

April 25, 1933.

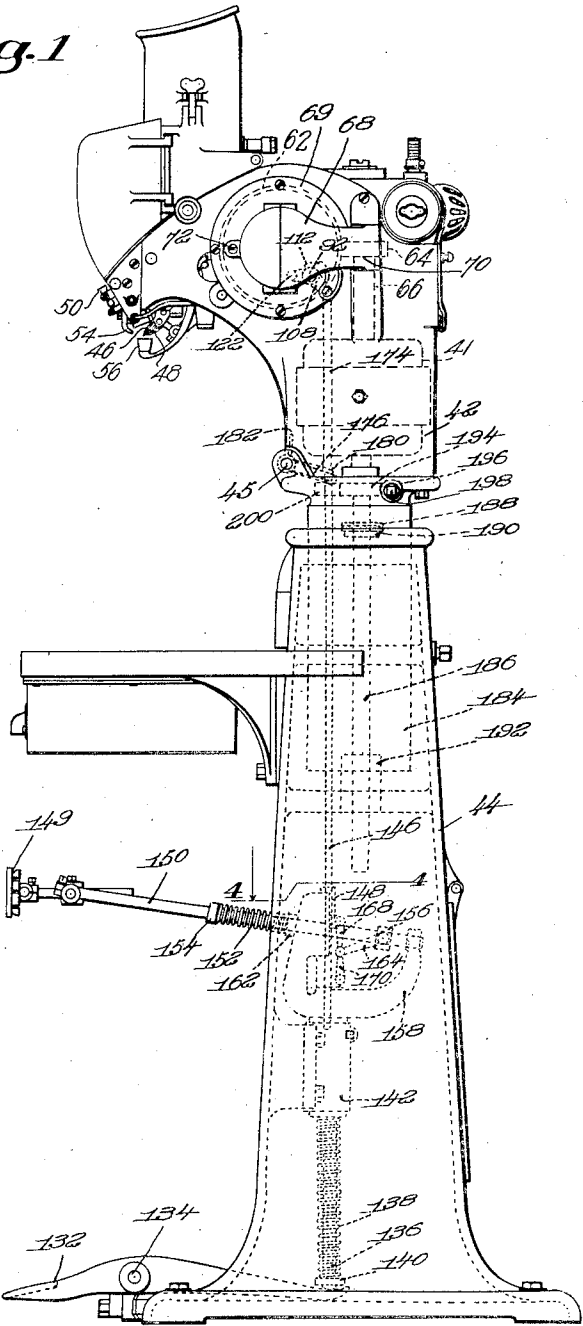
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1,905,735

DRIVING AND STOPPING MECHANISM

Original Filed July 25, 1927 6 Sheets-Sheet 1

Fig. 1



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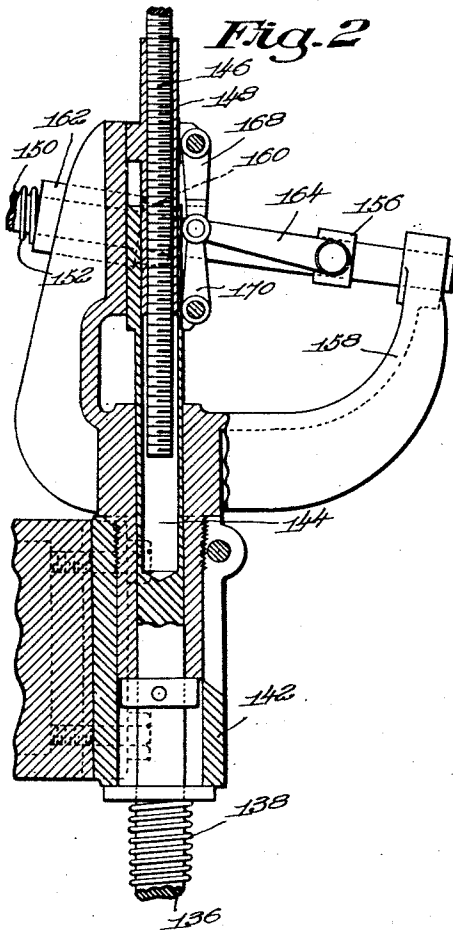
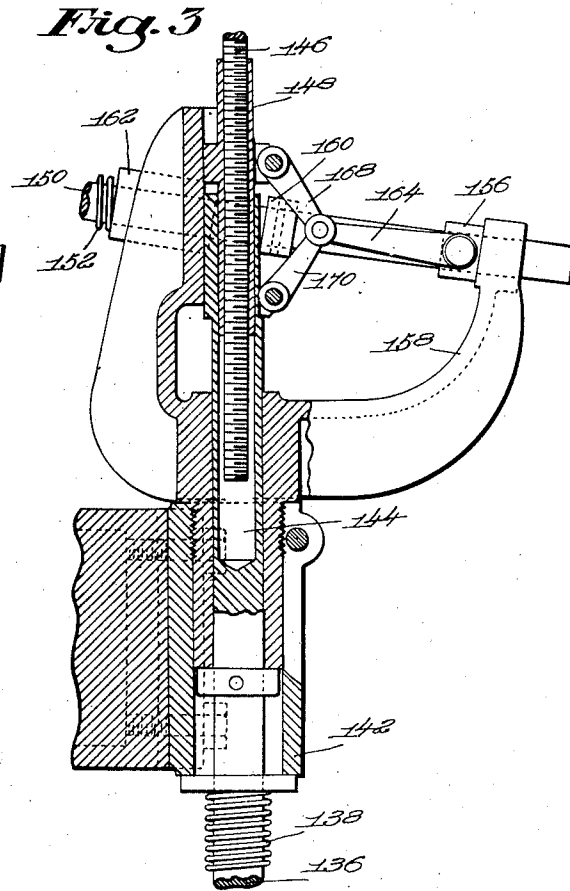
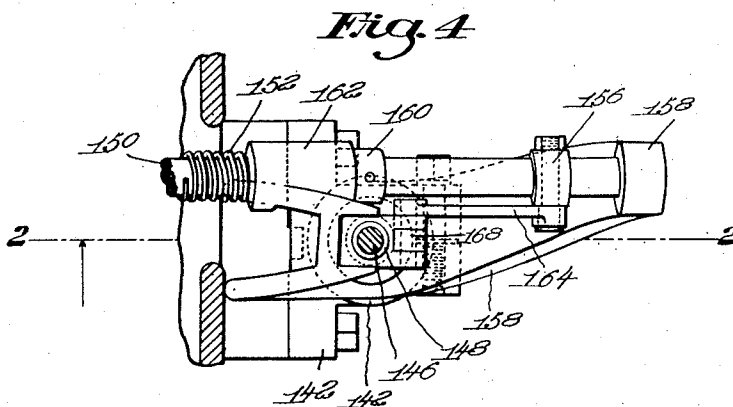
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6 Sheets-Sheet 2



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DRIVING AND STOPPING MECHANISM

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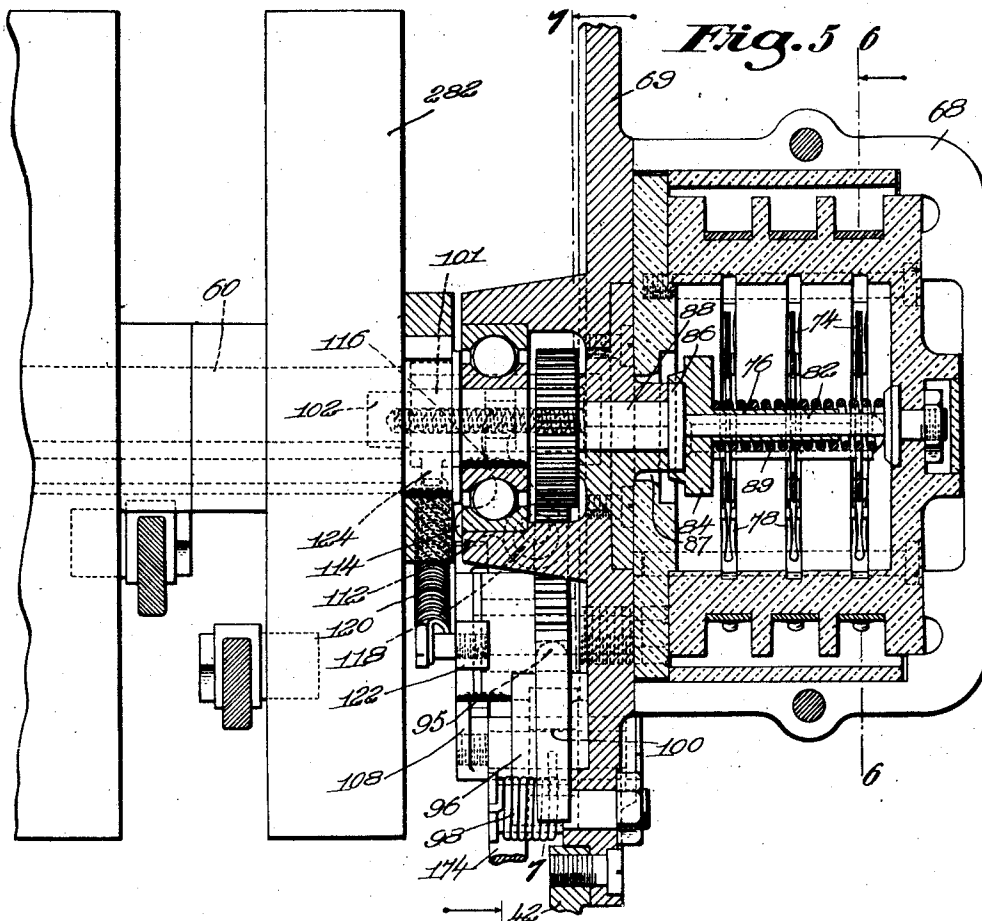
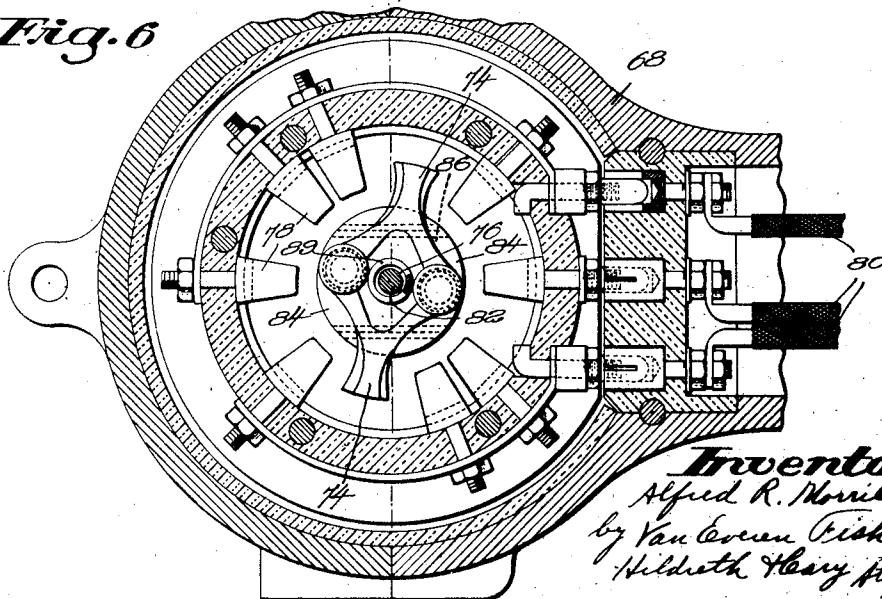


Fig. 6



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DRIVING AND STOPPING MECHANISM

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Fig. 7

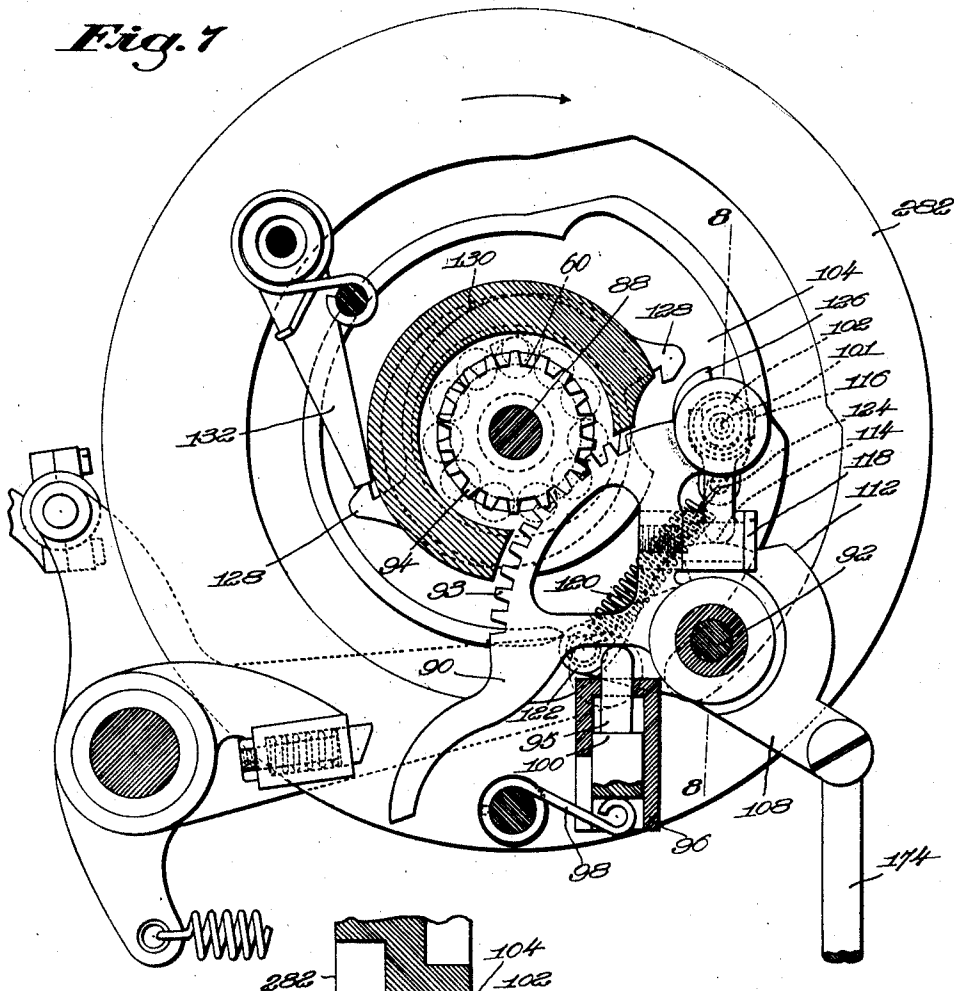
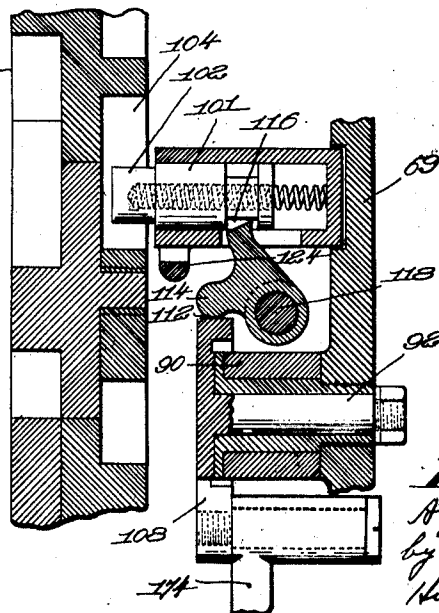


Fig. 8



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DRIVING AND STOPPING MECHANISM

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Fig. 9

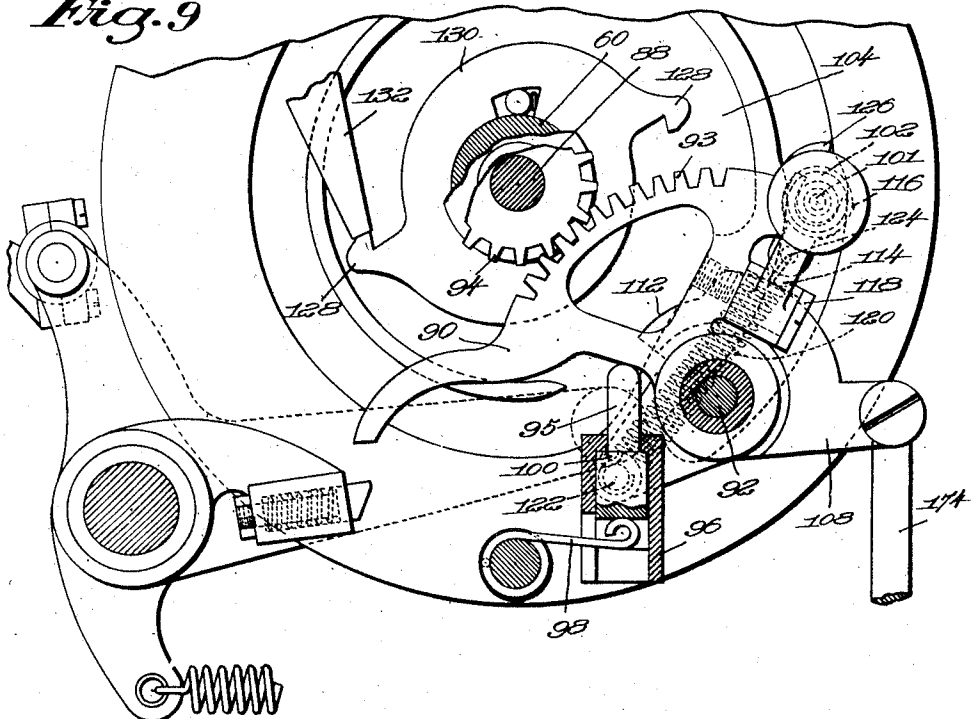


Fig. 10

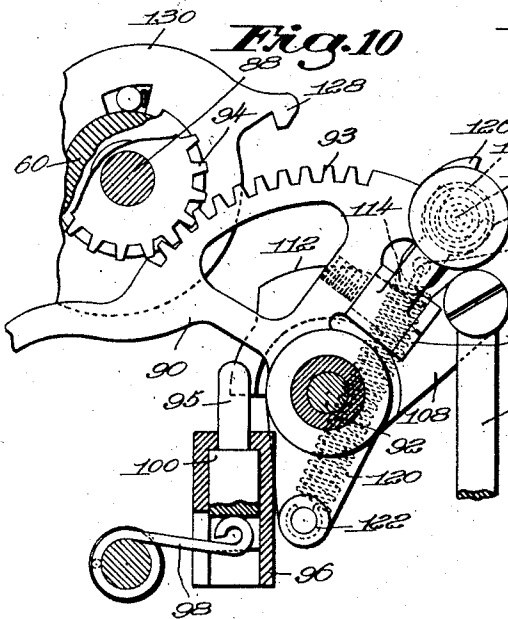
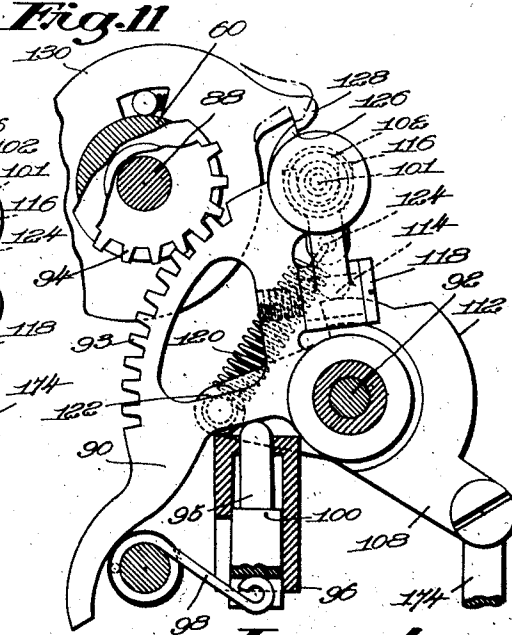


Fig. 11



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DRIVING AND STOPPING MECHANISM

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6 Sheets-Sheet 6

Fig. 12

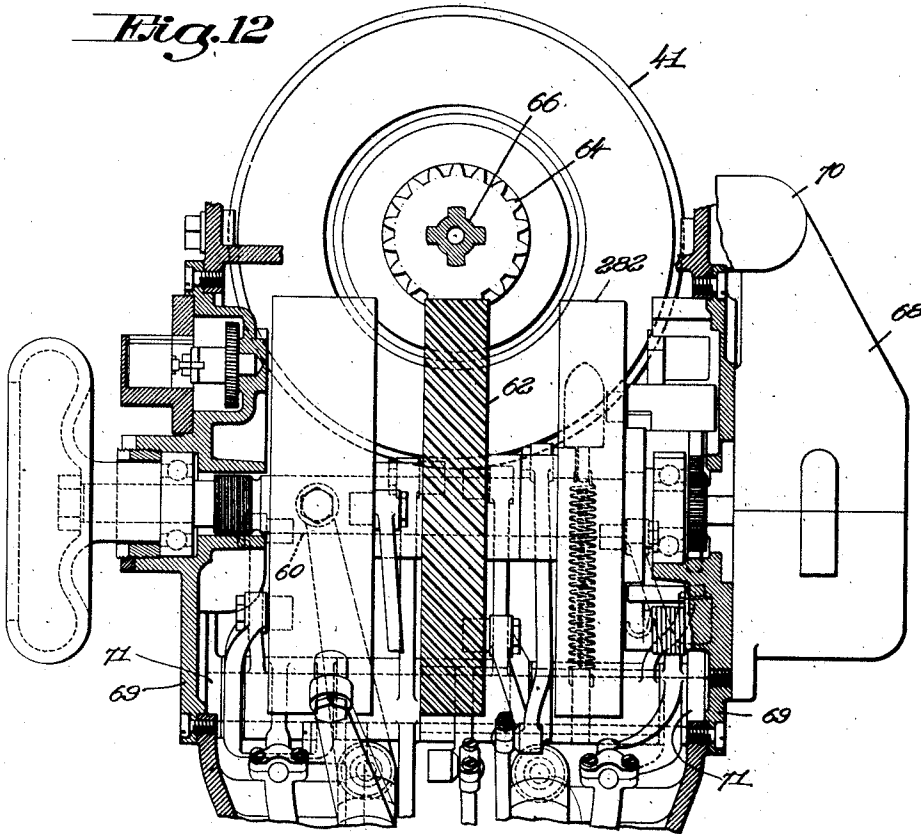
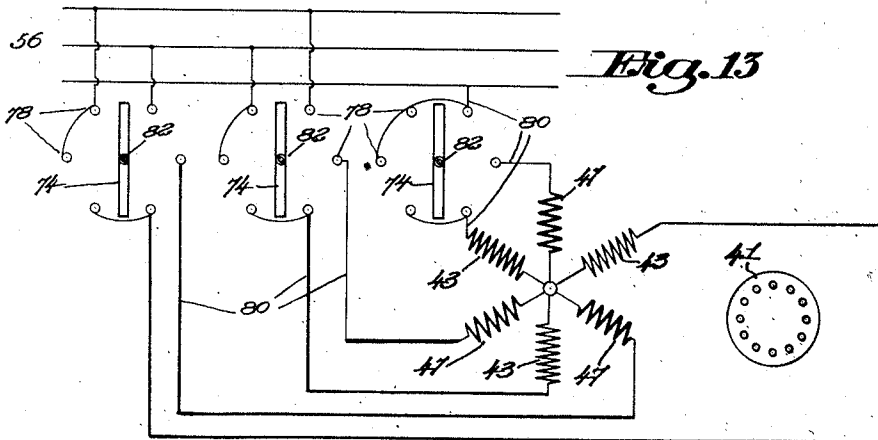


Fig. 13



Witness

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UNITED STATES PATENT OFFICE

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DRIVING AND STOPPING MECHANISM

Original application filed July 25, 1927, Serial No. 208,116. Divided and this application filed February 1, 1930. Serial No. 425,342.

The present invention relates to driving and stopping mechanism adapted for use in machines which it is necessary or desirable to stop at a certain or substantially certain point in the cycle of operations or at a certain or a substantially certain angular position of the main shaft or one of the other shafts of the machine.

The invention more particularly relates to a driving and stopping mechanism of that type which utilizes the braking effect or drag produced on the armature of an electric motor when the conditions in the motor are changed so as to alter its electrodynamic torque. The invention is intended primarily for use on wax thread sewing machines but is well adapted for use on other types of machines.

The principal object of the invention is to provide a novel and improved driving and stopping mechanism of this general description which utilizes a reverse torque of an electric motor to stop the machine in a predetermined angular position which will be simple and durable in construction and may be more readily controlled by the operator than mechanisms of this character previously produced.

With this and other objects in view, as will hereinafter appear, the several features of the invention consist in the devices, combinations, and arrangement of parts hereinafter described and claimed which together with the advantages to be obtained thereby will be readily understood by those skilled in the art from the following description taken in connection with the accompanying drawings.

In the drawings which illustrate the preferred embodiment of the invention in a turn shoe sewing machine, Fig. 1 is a view in side elevation of the whole machine; Fig. 2 is a detail view partly in section taken on the line 2—2 of Fig. 4 of the control mechanism for operating the machine at low speed, the parts being shown in position for the full speed operation; Fig. 3 is a view similar to Fig. 2 with the parts in position to operate the machine at low speed; Fig. 4 is a plan view of the parts shown in Figs.

2 and 3 taken on the line 4—4 of Fig. 1; Fig. 5 is a detail view in front elevation partly in section showing particularly the two-speed starting and stopping switch and actuating connections; Fig. 6 is a detail sectional view of the two speed switch taken on the line 6—6 of Fig. 5; Fig. 7 is a detail view taken on the line 7—7 of Fig. 5 illustrating particularly the mechanism for starting and stopping the machine, the parts being shown in rest position; Fig. 8 is a detail sectional view taken on the line 8—8 of Fig. 7; Figs 9, 10 and 11 are views similar to Fig. 7 illustrating different positions of the starting and stopping mechanism, the parts being shown in low, high and reverse positions, respectively; Fig. 12 is a sectional plan view of the head of the machine, and Fig. 13 is a diagrammatic view illustrating in a conventional manner the connections between the motor and controlling switch.

The shoe machine illustrated in the drawings is adapted for sewing the upper to the sole of a turn shoe and is provided with the usual operating elements of a chain stitch turn sewing machine. These elements are actuated in timed relation from a cam shaft which is driven by means of a direct connected motor mounted in the head of the machine. For a complete description of these elements and their actuating mechanisms, reference may be had to the inventor's pending application Serial No. 208,116, filed July 25, 1927, for inseam shoe sewing machines, of which the present application is a division.

The driving and stopping mechanism herein more particularly described as embodying the several features of the present invention is treadle controlled by the operator and acts automatically when thrown into operation to stop the machine with the needle withdrawn from the work. As has been stated, the motor for driving the machine is directly connected to the cam shaft. This motor is adapted to run at either of two speeds, and the mechanism for driving and stopping the machine comprises this motor, a two-speed switch movable to high, low,

reverse and off positions, and means for controlling the switch. The construction and arrangement is such that while the operator holds the starting and stopping treadle of the machine depressed, the switch remains in its high position to cause the machine to run at its normal high speed. When the treadle is released in stopping the machine, the switch is first moved to low speed position where it remains for nearly a complete revolution of the cam shaft to allow the machine to slow down to a predetermined low speed, and then at a predetermined angular position of the cam shaft, the switch is moved to reverse position to bring the motor and the machine to a complete stop with the needle withdrawn from the work. After the motor and machine have been stopped, and as the motor starts to reverse, the switch is moved to its off position, where it remains until the machine is again thrown into operation.

Referring more specifically to the drawings, the casing which forms the head of the machine and houses the sewing mechanism and the electric motor 41 by which it is driven, is indicated at 42 and is adjustably supported on a column or base 44. The head 42 is hinged to the base at 45 to permit the head readily to be swung forward to give access to the motor which is located in the lower portion of the head. The operating elements and stitch forming devices carried in the head of the machine, as shown in Figs. 1 and 12, include a curved hook needle indicated at 46, an awl 48, a looper 50, a thread finger (not shown), a channel guide 54, a back gage 56, and a take-up. These elements are actuated from a main cam shaft 60 mounted in the head of the machine, which cam shaft is driven by the electric motor 41 which is permanently connected to the cam shaft through a gear 62 on the cam shaft and a worm gear 64 on the vertical driving shaft 66.

As illustrated, the two speed starting and stopping switch for the motor 41, having low and high speed windings 43 and 47 is mounted concentrically with the main cam shaft 60 in a casing 68, which, for convenience of assembling and repair, is pivotally mounted at 70 on the head of the machine and held in position by means of a screw 72. When the switch casing 68 is released and swung back out of the way, discs 69 which are screwed to the head casing 42 may be readily removed to give access to the cam shaft through apertures 71 in the frame over which the discs are secured. The switch is controlled partly from the starting treadle of the machine and partly from the main cam shaft 60. Referring to Figs. 5, 6, and 7, the switch blades as indicated at 74, are mounted upon a rotatable frame 76 and are arranged to cooperate with spring

contact plates 78 rigidly mounted on the casing 68. The blades 74 are suitably cross connected and the contact plates 78 are connected to the lead-in wires 80 of the motor 41 which enter the switch casing 68 through the pivot 70. The blades and contact plates of the switch are arranged and connected in a conventional manner so that in the different positions of the switch, the circuits of the motor may be opened or they may be connected to a three-phase line 56 to cause the motor to run at a low or high speed when the contact blades are swung counter-clockwise to partial or extreme positions, respectively, or when swung clockwise from the open position, as shown in Figs. 6 and 13, to reverse the direction of rotation of the motor 41. The rotatable switch part may be said, therefore, to be movable to high, low, reverse and off positions.

The rotatable frame 76 on which the blades are mounted is loosely sleeved on a fixed stud 82 in the casing 68 and is provided at one end with a clutch face 84 which is held yieldingly in engagement with a corresponding surface 86 on the abutting end of the switch actuating shaft 88 by means of a spring 89 coiled about the fixed stud 82 within the rotatable frame 76. When the switch casing 68 is swung back out of the way, spring 89 thrusting against the collar 84 moves the carrier 76 axially, forcing the outer beveled surface of the collar into a recess 87 formed in an insulating plate constituting a portion of the casing 68, to hold the carrier against accidental turning, thus, insuring that the carrier shall be returned to proper engagement with the clutch face 86 of the actuating shaft.

The mechanism for actuating the switch actuating shaft 88 and thus for positioning the starting and stopping switch, comprises (see Figs. 5 and 7-11, inclusive) a control lever 90 loosely mounted on a shaft 92 and provided with a gear segment 93 adapted at all times to engage a pinion 94 formed on the shaft 88. A plunger 95 mounted in a casing 96 in the machine frame is forced by means of a heavy spring 98 into contact with the control lever 90 and tends to swing it about the pivot shaft 92 and acting through the actuating speed position. The abutment 100 on the plunger which engages the end of the casing 96 prevents movement of the plunger beyond this point. On the upper portion of the control lever 90 is mounted a spring pressed bolt or plunger 101 formed at its outer end as a cam follower or roll 102 which in the rest position of the mechanism as illustrated in Fig. 7 engages a cam groove 104 formed in the face of the cam disk 282 secured to the main cam shaft 60 and so locks the control lever 90 against movement under the pressure of the spring 98. There is also loosely mounted on the pivot shaft 92 a lever

108 which is controlled through intermediate connections hereinafter to be described from the foot treadle 132 of the machine. This lever is provided with a cam surface 112 which is adapted to engage an arm 114 of a yoke 116 pivotally mounted at 118 on the control lever 90 to engage a groove in the bolt 101.

When the treadle is depressed in starting the machine, the lever 108 is rotated in a counter clockwise direction from the position illustrated in Fig. 7, to bring the cam surface 112 into contact with the projecting arm 114 of the yoke 116 which acts in turn to withdraw the cam roll 102 from engagement with the cam groove 104 thus permitting the control lever 90 to swing about its pivot under the pressure of the heavy spring 98 into low speed position as previously explained. The control lever is held in low speed position in contact with the plunger 95 by means of an off center tension spring 120 which is connected between a lever arm 122 formed on the lever 108 and a point 124 on the control lever 90. The further movement of the foot treadle to its lowest position causes the lever 108 to be rotated still further in a counter clockwise direction about its pivot, thus swinging the lever arm 122 and the tension spring 120 past center to swing the control lever 90 to its furthest limit and to rotate the switch to high speed position.

Mechanism is provided for bringing the machine to a stop in a predetermined angular position with the needle retracted from the work independently of whether the machine is operating at high or low speed. When the treadle is released during high speed operation, the switch is first thrown into low speed position where it is held for nearly one complete revolution of the cam shaft and is then thrown into reverse at a predetermined angular position of the cam shaft. The machine will thus be operating at low speed when the switch is thrown to reverse, and the inertia to be overcome by the reversing torque of the motor will always be the same and the machine will be stopped at the same point with the needle withdrawn from the work.

In stopping the machine when the treadle is released, the lever 108 is swung downward in a clockwise direction from the position illustrated in Fig. 10. The lever arm 122 with the tension spring 120 is again moved past the center position causing the control lever 90 to swing back again about its pivot to low speed position (see Fig. 9), where it is held by contact with the spring pressed plunger 95. In this position of the parts, as illustrated particularly in Fig. 9, with the foot treadle partially raised and the control lever 90 in low speed position, the cam roll 102 is still held in retracted posi-

tion out of contact with the cam disk 282 by the engagement of the cam surface 112 on the lever 108. When the treadle is entirely released permitting the lever 108 to return to the rest position illustrated in Fig. 7, the cam roll 102 is released and is pressed endwise against the face of the cam disk 282 until the cam disk reaches a position in which the cam roll can enter the extreme outer portion of the cam groove 104. Continued rotation of the cam disk causes the cam roll 102 to move into the main portion of the groove 104 where it is held to maintain the control lever 90 in its low speed position for almost a complete revolution. Finally the roll 102 engages with the inner portion of the groove 104 causing the control lever 90 to be moved to its extreme left position against the pressure of the spring pressed plunger 95, as illustrated by Fig. 11, corresponding to the reverse position of the switch. The contour of the cam groove 104 is such as to permit the cam shaft 60 to make nearly a complete revolution with the switch set at low speed position before the switch is thrown to reverse at a predetermined angular position of the cam shaft. The control lever 90 is held in reverse position until the machine is brought to a complete stop and starts to reverse under the influence of the reversing torque imparted to the motor, by the engagement of an abutment 126 on the lever 90 with a catch 128 formed on a ring 130 surrounding the cam shaft and connected therewith by an over-running clutch arrangement of ordinary construction. During the normal operation of the machine, the ring 130 tends to swing with the cam shaft 60 in a clockwise direction, as shown in Fig. 9, to move the catch 128 downwardly into the path of the abutment 126 where it is held against further rotation by the engagement of a spring pressed detent lever 132 with a second catch 128 formed on the opposite side of the ring 130. When the machine starts to reverse, the ring 130 will be clutched to the main cam shaft 60 and will rotate therewith in a counter clockwise direction as indicated in Fig. 11 to release the control lever 90 which will then be returned by the pressure of the spring pressed plunger 95 as far as rest position where it is held by the engagement of the cam roll 102 with the outer wall of the groove 104.

The starting and stopping treadle of the machine is indicated at 132 pivotally mounted at 134 on the machine frame and bears at its rear end against the lower end of a vertical rod 136 which forms one of the connections to the lever 108 for operating the starting and stopping switch. The vertical rod 136 is normally held in a depressed position with the foot treadle raised by means of a compression spring 138

- coiled about the rod between a collar 140 on the rod and a bracket 142 through which the rod slides. A sleeve 144 is formed at the upper end of the rod 136 to receive the
- 5 lower end of a rod 146 which is threaded for lengthwise adjustment of an elongated nut or sleeve 148 adapted to fit within the sleeve 144 and connected thereto as will be described.
- 10 Mechanism is provided for enabling the operator to reduce the machine to low speed whenever it is desired to do so independently of the foot treadle and without throwing the stopping mechanism into operation.
- 15 This mechanism comprises a knee treadle 149 mounted upon a rod 150 which is loosely fitted to move longitudinally in the bracket 142 and is normally held in an advanced position by means of a compression
- 20 spring 152 coiled about the rod between a collar 154 and the bracket 142. The movement of the rod 150 is limited in one direction by the engagement of a collar 156 with one arm 158 of a bracket and in the other
- 25 direction by the engagement of a collar 160 with another arm 162 of the bracket. A link 164 is pivotally secured at one end to the collar 156 on the rod 150 and at the other end to the central pivot of two toggle
- 30 levers 168 and 170 which are connected respectively at their free ends to the nut 148 on the rod 146 and the sleeve 144 on the rod 136. The toggle is held normally in
- 35 straightened position by the pressure of the spring 152 on the knee treadle rod 150 to hold the rods 136 and 146 rigidly in position with relation to each other when they are raised or lowered by the action of the
- 40 foot treadle in starting and stopping the machine. When, however, it is desired to operate the machine at low speed, the knee treadle 149 is pressed inwardly by the operator breaking the toggle and depressing the rod 146 part way to bring the lever 108
- 45 exactly to low speed position.
- The connections through which the lever 108 in the head of the machine is actuated from the rod 146 in the base comprise a vertical rod 174 connected at its upper end
- 50 to one arm of the lever 108 and connected at its lower end to a lever arm 176 formed on a sleeve surrounding a pivot stud 45. A second lever arm 180 is formed on the sleeve to engage the upper end of the vertical rod
- 55 rod 146 and is held yieldingly in engagement therewith by means of a spring 182 coiled about the stud 45.
- In order that the machine may be readily adjusted to the height of the operator, the
- 60 head 42 is mounted on a tubular support 184 which fits tightly into the upper end of the base 44. A vertical shaft 186 is rotatably mounted in a journal 188 formed in the support 184 and is held against end-
- 65 wise movement relatively thereto by means of a bearing block 190 formed on the shaft which is adapted to sustain the weight of the support 184 and the head 42. The shaft 186 at its lower end is threaded into a stationary nut 192 mounted in the base 44 and
- 70 its upper end is provided with a pinion 194 adapted to engage with a worm gear 196 on a hand operated cross shaft 198 so that the shaft 186 may be readily rotated to raise or lower the head of the machine. The rod
- 75 146 through which the starting and stopping switch is controlled also carries a pinion 200 which meshes with the pinion 194 so that the rod 146 is rotated to adjust itself automatically as the head of the machine
- 80 is raised or lowered.
- The invention having been described, what is claimed is:—
1. A driving and stopping mechanism for a machine having, in combination, an electric
- 85 motor, a cam shaft driven thereby, means for supplying current to the motor, comprising an electric switch part movable to high, low, reverse and off positions, mechanism rendered operative in starting the
- 90 machine to move the switch part to high speed position, and in stopping the machine to move the switch part to low speed position and then at a predetermined angular position of the cam shaft to move the switch
- 95 part to reverse position.
2. A driving and stopping mechanism having, in combination, an electric motor, a cam shaft driven thereby, means for supplying current to the motor comprising an
- 100 electric switch part movable to high, low, reverse and off positions, an actuating treadle, and connections from the treadle for moving the switch part to a high speed position in starting the machine and upon
- 105 stopping the machine to move the switch part to low speed position and means acting at a predetermined angular position of the cam shaft to move the switch part to reverse position.
- 110 3. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising an electric switch part movable to high, low, reverse
- 115 and off positions and treadle operated mechanism for actuating the switch part from high to low speed position, means controlled from the treadle and acting in timed relation to the shaft after at least a predetermined period of low speed operation to
- 120 move the switch part to reverse position, and means acting automatically thereafter to move the switch part to off position.
4. A driving and stopping mechanism
- 125 having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising an electric switch part movable to high, low, reverse and off positions, a switch control member,
- 130

a cam for actuating said member to move the switch part from low to reverse position, means controlled by the reversal of the motor to move the switch part from reverse to off position, and a treadle and suitable connections for moving the switch control lever from high to low position and thereafter for operatively connecting the switch control member to the cam.

5. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising a forward, a switch control member, a cam for actuating said member to move the switch, a lock bolt for operatively connecting the switch control member with the cam, a treadle, and connections from the treadle to control the lock bolt and actuate the member.

6. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, a high, low, and off switch for the motor, a switch control member, a stiff spring to move the switch control member from off to low position, and an off center spring arranged to swing past center to move the control member from low to high speed position.

7. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising a high, low, reverse, and off switch, a switch control member, a stiff spring to move the switch control member from off to low position of the switch, an off center spring arranged to swing past center to move the control member between low and high position, and a cam for actuating the said member against the pressure of the stiff spring from low to reverse position.

8. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising a high, low, reverse, and off switch, a switch control member, a stiff spring to move the switch control member from off to low position, a lock bolt for holding the member in rest position against the pressure of the spring, an off center spring arranged to swing past center to move the control member from low to high position, and treadle actuated connections for releasing the lock bolt to move the member to low position and thereafter to swing the off center spring to move the member to high speed position.

9. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising a high, low, reverse, and off switch, a switch control member, a stiff spring to move the switch control member from off to low position, a cam for actuating the said member against

the pressure of the stiff spring from low to reverse position, a lock bolt for operatively connecting the cam to the switch control member, means operated by the reversal of the motor to return the switch to off position, and treadle controlled means for actuating the lock bolt to stop and start the machine.

10. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising a forward, reverse, and off switch, a switch control member, a spring acting to move the member toward low speed position, a cam for moving the member against the pressure of its spring to reverse position, a latch for holding the member in reverse position, and means rendered operative by the reversing of the motor to release the latch.

11. A driving and stopping mechanism having, in combination, an electric motor, a shaft driven thereby, means for supplying current to the motor comprising a high, low, reverse, and off switch, a foot treadle, means for actuating the switch from the treadle, and a knee treadle for moving the switch only between high and low position.

12. A driving and stopping mechanism having, in combination, a main frame, a driven shaft mounted in the frame, a motor, driving connections to the shaft, and a switch to control the motor comprising a switch blade carrier, a casing on which the carrier is mounted pivoted to swing towards and from the main frame, a shaft through which the switch blade carrier is actuated mounted in the main frame in alignment with the axis of the blade carrier, and clutch connections between the shaft and the glade carrier.

13. A driving and stopping mechanism having, in combination, a main frame, a shaft, a motor, driving connections to the shaft and a switch to control the motor comprising a switch blade carrier, a casing on which the carrier is mounted pivoted to swing towards and from the main frame, an actuating shaft through which the switch blade carrier is actuated mounted in the main frame in alignment with the axis of the blade carrier, clutch connections between the actuating shaft and the blade carrier, spring means for forcing the blade carrier in a direction to engage the actuating shaft, and a recess formed in the casing to hold the carrier from turning upon disconnecting the switch from the actuating shaft.

14. A driving and stopping mechanism having, in combination, a shaft, a motor from which the shaft is driven, a frame within which the shaft is housed, bearings for the shaft, disks on which the bearings are mounted, apertures in the frame over

which the disks are secured, and a switch
to control the motor comprising a switch
blade carrier pivotally mounted on the
frame to fit over one disk and a casing
5 within which the switch blade carrier is
mounted, an actuating shaft through which
the switch blade carrier is actuated mounted
in the main frame in alignment with the
axis of the blade carrier, and clutch connec-
10 tions between the actuating shaft and the
blade carrier.

In testimony whereof I have signed my
name to this specification.

ALFRED R. MORRILL.

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