thus hold the latches normally in operative position.

The hook-shaped lower ends of the latches 50 engage hook-shaped pawls 57 (Fig. 4) loosely mounted on the studs 58 fixed on the frame 10. Springs 59 move the pawls 57 yielding to operative position, which position is determined by stop screws 60 adjustable in downward projections 61 of the pawls 57 and engaging the sides of the fixed bearings 14 previously described.

The pawls 57 yield in the direction of the arrow *a* in Fig. 6, as the upper roll 13 is swung downward to operative position and then move back to their normal positions in engagement with the latches 50, so that the upper roll 13 is held in relatively fixed position during the winding operation.

Power for operating the machine is supplied by a reversible motor M vertically mounted as indicated in Fig. 2, and having a worm 62 secured to the upper end of an extension 63 of its armature shaft. The worm 62 engages a worm wheel 64 on a short shaft 65 (Fig. 9) rotating in a fixed bearing aligned with the axis of the lower roll 11 previously described as rotating in the fixed bearings 14.

A gear 66 is secured to the short shaft 65 and engages a relatively large gear 67, loosely rotatable about the axis of the shaft 42 previously described and on which the arms 40 are mounted, which arms support the roll 13. The gear 66 is connected to the shaft of the roll 11 through a one-way clutch 68 (Figs. 10 and 12).

The upper roll 13 is provided with a gear 70 (Figs. 2 and 13) engaging the gear 67 and connected to the shaft of the roll 13 by a one-way clutch 71 (Figs. 13 and 14).

The clutches 68 and 71 are reversely mounted,

so that the roll 11 is positively driven in one direction when the motor rotates in a given direction and the roll 13 is positively driven in the opposite direction when the motor is reversed. Each roll 11 or 13 rotates freely when the other roll is driven and in the same direction, and both rolls 11 and 13 rotate about fixed axes during the winding operation.

A pinion 69 (Fig. 10) is mounted on a three-part shaft 72 (Figs. 9 and 1) and is driven by the continuously rotated gear 66. The three parts of the shaft 72 are connected by universal joints and the parts 72^a rotates in a fixed bearing as shown in Fig. 11.

The end portion 72^b rotates in a bearing in one of the levers 16 and is provided with a pinion 73 engaging a gear 74 on the shaft of the tension roll 12. The roll 12 is thus continuously rotated but is permitted to swing outward as the spool increases in diameter.

Control and stopping mechanism

I have provided special mechanism for controlling the driving mechanism and for stopping the winding machine after a predetermined length of yarn has been wound on a spool.

The motor M (Fig. 2) is provided with a drum 75 and with a brake-band device 76 including a spring which normally applies the brake to the drum 75.

When the main magnetic switch 77 (Figs. 2 and 15) is closed to start the motor, current passes through a solenoid coil 78, which overcomes the brake spring and expands the brake-band, releasing the brake-drum 75, which thereafter rotates freely so long as the motor is in operation. As soon as the motor circuit is broken, however, the solenoid 78 becomes inoperative and the spring-actuated brake-band engages the drum 75 to bring the winding machine immediately to rest.

A reversing switch 80 (Figs. 2 and 15) is provided by which the leads of the motor may be shifted to cause the motor to rotate in either desired direction. Consequently the winding roll 11 (Fig. 16) may be positively rotated in one direction to wind a spool of one hand, or the roll 13 (Fig. 17) may be positively rotated in the opposite direction to wind a spool of opposite hand.

The foot-operated switch F (Figs. 1 and 15), previously described, is connected in series with a limit switch G (Figs. 1, 8 and 15) controlled by measuring mechanism which will now be described, it being understood that the switches F and G control the main switch 77 and must both be closed before the motor M can be started.

The switch G is mounted on and movable with one of the three-armed levers 16 previously described, which levers support the movable tension roll 12. Twin wires W and W' (Fig. 8) are led to the switch G through a conduit 82 and are connected to terminals 83 and 84 in the switch G. A contact lever 86 is mounted on a short shaft 87 pivoted in the casing of the switch G and the lever normally engages the terminal 83 and 84 to close the motor circuit. A spring or gravity maintains the switch G normally closed.

A knock-off lever 90 (Figs. 7 and 8) is loosely pivoted on a stud 91 on an arm 92 fixed to the pivot shaft 87. A shoe 94 on the upper end of the lever 90 is engaged by the links of a measuring chain 95 mounted on a sprocket 96.

The sprocket 96 is loosely rotatable on the shaft 17 previously described and is secured to a gear 97 engaging a pinion 98 rotatable on a stud 99 fixed on the three-armed lever 16 which sup-

ports one end of the tension roll 12. A gear 100 is secured to the pinion 99 and engages a pinion 101 (Fig. 8) mounted on the shaft of the tension roll 12 and rotatable therewith. Consequently the sprocket 96 is rotated in a definite speed relation to the rotation of the tension roll 12 and has a continuous driving connection therewith in every position of the roll.

A stop rod 103 (Figs. 6 and 7) is mounted in fixed position in the frame 10 and extends forward into the path of the lower end of the lever 90.

The normal operation of the mechanism is indicated in Fig. 6, with the shoe 94 engaging the ordinary or low links of the chain 95 and with the switch lever 86 engaging the terminals 83 and 84 and thus closing the circuit so long as the foot-operated switch F is closed. Consequently the operator can start and stop the machine as desired by use of the switch F.

The chain 95 is made of such length that a high link 95^a (Fig. 7) will come under the shoe 94 when the predetermined length of yarn has been wound on the spool S. At this time the three-armed lever 16 has been moved by the outward displacement of the tension roll 12 to such a position that the lower end of the lever 90 engages the end of the fixed stop 103, such engagement providing a fixed pivot or bearing for the lever 90.

As the high link 95^a moves under the shoe 94, the lever 90 swings about the stop 103, thus swinging the stud 91 outwardly and separating the switch lever 86 from the terminals 83 and 84. The motor control circuit is thus broken and the winding machine is stopped with the desired length of yarn on the spool S.

The operator then releases the latches 50 and swings the upper winding roll 13 to its forward inoperative position, as indicated in dotted lines in Fig. 3. This operation causes a turning movement of the cross shaft 17 on which the counterweight 47 is mounted, all as previously described.

A cam 110 (Figs. 6 and 8) is secured to the cross shaft 17 and is provided with a recess 111 at one side thereof. A stud 112 is mounted in an offset member 113 secured to the arm 92 previously described and is positioned in the recess 111 when the winding roll 13 is in normal operative position.

When the roll 13 is moved to inoperative position, however, the raised portion of the cam 110 engages the stud 112 and moves the switch lever 86 to break the circuit through the switch G. It is thus impossible to start the winding machine when the winding roll 13 is out of operative position.

When the machine is stopped with the shoe 94 on the high link 95^a, the circuit is broken at the switch G and would remain broken after the winding roll 13 had been returned to operative position, so that the machine could not be started by the foot-operated switch F except for a special feature which will now be described.

As will be hereinafter explained, the operator releases the latches 27 (Fig. 3) before inserting a new empty spool, thereby permitting the tension roll 12 to move from the position shown in Fig. 7 to the position shown in Fig. 6. This moves the lower end of the lever 90 away from the fixed stop 103, so that the lever 90 turns idly about the pivot stud 91 and the link 95^a is no longer effective to hold the limit switch G open. Consequently the operator may start the winding ma-

chine with the shoe 94 resting on the high link 95^a.

The link 95^a is of symmetrical shape, so that the machine may be started in either direction at will from the position of rest, and the chain 95 will measure off the same length of yarn, regardless of the direction in which the machine is winding.

Gear guard

In Fig. 4 I have shown a special construction of gear guard which I have designed for covering the gears 67 and 70 through which the upper roll 13 is driven. A guard plate 135 is fixed to one of the arms 40 and projects over the upper portions of the gears 67 and 70 when the roll 13 is in operative position. A guard member 136 is hinged at 137 to the guard plate 135 and is provided with an elongated slot 138 in a depending arm 139. A guide-pin 140 fixed in the frame 10 projects through the slot 138.

When the arm 40 and roll 13 are in operative position, the plate 136 is raised and occupies the full line position indicated in Fig. 4. When the roll 13 is moved to the inoperative dotted line position of Fig. 3, the plate 136 moves downward with substantially a straight line motion, guided by the pin 140. The gears 67 and 70 are thus effectually protected except when the roll 13 is in inoperative position, in which position it is impossible to start the machine, due to the operation of the cam 110 previously described.

General operation

Having described the details of my improved winding mechanism, a brief description of the general operation of the machine will now be given. Prior to starting the machine, the latches 27 (Fig. 3) are released, permitting the weights W to move downward until the segment gears 26 engage adjustable stop screws 72 (Fig. 3) threaded in fixed brackets 73. The ends of a plurality of strands of yarn Y are drawn through a suitable tensioning reed R and are then wrapped about and suitably secured to the barrel portion of an empty spool S, which is then placed on the rolls 11 and 12, as indicated in Fig. 6, after which the operator swings the roll 13 from the dotted line to the full line position shown in Fig. 3, in which latter position the latches 50 engage the hook-shaped pawls 57, as indicated in Figs. 3 and 4. To effect this movement of the roll 13, the operator grasps the cross rod or hand rail 52 (Fig. 1). The pawls 57 yield as the latches 50 move downward.

The winding of the roll is then started by closing a foot-operated switch F (Fig. 1) controlling the motor M. As the roll increases in size, as indicated in Fig. 7, the rolls 11 and 13 continue to rotate about their fixed axes, but the roll 12 swings outward about the axis of the shaft 17 and by such movement gradually raises the weight W, thus maintaining a uniform pressure or tension on the spool S as it is continuously rotated by the driven rolls 12 and 11 or 13, depending on the direction of rotation.

When the spool has reached a predetermined size, the motor is stopped by the stop mechanism previously described, and the operator again grasps the cross rod or hand rail 52 and releases the latches 50, after which the upper roll 13 is swung to the dotted line position of Fig. 3. In this position, the roll 13 rests against the bands 48 on the counterweight cylinder 47 and is out of the way of the operator, so that she may easily remove the full spool S and insert an empty spool

in place thereof. Preferably, the full spool S is placed on a fixed support 73 (Figs. 4 and 18) while an empty spool S' is being substituted therefor. Before inserting the empty spool, the operator again releases the latches 27, thus allowing the tension roll 12 to return to the initial position shown in Figs. 3 and 6.

An important advantage of my improved mechanism lies in the fact that when winding in either direction the first roll to engage the yarn is an undriven roll which by reason of friction puts a certain drag on the yarn. The second and third rolls in the order of engagement with the yarn are always positively driven, for either right or left-hand winding.

This is made clearly evident in Figs. 16 and 17. In Fig. 16 the roll 11 is free, while the rolls 12 and 13 are driven. In Fig. 17, the roll 13 is free, while the rolls 11 and 12 are driven. This arrangement of driving mechanism produces exceptionally hard and uniform spools with a maximum yardage of yarn.

The provision of the ratchet wheel 26 and pawls 27 assists materially in the winding of a round spool, as the pawls prevent any return movement of the tension roll 12 during the winding operation. Without this ratchet and pawl arrangement, it is found that the tension roll tends to oscillate and to thereby accentuate any irregularity in the cross section of the partly wound spool.

It is also an important advantage of my machine that the weight W is raised during the operation of winding a spool, and is merely released by the operator after the winding is completed. In previous practice, the operator was commonly obliged to raise or rewind the weight manually as each spool was removed.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:—

1. In a yarn winding machine, a pair of winding rolls, rotatable about fixed axes, selective means to drive one only of said rolls in a predetermined direction or the other roll in the opposite direction, the second roll being in each case free to rotate, and a continuously driven tension roll mounted for yielding movement away from said two winding rolls.

2. In a yarn winding machine, a pair of winding rolls, selective means to drive one only of said rolls in a predetermined direction or the other roll in the opposite direction, the second roll being in each case free to rotate, and a continuously driven tension roll mounted for yielding movement away from said winding rolls, said winding rolls being rotatable about fixed axes during a winding operation and one of said winding rolls being quickly and easily movable manually to a relatively remote inoperative position to permit convenient removal and replacement of spools.

3. In a yarn winding machine, a yieldingly mounted tension roll, a winding roll rotatable in fixed bearings, a second winding roll rotatable in movable bearings, means to lock said movable bearings in fixed position during a winding operation, and selective means to positively and alternately drive one only of said winding rolls in one direction or the other roll in the opposite direction.

4. In a yarn winding machine, a plurality of spool-engaging rolls, movable supports for one of said rolls, means to lock said supports to hold said roll in operative position during a winding operation, said roll being removable to an in-

operative position to permit replacement of spools, means to positively rotate said roll while in locked and operative position, and means to prevent the driving of said roll when out of operative position.

5. In a yarn winding machine, a pair of winding rolls rotatable about fixed axes during a winding operation, a movably mounted tension roll, a weight connected to continuously apply pressure on said tension roll during a winding operation, said weight being freely raised by the spool as the spool increases in diameter, and manually releasable pawl and ratchet means effective to prevent return movement of said roll during said winding operation.

6. In a yarn winding machine, a plurality of spool-engaging rolls, means to drive one of said rolls, a movably mounted tension roll, means to continuously press said tension roll against a spool being wound, said tension roll being displaced outwardly by the spool as the spool diameter increases, and means to prevent any return movement of said tension roll during a winding operation.

7. In a yarn winding machine, a pair of winding rolls, means to drive one of said rolls, a driven tension roll, a measuring device, driving connections between said driven tension roll and said measuring device, and stopping mechanism controlled by said measuring device.

8. In a yarn winding machine, a pair of winding rolls, means to drive one of said rolls, a driven tension roll, a measuring device, driving connections between said driven tension roll and said measuring device, and stopping mechanism controlled by said measuring device, said measuring device being operative and effective to stop the winding machine after measuring a substantially uniform length of yarn, whether the spool is being wound right-hand or left-hand.

9. In a yarn winding machine, a pair of winding rolls, means to drive one of said rolls, a driven tension roll, a measuring device, and stopping mechanism rendered operative by said measuring device, said stopping mechanism including a brake by which over-run of said winding machine is prevented and said brake being controlled by said stopping mechanism.

10. In a yarn winding machine, a winding roll, movable supports for said roll, means to lock said supports with said roll in operative position, means to drive said roll, said roll being movable with its supports to inoperative position, and means to counterweight said roll in every position thereof.

11. In a yarn winding machine, a winding roll, movable supports for said roll, means to lock said supports with said roll in operative position, means to drive said roll, said roll being movable with its supports to inoperative position, and means to counterweight said roll in every position thereof, said latter means also providing a cushioning stop defining the inoperative position of said roll.

12. In a yarn winding machine, a driven winding roll, means to support said winding roll for movement to operative and inoperative positions, a driven tension roll, a measuring device actuated thereby, stopping mechanism controlled by said measuring device, and means to prevent the starting of said machine while said winding roll is out of operative position.

13. In a yarn winding machine, a driven winding roll, means to support said winding roll for movement to operative and inoperative positions,

a driven tension roll, a measuring device actuated thereby, stopping mechanism controlled by said measuring device and including a switch, means to prevent the starting of said machine

while said winding roll is out of operative position, a manually controlled switch in series with said stopping mechanism switch, and means to restore control to said manual switch while said measuring device remains in stopping position. 5

14. In a yarn winding machine, a winding roll, movable supports for said roll, and means to lock said supports with said roll in operative position, said locking means comprising spring-actuated latches on said supports and yieldingly mounted 10

18. In a yarn winding machine, a winding roll mounted in fixed bearings, a second winding roll mounted in movable supports, means to lock said supports in operative position during a winding operation, a yieldingly mounted tension roll, and 15

15. In a yarn winding machine, a winding roll, movable supports for said roll, and means to lock said supports with said roll in operative position, said locking means comprising spring-actuated latches on said supports and yieldingly mounted 20

selective means to drive one winding roll and said tension roll in one direction or the other winding roll and said tension roll in the opposite direction and to permit the winding roll which is not driven to rotate freely in the same direc- 20

16. In a yarn winding machine, a winding roll mounted in fixed bearings, a second winding roll mounted in movable supports, means to lock said supports in operative position during a winding operation, a yieldingly mounted tension roll, and 25

19. In a yarn winding machine, a winding roll mounted in fixed bearings, a second winding roll mounted in movable supports, means to lock said supports in operative position during a winding operation, a yieldingly mounted tension roll, reversible power mechanism, and driving connections between said mechanism and said winding rolls effective to drive one winding roll and said tension roll in one direction when said power 30

17. In a yarn winding machine, a winding roll mounted in fixed bearings, a second winding roll mounted in movable supports, means to lock said supports in operative position during a winding operation, a yieldingly mounted tension roll, re- 35

mechanism rotates in a given direction and the other winding roll and said tension roll in the opposite direction when said power mechanism rotates in the opposite direction and said connections permitting the idle winding roll to rotate 35

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