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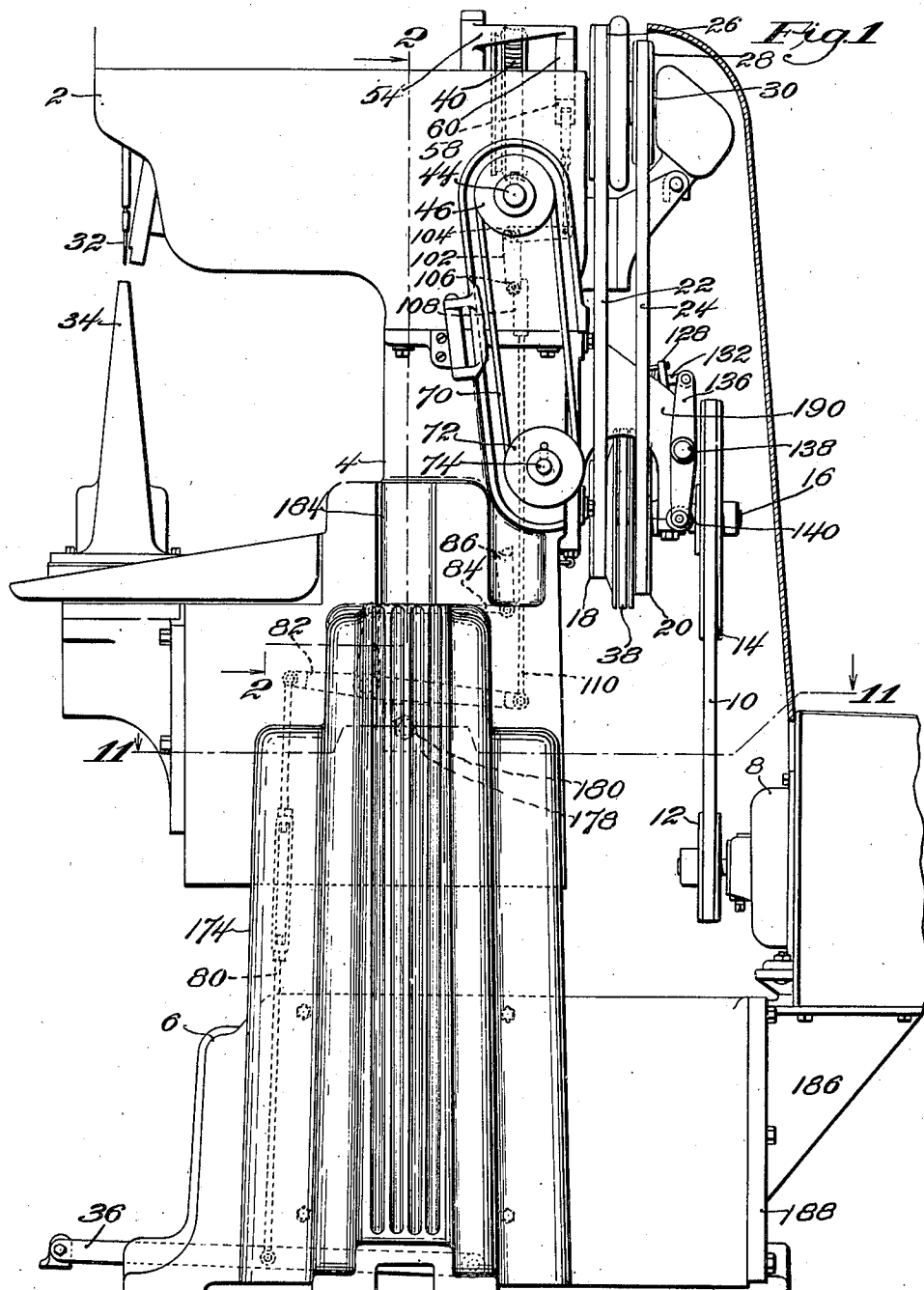
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2,332,649

DRIVING AND STOPPING MECHANISMS

Filed March 8, 1938

7 Sheets-Sheet 1



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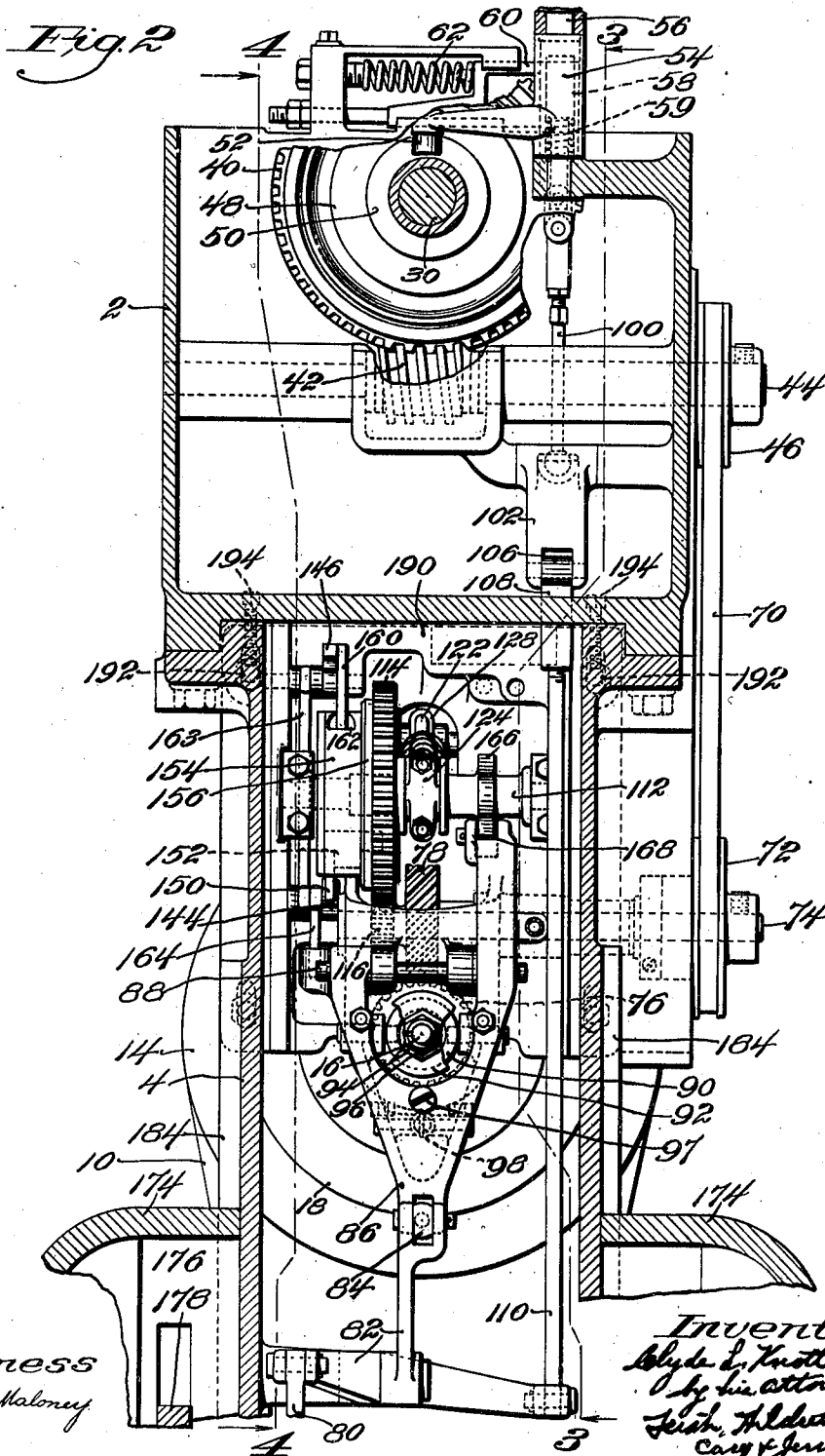
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DRIVING AND STOPPING MECHANISMS

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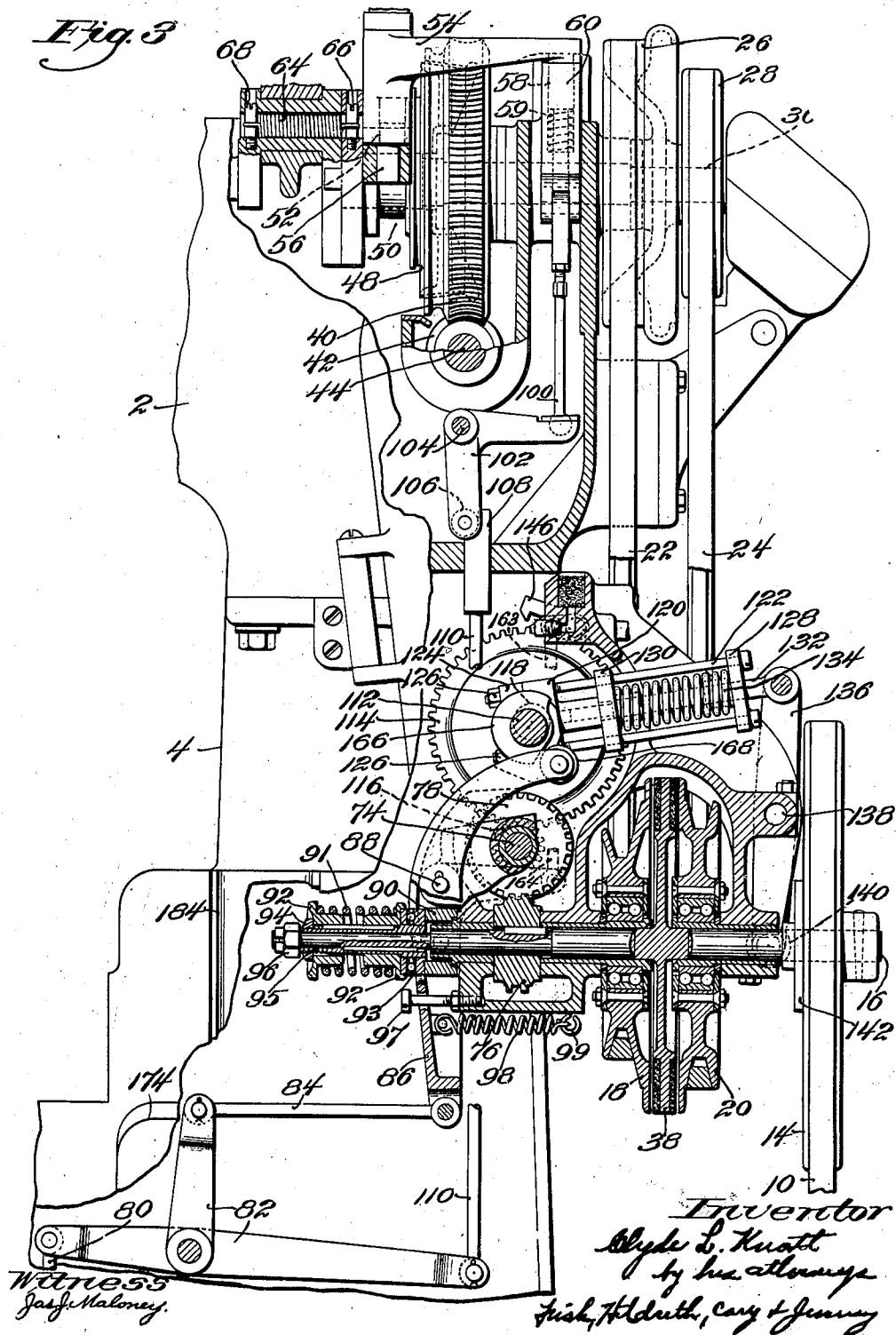
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DRIVING AND STOPPING MECHANISMS

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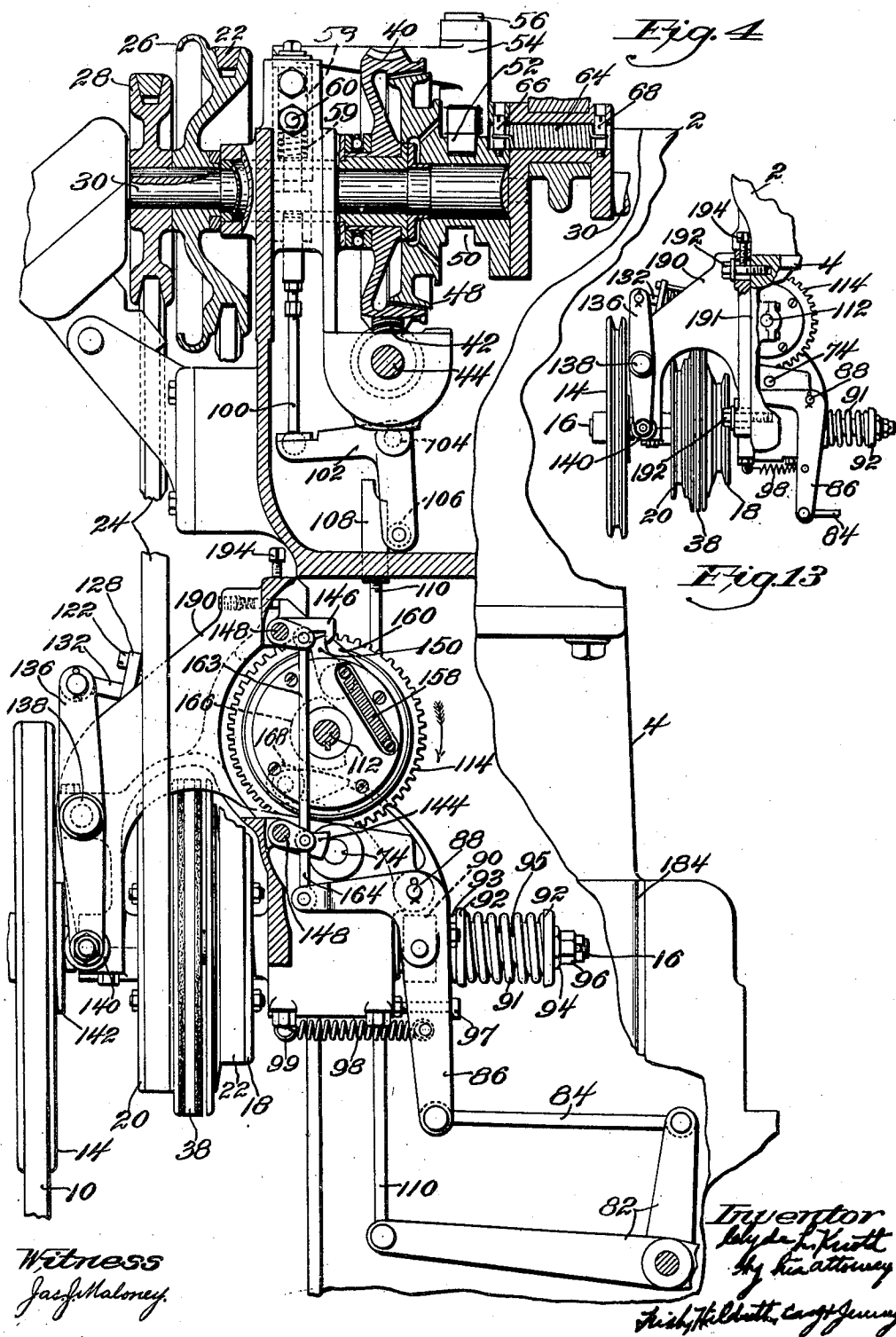
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Filed March 8, 1938

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Oct. 26, 1943.

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DRIVING AND STOPPING MECHANISMS

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7 Sheets-Sheet 5

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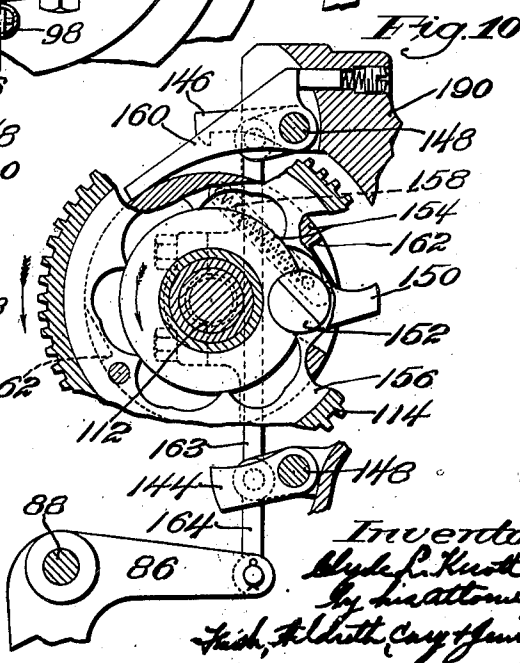
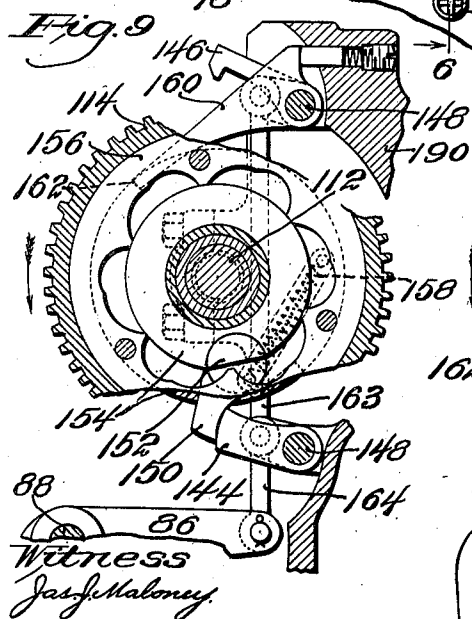
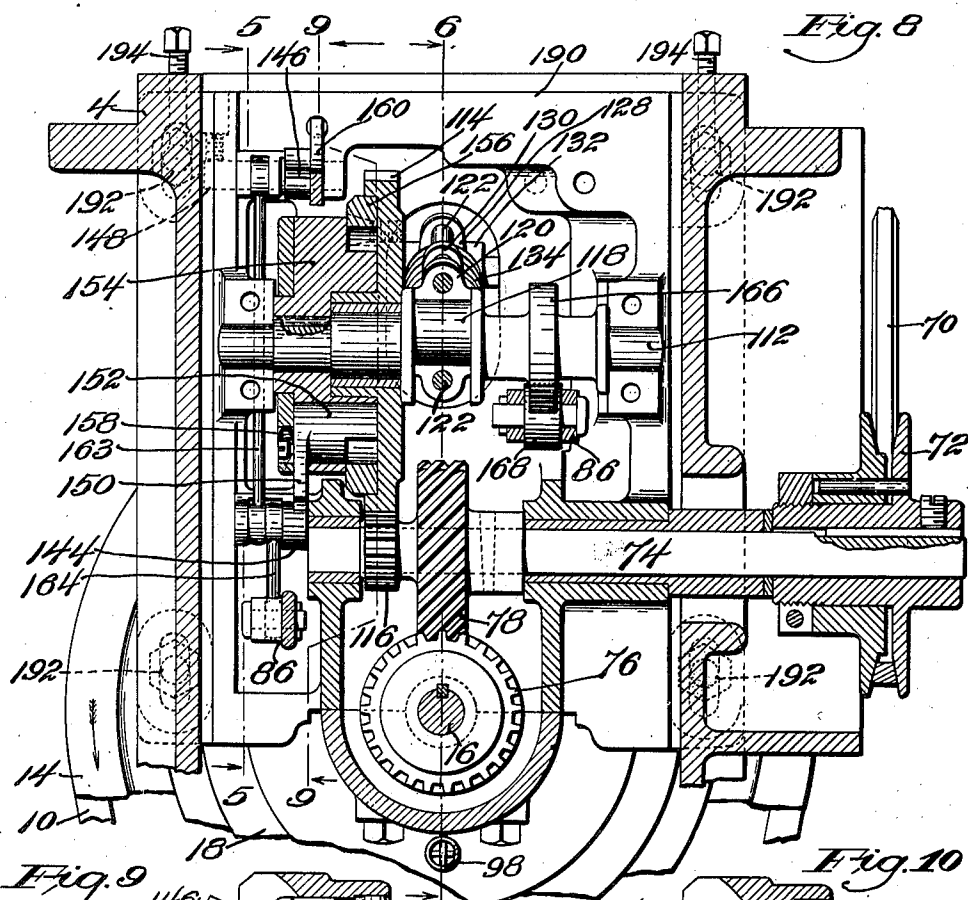
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DRIVING AND STOPPING MECHANISMS

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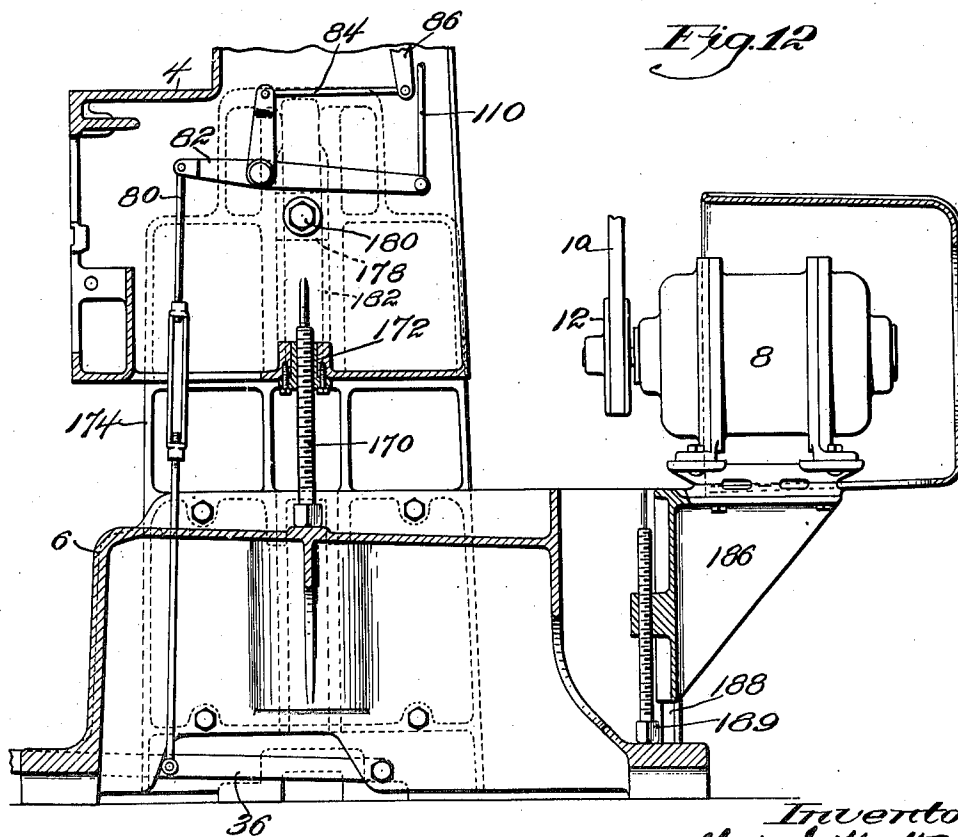
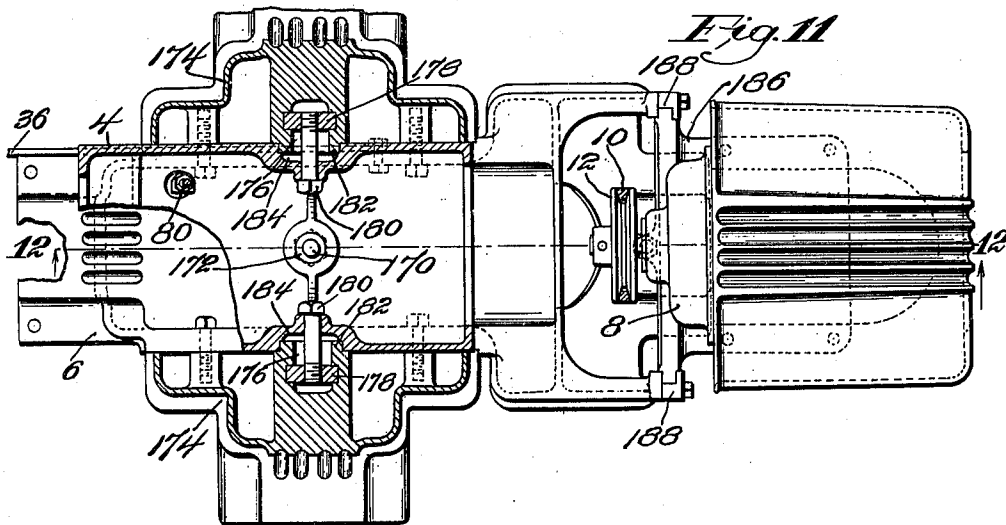
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DRIVING AND STOPPING MECHANISMS

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7 Sheets-Sheet 7



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UNITED STATES PATENT OFFICE

2,332,649

DRIVING AND STOPPING MECHANISM

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Application March 8, 1938, Serial No. 194,594

21 Claims. (Cl. 192—146)

The present invention relates to driving and stopping mechanisms for heavily constructed machines, more particularly for high speed shoe sewing machines.

To provide convenient control for a shoe sewing machine, a driving and stopping mechanism for such machine should act quickly and smoothly to bring the main sewing shaft of the machine to rest at a predetermined point in its rotation without shock or undue strain on the operating parts. The driving and stopping mechanism of a shoe sewing machine is ordinarily controlled by a foot treadle arranged to be depressed in starting the machine, and to be capable of causing the main sewing shaft to be driven faster or slower, as more or less pressure is exerted on the treadle. Sewing machines heretofore have been constructed with a number of different speed driving mechanisms arranged to be rendered operative as the controlling foot treadle is depressed more or less, but certain difficulties have been met with the use of driving mechanisms thus operated. When the control treadle is depressed to one position it first causes rotation of the sewing shaft by one driving mechanism and, upon being depressed further to another position, causes rotation of the sewing shaft by another driving mechanism and between said positions of the treadle, there will be a point where neither mechanism is operative so that the machine may come to rest by itself if the treadle is held at that point. As a result irregular and uncertain operation of the machine may occur. To avoid these difficulties, certain prior machines equipped with two or more driving mechanisms have been so arranged that the lower speed driving mechanism acts through an overrunning clutch, thus rendering the main shaft free to run at a higher speed but with such an arrangement the lower speed driving mechanism is ineffective to reduce quickly the speed of the sewing shaft after the shaft is driven at high speed, the momentum of the operating parts tending to prolong high speed operation after the higher speed mechanism is disconnected.

The objects of the present invention are to provide a novel and improved heavily constructed high speed machine, of the type referred to, having driving and stopping mechanisms which will avoid the above difficulties, and which will act positively under all conditions to bring the machine to rest in a predetermined position or to control the speed of the machine easily and

quickly without the exercise of special skill or effort on the part of the operator.

With these and other objects in view, an important feature of the present invention relates to the provision, in a driving and stopping mechanism having a driven shaft and main driving means therefor comprising a plurality of different speed driving mechanisms, of power actuated mechanism arranged for manual control to cause one of the driving mechanisms to be disconnected and another to be connected without delay and to remain connected until a predetermined position of the shaft is reached so that the speed of the driven shaft will immediately be changed. In the embodiment of the invention hereinafter described, the main driving means is provided with mechanisms to operate the driven shaft at either high or intermediate speeds, and there is also provided low speed driving and braking mechanism for bringing the shaft to proper stopping position after the main driving means is rendered inoperative, the main driving means and also the low speed driving and braking mechanism through suitable connections being under the control of a foot treadle. This arrangement, in a driving and stopping mechanism, of intermediate and high speed driving mechanisms controlled from a foot treadle, together with a low speed driving and braking mechanism which is rendered operative in stopping the machine to act as a friction brake and then drive the shaft at a reduced speed until a predetermined position of the shaft is reached, is believed to be new and constitutes a feature of the present invention whether or not power actuated mechanism is provided for shifting from one of the main driving mechanisms to the other.

In the above discussion of the invention, the expression "main driving means" is intended to define mechanisms which act, when in operation, to drive the driven shaft continuously at a working speed, or in other words, to drive the shaft while the machine in which it is used is running normally to perform its intended functions. For convenience, this expression "main driving means" is also used in the claims, and where so used is to be construed as defined above and as distinguishing from supplemental or auxiliary driving means brought into operation in stopping a shaft and acting for only one or a very few revolutions of the shaft.

Other features consisting in certain constructions, arrangements and combinations of parts,

the advantages of which will be obvious to those skilled in the art from the following description taken in connection with the accompanying drawings, in which:

Figure 1 is a view in side elevation of a high speed shoe sewing machine having a driving and stopping mechanism embodying the features of the present invention; Figure 2 is a sectional view of a portion of the machine, on an enlarged scale, looking from the front, taken along the line 2—2 of Figure 1; Figure 3 is a right side view, partly in section, and partly broken away, of the portion of the machine including the driving and stopping mechanism, as viewed along the line 3—3 of Figure 2, the parts being shown in stopped positions; Figure 4 is a left side view, partly broken away and shown in section, taken along the line 4—4 of Figure 2, of the driving and stopping mechanisms in high speed running positions; Figure 5 is a view of the main driving means for the machine, partly broken away, and shown in section along the line 5—5 of Figure 8, the parts being illustrated in intermediate speed running positions; Figure 6 is a sectional view of a portion of the main driving means illustrated in Figure 5, taken along the line 6—6 of Figure 8; Figure 7 is a detail view showing a cam and follower in the positions indicated in Figure 6; Figure 8 is a sectional view of the main driving means, taken along the line 8—8 of Figure 5; Figure 9 is a detail sectional view, taken along the line 9—9 of Figure 8 of the main driving means, indicating the position of the parts when the machine is at rest; Figure 10 is a view of the same parts, after the treadle has been fully depressed to cause the machine to be operated at its highest speed; Figure 11 is a horizontal sectional view of the frame and base of the machine, taken along the line 11—11 of Figure 1; Figure 12 is a vertical sectional view of the frame and base, taken along the line 12—12 of Figure 11; and Figure 13 is a view in side elevation of the main driving means for the machine showing its method of mounting on the frame.

The machine herein disclosed as embodying the several features of the present invention is a shoe sewing machine having a sewing head 2 which is mounted on the upper end of a frame 4 of generally rectangular vertical section connected to a main base 6 of similar shape. The machine is driven by means of an electric motor 8 carried at the rear of the base 6 through belt connections including a belt 10 which passes around a pulley 12 directly connected to the motor and around a pulley 14 fast to an intermediate shaft 16 for the main driving means of the machine. The main driving means is connected by pulleys 18 and 20 on the shaft 16 about which are belts 22 and 24 extending to pulleys 26 and 28, respectively, fastened to a driven operating shaft 30 in the head 2. The devices operated by the shaft 30 comprise the sewing instrumentalities of a heavily constructed McKay type machine including a straight hook needle 32, and a looper for threading the needle contained within a rotatable shoe supporting horn 34 mounted on the main frame 4 of the machine. The main driving means of the machine acts to connect the continuously rotating motor with the operating shaft 30 upon depression of a control treadle 36 mounted in the base 6 of the machine, and upon release of the treadle a low speed driving and braking mechanism is thrown into operation to act first as a brake in reducing the speed of

the sewing shaft 30 and then to drive the sewing shaft until a predetermined position of the shaft is reached.

The main driving means comprises clutches 5 formed by the pulleys 18 and 20 respectively, which are rotatable on the shaft 16 and a central clutch disk 38 secured to the shaft 16 and disposed between the pulleys 18 and 20. The shaft 16 is mounted so as to be capable of slight longitudinal movement and the clutch disk 38 is provided at its opposite sides with facings cooperating with flanges formed on the pulleys 18 and 20 so that when the shaft 16 slides longitudinally the disk 38 will be forced into driving relation 10 with one of the pulleys. The pulleys 18 and 20, 26 and 28 are formed with different diameters so that the belts 22 and 24 will cause the operating shaft 30 to which the pulleys 26 and 28 are secured to rotate at different speeds when one 15 clutch or the other is closed, the driving means being so arranged when the central disk is in engagement with the pulley 20 that the operating shaft will be driven at high speed and when the central clutch disk 38 is in engagement with the pulley 18 the operating shaft will be driven at an 20 intermediate driving speed as distinguished from the low speed at which the braking mechanism acts.

The low speed driving and braking mechanism is in part mounted on the operating shaft 30 and is similar in many respects to that employed in the machines disclosed in the U. S. Letters Patent to Topham No. 1,099,323 of June 9, 1914, and to Meyer No. 1,298,758 of April 1, 1919, which have a low speed worm wheel similar to that indicated at 40 rotatable on the operating shaft. The worm wheel 40 is driven through a worm 42 secured to a cross shaft 44 provided at its outer end with a pulley 46. The worm wheel 40 has an inner conical clutch face arranged to cooperate with an outer clutch face provided on a movable clutch member 48 rotating with, but slidable along, the operating shaft 30. The hub of the movable clutch member 48 45 is provided with a timing cam slot 50 in which a cam follower 52 rides, so that the cam follower is vibrated continuously while the machine is running. The cam follower 52 is mounted on one arm of a vibrating bell crank 54 fulcrumed on a stud 56 secured in the head of the machine and another arm of the bell crank has a recess into which the upper end of the vertical lock bolt or pin 58 may enter to hold the bell crank stationary and cause the clutch member 48 to 50 slide towards the worm wheel 40. The lock bolt 58 is raised towards the bell crank 54 by a spring 59 within a horizontally sliding carrier 60 which is held towards the right by means of the spring 62 (Fig. 2) to cause the movable clutch member 48 during rotation of the operating shaft 30 to engage the worm wheel 40 whenever the arm 54 is held stationary. The timing cam slot 50 is so cut that the lock bolt 58 may enter the recess on one arm of the bell crank 54 at one 55 point in the rotation of the operating shaft 30, and during continued rotation of the operating shaft the movable clutch member 48 is forced into engagement with the worm wheel 40 for a predetermined part of a rotation. When the 60 speed of the operating shaft 30 is substantially reduced, the clutch member 48 is disengaged from the worm wheel 40, the rotation of the operating shaft by the worm wheel 40 being so low that the momentum of the operating shaft 65 may quickly be overcome by friction. The shaft 75

then comes to rest with the needle disengaged from the work and the other parts in the desired stopping positions. To hold the movable clutch member out of engagement with the worm wheel 40 while the machine is running, there is a tension spring 64 (see Figs. 3 and 4) connected at one end with a pin 66 on the clutch member 48 and at the other end with a pin 68 on the main sewing shaft.

For driving the pulley 46 of the low speed driving and braking mechanism there is a belt 70 surrounding the pulley 46 and a continuously rotating pulley 72 secured to the outer end of a shaft 74 supported in suitable bearings, the axis of which passes at right angles to the intermediate shaft 16. The shaft 74 is driven by means of spiral gears 76 and 78 made fast, respectively, to the intermediate shaft 16 and the shaft 74.

When the treadle 35 is first depressed with the machine at rest, the lock bolt 58 is withdrawn from engagement with the bell crank 54, thus rendering the low speed driving mechanism inoperative, and the clutch disk 38 is pressed into frictional contact with the intermediate speed driving pulley 18 to drive the operating shaft. The pressure of the disk 38 against the intermediate speed driving pulley may be directly controlled by varying the extent to which the treadle is depressed so that the operating shaft may be rotated at any speed up to the speed of the pulley 26. When the treadle is depressed further, the clutch disk 38 is disengaged from the pulley 18 and forced positively against the high speed driving pulley 20 so that the operating shaft 30 will be rotated at high speed by the pulley 28.

In order to afford easy and effective control, according to the present invention, and to prevent the clutch disk 38 from being held manually in a mid-position out of driving relation with either the intermediate or the high speed driving pulleys 18 and 20 at any point in the movement of the treadle, there is provided a selectively controlled power-actuated mechanism acting when the treadle is depressed below an intermediate position to disconnect the intermediate speed driving mechanism and to connect the high speed driving mechanism with the main shaft 30. When the treadle is allowed to rise, the power-actuated mechanism disconnects the high speed driving mechanism and reconnects the intermediate speed driving mechanism. The power-actuated mechanism acts to shift the treadle connections which press the clutch disk 38 against the intermediate speed driving pulley 18 and these connections are arranged to yield so that the treadle is not moved by the power-actuated mechanism.

The treadle-controlled connections include a vertical link 80 connected to the foot treadle and to a three-armed lever 82 fulcrumed in the machine frame. One arm of the three-armed lever 82 is connected to a horizontal rod 84, the other end of which is pivoted to a forked shifting lever 86 shown in Figure 3, mounted on a stationary pin 88. The forked lever 86 is constructed with a channel shaped section and has pivoted between its forked portions a collar 90 surrounding the forward end of the intermediate shaft 16. When the treadle is depressed the lever 86 acts through the collar 90 and through a compression spring 91 on the intermediate shaft to move the shaft lengthwise in its bearing, thus forcing the clutch disk 38 which is secured to the shaft against the pulley 18.

The spring 91 is secured between flanged sleeves 92, one of which engages a thrust bearing 93 backed by the collar 90, and the other of which engages a nut 94 threaded on a tubular spacer 95 having a shoulder for supporting one of the sleeves 92. A reduced end of the shaft 16 passes through the spacer 95, the spacer being held by a nut 96 on the shaft 16. The tubular spacer 95 prevents expansion of the spring 91 beyond the point where the shaft 16 will be held with the clutch disk 38 centrally located between the pulleys 18 and 20, so that when the treadle 36 is raised to its fully released position, both high and intermediate clutches will be held open. To limit the movement of the lever 86 there is provided a stop screw 97 threaded into a stationary part and the treadle is held raised through the connections described and a spring 98 connected at one end to the lever 86 and at the other end fixed to a hook 99.

The connections for withdrawing the lock bolt 58 of the low speed driving and braking mechanism when the treadle is depressed include a rod 100 having a threaded connection with the bolt, pivotally connected to one arm of a right angle lever 102 fulcrumed on a stud 104 on the machine frame. A vertical downwardly extending arm of the lever carries a roll 106 against which a cam surface at the end of a cam block 108 acts. The block 108 is slidable vertically in the machine frame and is connected through a rod 110 to a horizontal arm of the lever 82, the arrangement being such that the block 108 is forced against the roll 106 to withdraw the lock bolt when the treadle is depressed before the clutch disk 38 is brought into driving relation with the pulley 18.

The power actuated mechanism comprises a horizontal rotary shaft 112 for selecting by its angular position the speed at which the operating shaft is rotated. On the selecting shaft 112 is loosely mounted a gear 114 meshing with a pinion 116 secured to the shaft 74 so that the gear 114 is rotated continuously in the direction of the arrow (Fig. 4) from the motor 8. The shaft 112 is provided with a crank portion 118 (see Figs. 6 and 8) surrounding which is a pitman consisting of a bearing block 120 through which is threaded a pair of rods 122, and a bearing cap 124 is secured to the block 120 by nuts 126 threaded to the ends of the rods 122 which pass through the cap 124. The rods 122 are headed at their outer ends and support flanged sleeves 128 and 130, the latter of which is threaded to a connecting rod 132 passing through the sleeve 128 and having a reduced end slidably mounted in the block 120. Between the flanged sleeves 128 and 130 is disposed a coil spring 134 to provide a yield between the rod 132 and the pitman when the high speed clutch is closed. The rod 132 is connected at its rearward end with the uppermost arms of a pair of similar levers 136 fulcrumed at 138 and each provided with a roll 140 at its lowermost end. When the selecting shaft 112 is in one position, the rolls 140 at the ends of the levers 136 engage a washer 142 secured to the pulley 14 to cause the intermediate shaft 16 to be held against the pressure of the spring 91 in a rearwardly position. When in this position, the clutch disk 38 is free of the intermediate driving pulley 18 and engages the high speed pulley 20. In another position of the selector shaft the rolls 140 are held away from the washer 142 and the intermediate shaft 16 is permitted to assume a position with

the disk 38 either in or out of contact with the intermediate speed pulley 18.

To cause the shaft 112 to be held selectively in either of the two angular positions referred to, there is provided a clutch cooperating with the gear 114 and an escapement comprising two latches 144 and 146 mounted on stationary pins 148. Cooperating with the latches is a pawl 150 secured to one end of a cylindrical block 152 rotatable in a clutch disc 154 which is keyed to the shaft 112 (see Fig. 8) and is provided with a cylindrical portion projecting into a ring 156 secured to the gear 114. The end of the block 152 which projects through the cylindrical portion of the clutch disc 154 is partly cut away and is arranged to cooperate with recesses in the ring 156 (see Figs. 9 and 10), the arrangement being such that when the block is rotated to a position with its cut away portion facing outwardly, the clutch disc 154 remains stationary while the gear 114 rotates and when the block 152 is turned somewhat in the disc 154, it engages the end of one of the recesses in the ring 156 to cause rotation of the clutch disc 154 and selector shaft 112. When the latch 144 cooperates with the pawl 150 the selector shaft 112 is held in a position in which the intermediate speed driving mechanism may operate and when the latch 146 cooperates with the pawl 150, the shaft 112 is held in the position in which the high speed driving mechanism is rendered operative. To hold the block 152 yieldingly in a position for driving the selector shaft, there is a spring 158 connected between the pawl and the clutch disc 154 and the clutch disc is held from reverse movement after being stopped by a spring pressed finger 160 pivoted on the upper pin 148 and arranged to engage either of a pair of oppositely disposed notches 162 when the shaft 112 stops. The latches 144 and 146 are controlled by a rod 163 pivotally connected between the latches and a rod 164 connected between the latch 144 and one arm of the bell crank lever 86. When the treadle is depressed after the clutch disk 38 is moved against the intermediate speed driving pulley 18, the latch 144 is moved away from the pawl 150 and the shaft 112 is rotated 180 degrees until the pawl 150 engages the latch 146. The high speed driving mechanism is then thrown into operation and continues in operation until the treadle is released.

To avoid the sudden strain of abruptly stopping the machine after the high speed driving mechanism has been operative, the intermediate speed driving mechanism is first thrown into operation briefly after releasing the foot treadle before the low speed driving and braking mechanism becomes operative in order to quickly reduce the speed of the operating shaft. The selector shaft 112 is provided with a cam 166 and the lever 86 is provided with an upwardly extending arm having a roll 168 which, when the selector shaft is in high speed running position, does not permit the treadle to be moved immediately to its highest raised position, the roll 168 engaging the cam 166 to hold the treadle actuated connections in intermediate speed running position until the selector shaft has rotated through the first part of its movement. Thereafter the treadle actuated connections are shifted to fully raised positions and the lock bolt 58 is raised to cause the low speed driving and braking mechanism to come into operation.

The general operation of the driving and stopping mechanism will be apparent from Figures

1 to 6. Starting with the machine at rest, when the treadle 36 is depressed, the cam block 108 is raised, the lever 102 rotated in a clockwise direction, as indicated in Figure 4, and the lock bolt 58 withdrawn from the opening in lever 54 so that the low speed driving and braking mechanism is rendered inoperative. The intermediate speed driving clutch is then closed, the central disk 38 being moved into contact with the low speed driving pulley 18, as indicated in Figures 5 and 6, to start the machine. To vary the speed of the machine, the pressure of contact between the clutch disk and the pulley 18 is changed by the pressure applied to the treadle 36. Upon depressing the treadle further, the spring 91 is compressed and the latch 144 is finally withdrawn from engagement with the pawl 150. The selector shaft 112 is then rotated through 180 degrees until the pawl 150 strikes the latch 146 which has been moved to operative position when the latch 144 disengaged the pawl 150. When the selector shaft has reached the new rotary position, the crank 118, the pitman and the lever 136 cause the intermediate shaft 16 to be moved rearwardly compressing the spring 91 still further and causing the intermediate speed clutch to be opened and the high speed clutch to be closed, as illustrated in Figure 4. The machine is thus operated at high speed. When the treadle is released, the treadle connections raise the latch 146 sufficiently to clear the pawl 150 and again shift the latch 144 into the path of the pawl. The treadle is prevented from immediately reaching its highest raised position by the roll 168 which strikes the cam 166 so that the intermediate speed clutch is again held closed by the partially depressed treadle for a short interval while the selector shaft is rotating to its original position. This short closing of the intermediate speed clutch causes the speed of the operating shaft 36 to quickly be reduced after running at high speeds. The cam 166 also holds the lock bolt 58 lowered during this short interval and the low speed driving and braking mechanism is therefore held inoperative. After the high part of the cam 166 has passed the roll 168, the treadle is released so that it may rise to its highest position and the intermediate speed clutch may open, the clutch disk 38 assuming a position between the intermediate and high speed pulleys. At the same time the lock bolt 58 is released so that it may enter the opening in the lever 54 and the low speed driving and braking mechanism operates to reduce the speed of the operating shaft and bring it to rest in the desired position.

As has been stated, the machine is provided with means for rendering its use more convenient for operators of different heights, than previous McKay type machines, the machine being raised or lowered by regulating a jack screw 170 (see Figs. 11 and 12). The jack screw is threaded to a nut 172 secured in the main frame 4 of the machine and engages with its lower end a horizontal portion of the base 6. In order to guide the vertical movement of the frame there are bolted to opposite sides of the base 6, guide plates 174 having opposed surfaces between which the frame slides and vertical guideways 176. In the guideways 176 are slidably mounted rectangular blocks 178 into each of which the threaded end of a clamp bolt 180 enters. The guide plates are also provided with ribs 182 disposed in guideways 184 in the

main frame. When the bolts 180 are tightened, the frame is securely held in place at the position to which it is raised by the jack screw. To maintain the proper tension on the motor driven belt 10 when the machine is raised or lowered the motor 8 is bolted to an angular support 186 slidable in vertical guideways 188 at the side of the base 6, not covered by a guide plate, and a lug on the support has threaded through it a second jack screw 189, the head of which is supported by a horizontal portion of the base.

To provide means for easily adjusting the driving belts and for the main driving means, together with the treadle controlled power actuated mechanism, the main driving means and the power actuated mechanism is supported on a bracket 190, best shown in Fig. 13, and is separable as a unit from the main frame 4 and the sewing devices carried thereby. The bracket 190 carries all of the bearings and pivots for the shafts and fulcrum points for levers directly connected with the driving means and power actuated mechanism, and is so arranged that upon disengaging the belts and disconnecting the treadle connections the bracket and its mechanism together may be removed from the machine. The bracket may also be adjusted vertically to impart the proper tension to the belts between the operating shaft and the driving means and is supported upon a vertical face 191 of the frame by bolts 192 arranged in slots in the bracket and threaded at their ends into the frame 4. To raise and lower the bracket, the uppermost portion of the bracket 190 carries vertical adjusting bolts 194 threaded in the bracket with their lowermost ends engaging the uppermost bolts 192 so that when the adjusting bolts are rotated the bracket will be moved toward or from the operating devices driven by the belts 22 and 24.

The improvements in the frame of the machine herein disclosed form the subject-matter of a divisional application for Shoe machine frames, filed July 30, 1941, Serial No. 404,681.

The nature and object of the invention having been indicated, and an embodiment of the invention having been specifically described, what is claimed is:

1. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising a plurality of different speed driving mechanisms, a brake for the driven shaft, a member vibrated by the driven shaft for actuating the brake to bring the driven shaft to rest at a predetermined stopping position, and manually controlled power actuated mechanism arranged when rendered operative to cause the driven shaft to be disconnected from one of the driving mechanisms and another driving mechanism to be connected and the vibrated member to be held inoperative to actuate the brake until both driving mechanisms are disconnected from the driven shaft.

2. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanism constructed to act as a friction brake when the main driving mechanism is thrown out of operation, and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, and power actuated mechanism for selectively rendering the high and intermediate speed driving mechanisms operative to drive the shaft.

3. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanism constructed to act as a friction brake when the main driving means is thrown out of operation and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, and mechanisms for selectively rendering the high and intermediate speed driving mechanisms operative to drive the shaft and, after the high speed driving mechanism drives the shaft, for preventing the low speed driving mechanism from operating until the intermediate speed driving mechanism is rendered operative.

4. A driving and stopping mechanism having, in combination, a driven shaft, main driving mechanism therefor comprising a friction clutch through which the shaft may be driven at varying speeds and a clutch through which the shaft may be driven at a different speed, a slow speed driving clutch constructed to act as a friction brake during stopping and then to drive the shaft at a reduced speed until a predetermined position of the shaft is reached, and a treadle and connections for controlling the clutches of the main driving mechanism and for rendering the slow speed driving clutch operative to drive the shaft when the clutches of the main driving mechanism are thrown out of operation.

5. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanisms constructed to act as a friction brake when the main driving mechanism is thrown out of operation, and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, a treadle and connections for rendering either the high or the intermediate speed driving mechanism operative or inoperative to drive the shaft, and for rendering the low speed driving mechanism operative in stopping when the main driving means is rendered inoperative.

6. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanism constructed to act as a friction brake when the main driving mechanism is thrown out of operation, and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, a treadle and connections for rendering either the high or the intermediate speed driving mechanism operative or inoperative to drive the shaft, for rendering the low speed driving mechanism operative in stopping when the main driving means is rendered inoperative, and for rendering the intermediate speed driving mechanism operative before the low speed driving mechanism is rendered operative in stopping after the shaft is driven by the high speed driving mechanism.

7. A driving and stopping mechanism having, in combination, a driven shaft, a main driving mechanism therefor comprising a friction clutch through which the shaft may be driven at a varying intermediate speed and a clutch through which the shaft may be driven at a high speed, a slow speed driving clutch constructed to act as a friction brake during stopping and then to drive the shaft at a reduced speed until a predetermined position of the shaft is reached, and a treadle and connections for rendering either

clutch of the main driving mechanism operative and inoperative to drive the shaft, for rendering the low speed driving clutch operative to drive the shaft in stopping when the clutches of the main driving mechanism are rendered inoperative, and for rendering the intermediate speed clutch operative before the low speed clutch is rendered operative in stopping after the shaft is driven by the high speed clutch.

8. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, power actuated mechanism, a foot treadle for controlling the power actuated mechanism arranged, when in one of two depressed positions, to render either the high or the intermediate speed driving mechanisms selectively operative, a brake for the driven shaft, and a member vibrated by the driven shaft for actuating the brake to bring the driven shaft to rest at a predetermined stopping position, and connections controlled by the foot treadle for rendering the vibrated member inoperative to actuate the brake when either driving mechanism is connected to the driven shaft.

9. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanism constructed to act as a friction brake when the main driving means is thrown out of operation and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, power actuated mechanism, a foot treadle for controlling the power actuated mechanism to render either the high or the intermediate speed driving mechanisms operative, and connections between the low speed driving mechanism and the treadle for preventing operation of the low speed driving mechanism when the treadle is depressed.

10. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanism constructed to act as a friction brake when the main driving means is thrown out of operation and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, power actuated mechanism, a foot treadle for controlling the power actuated mechanism to render either the high or the intermediate speed driving mechanisms operative, connections for preventing operation of the low speed driving mechanism when the treadle is depressed, and means for actuating the connections to hold the low speed driving mechanism inoperative while the main driving means is operative.

11. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, low speed driving mechanism constructed to act as a friction brake when the main driving means is thrown out of operation and then to drive the shaft at a reduced speed until a predetermined position of said shaft is reached, power actuated mechanism, a foot treadle for controlling the power actuated mechanism to render either the high or the intermediate speed driving mechanisms operative, connections for preventing actuation of the low speed driving mechanism when the treadle is depressed, and means operated by said power actuated mechanism for holding the treadle

depressed, for a predetermined period of time and for rendering the intermediate speed driving mechanism operative after the shaft is driven by the high speed driving mechanism.

12. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving mechanisms, power actuated mechanism, a foot treadle for controlling the power actuated mechanism to render either the high or the intermediate speed driving mechanisms selectively operative, said power actuated mechanism including a clutch, a driving mechanism selector shaft arranged to be actuated by the clutch to a plurality of different angular positions, in one of which operation of the high speed driving mechanism is effected and in another of which operation of the intermediate speed driving mechanism is effected, a brake for bringing the driven shaft to rest in a predetermined angular position, and connections controlled by the foot treadle to prevent the brake from being actuated when the high or intermediate speed mechanism is operated.

13. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising a plurality of different speed driving mechanisms, power actuated mechanism including a clutch and a driving mechanism selector shaft arranged to be actuated by the clutch to a plurality of different angular positions, in one of which operation of one driving mechanism is effected, and in another of which operation of another driving mechanism is effected, a foot treadle for controlling the clutch to move the shaft to either of the two angular positions, a brake for bringing the driven shaft to rest in a predetermined angular position, and connections controlled by the foot treadle to prevent the brake from being actuated when either of the driving mechanisms is operative.

14. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising a plurality of different speed driving mechanisms, power actuated mechanism including a clutch and a driving mechanism selector shaft arranged to be actuated by the clutch to a plurality of different angular positions, in one of which operation of one driving mechanism is effected, and in another of which operation of another driving mechanism is effected, a foot treadle for controlling the clutch to move the selector shaft to either of the two angular positions, yielding connections actuated directly by the treadle when the treadle is depressed or released for causing any driving mechanism to be rendered operative or inoperative, respectively, a brake for bringing the driven shaft to rest in a predetermined angular position, and connections controlled by the foot treadle to prevent the brake from being actuated when either of the driving mechanisms is operative.

15. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising a plurality of mechanisms for driving the shaft at different speeds, a foot treadle, direct mechanical connections between the treadle and one of the mechanisms for causing rotation of the shaft at one speed when the foot treadle is partially depressed, power actuated mechanism controlled by the foot treadle for rendering another of said mechanisms operative to drive the shaft when the foot treadle is further depressed, a brake for bringing the driven shaft to rest in a predetermined angular position,

and connections controlled by the foot treadle, when depressed partially, to prevent the brake from being actuated.

16. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising a plurality of clutches arranged when rendered operative to rotate the shaft at different speeds, a foot treadle, connections between one of the clutches and the foot treadle for causing operation of the shaft at one speed when the treadle is partially depressed, and power actuated mechanism for opening the first mentioned clutch and closing another clutch to cause operation of the shaft at a higher speed when the foot treadle is further depressed and for again closing said first mentioned clutch when the treadle is released to cause the first mentioned clutch to act as a friction brake before again driving the shaft.

17. A driving and stopping mechanism having, in combination, a driven shaft, a plurality of mechanisms for driving the shaft at different speeds, a driving mechanism selector shaft, a clutch for driving the shaft, an escapement comprising a plurality of latches for controlling the clutch to cause the selector shaft to stop in any of a plurality of positions, and a foot treadle connected to the latches to move first one and then another out of stopping position as the treadle is depressed or released.

18. A driving and stopping mechanism having, in combination, a driven shaft, a plurality of mechanisms for driving the shaft at different speeds, a driving mechanism selector shaft, a clutch for driving the shaft, an escapement comprising a plurality of latches for controlling the clutch to cause the selector shaft to stop in any of a plurality of positions, a foot treadle connected to the latches for moving first one and then another out of stopping position as the treadle is depressed or released, and connections between one of the driving mechanisms and the treadle for causing said driving mechanism to become

operative when the treadle is first depressed, and to become inoperative to drive the shaft when the treadle is released.

19. A driving and stopping mechanism having, in combination, a driven shaft, main driving mechanisms therefor comprising a pair of clutch disks, and a central disk between said pair, a foot treadle for moving said central disk into contact with one of said pair, and power actuated mechanism under the control of the foot treadle for moving the central disk into contact with the other of the pair.

20. A driving and stopping mechanism having, in combination, a driven shaft, main driving mechanisms therefor comprising a pair of clutch disks, and a central disk between said pair, a foot treadle, connections including a yielding member for moving the central disk into contact with one of the pair of disks when the treadle is partially depressed, and power actuated mechanism under the control of the foot treadle for moving the central disk into contact with the other of the pair of disks and against the force of the yielding member when the treadle is further depressed.

21. A driving and stopping mechanism having, in combination, a driven shaft, main driving means therefor comprising high and intermediate speed driving clutches, a low speed driving clutch, actuating means therefor constructed to cause the low speed clutch to act as a friction brake when the main driving mechanism is thrown out of operation and then to drive the shaft at a reduced speed until a predetermined position of the shaft is reached, a foot treadle, connections including a yielding member for closing the intermediate speed clutch and power actuated mechanism under the control of the foot treadle for opening the intermediate speed clutch and closing the high speed clutch against the force of the yielding member.

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