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DRIVING MECHANISM

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1,175,894.

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Fig. 3

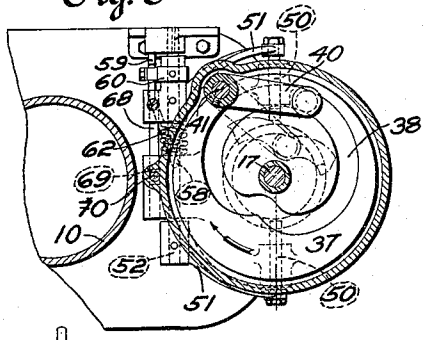

Fig. 2

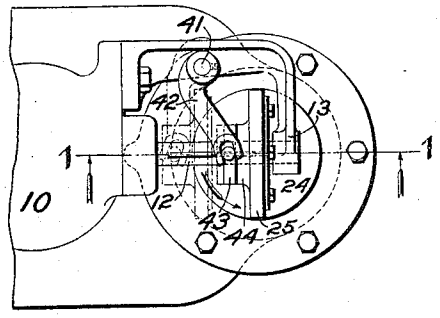

Fig. 1

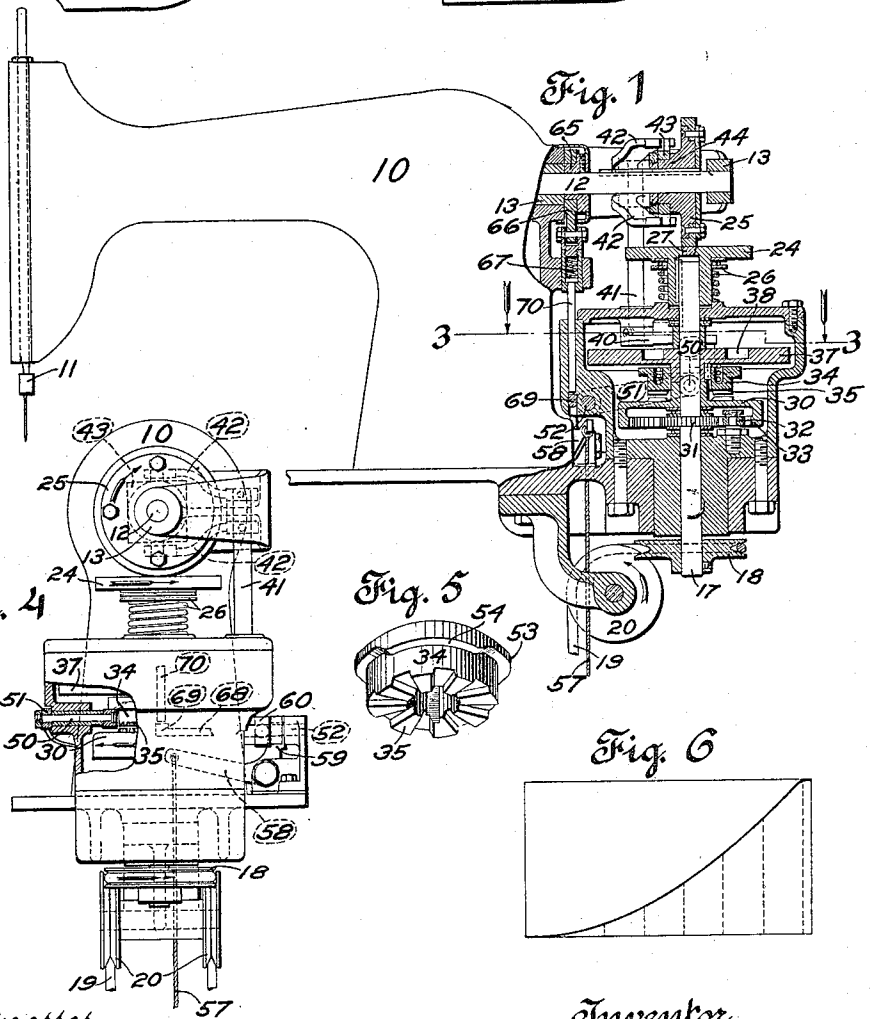

Fig. 4

Fig. 5

Fig. 6

Witnesses,

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UNITED STATES PATENT OFFICE.

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DRIVING MECHANISM.

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To all whom it may concern:

Be it known that I, AUGUST R. SCHOENKY, a citizen of the United States, residing at Somerville, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Driving Mechanisms, of which the following is a specification, reference being had therein to the accompanying drawing.

This invention relates to driving mechanisms, and more particularly to mechanisms adapted to be used on light sewing machines or various other power driven machines for controlling the starting and stopping thereof.

The main object of the present invention is that the motion of the power shaft or analogous driving members, such as driving belt or pulley, which driving member may be supposed to be running continuously and steadily at high speed, may be effectively transmitted to a driven shaft, such as the main operating shaft of the machine, with adaptability to adjustment of the transmitting means so as to cause the driving or stoppage of the machine at suitable times and in a manner without shock or noise.

Another object hereof is to secure in an effective manner a stoppage of a sewing machine or other analogous machine having reciprocating needles or parts in such manner as to invariably leave the reciprocating parts in a predetermined definite position, for example, with needle disengaged from work.

Other and more specific objects will appear in the hereinafter following description of one illustrative embodiment of this invention.

To the attainment of the objects referred to this invention comprises the novel features of combination, arrangement, mechanism, device and details herein illustrated and described.

In the accompanying drawings forming a part hereof, Figure 1 is a front elevation, largely in section upon the plane 1—1 of Fig. 2, of a light type of high speed power driven sewing machine constructed in accordance with the principles of the present invention. Fig. 2 is a top plan view of the novel portions of Fig. 1. Fig. 3 is a horizontal section upon the plane 3—3 of Fig. 1. Fig. 4 is a right end elevation partly broken away. Fig. 5 is a perspective view of a clutch member, seen in Fig. 1. Fig. 6 is a diagram showing the preferred rate of speed change in the act of stopping or starting the machine.

The same reference numerals designate corresponding elements in the several figures.

The illustrative machine herein, being a sewing machine, may have the usual head 10 carrying at its overhanging portion a needle bar 11, and the needle mechanism may be driven by the main or operating shaft 12 having suitable bearings at 13 in the head or extension thereof. The complete connections between the main shaft and the needle bar are omitted, but they will be well understood by those skilled in the art, and the necessary further coöperating mechanism and adjuncts for manipulating and controlling the thread, the tensions, etc., will be understood, they being omitted herefrom because *per se* constituting no part of the present improvement.

The novel mechanism hereof may be said to comprise two kinds of operative parts, namely, the driving parts, which continuously rotate whether or not the machine operates, and the driven parts, which rotate only when the machine is operated, and come to rest with the stoppage of the machine. The driving elements hereof include what may be termed the power or driving shaft 17, belt pulley 18 thereon, and driving belt 19. It being desired to drive the machine from a power pulley located near the floor, the driving belt is shown as extending vertically upward, and thence passing around a pair of idle pulleys 20 and thence horizontally to the pulley 17, thereby enabling the driving shaft 17 to be placed in upright position for better coöperation in the manner hereinafter described with the horizontally arranged driven or motion shaft 12. The driven elements comprise the main shaft 12 and the operating parts connected therewith.

Transmission of power from the driving

to the driven shaft may be effected according hereto by what may be termed a variable speed transmitter. By this term it is intended to include any transmission device which, unlike a mere clutch, has not only a normal driving adjustment and a non-driving adjustment, but one or more intermediate adjustment for effecting transmission of power at reduced speed. I very much prefer for this purpose to employ a variable speed transmitter which, through its adjustments, is constantly operatively connected, so that in adjusting from full speed to zero or stopping position there is constant driving control through an infinite number of intermediate adjustments.

The face friction type of variable speed transmitter is chosen for illustration, this, as herein illustrated, comprising the rotary disk 24 connected to the driving shaft 17 and engaged by the friction wheel 25 connected with the driven shaft 12. Each of these engaging elements, the disk and wheel, is shown keyed to its shaft to permit of longitudinal movement. A spring-pressed thrust bearing device 26 tends to hold the disk 24 in driving contact with the wheel 25, and the latter by its axial adjustment is capable of being shifted across the face of the disk from the center to the periphery of the latter, and vice versa. The wheel and disk are properly faced with friction material such as alloy and fiber, so that, when the wheel is at the periphery of the disk, it is frictionally driven at high speed. The speed gradually reduces through all intermediate speeds as the wheel is adjusted toward the center of the disk, and at the center I preferably provide a block of frictionless material 27 to minimize wear when the machine is out of operation. While such variable speed transmitter might in some cases be employed for driving at various speeds by providing for different adjustments, it is herein shown as employed solely for the purpose of effecting driving at full speed and effecting stoppage of the machine. It will be understood that, as the wheel moves centrifugally across the disk, a constant acceleration is produced, and conversely centripetal adjustment of the wheel effects a steady retarding of the machine, so that the instrument serves not only for reducing the driving action, but for retarding the momentum of the parts, thus dispensing with any further or other braking device.

According hereto, the adjustment of the variable speed transmitter from full speed to stop position, or vice versa is effected, not manually, but automatically, the actual shifting being caused from some running part of the machine. A driven element, such as the main shaft, might be employed for adjusting the variable speed gear to effect stoppage, but could not serve for restarting, and in the preferred embodiment of this invention I employ a constantly rotating element in train with the driving shaft for effecting both of the adjustments of the variable speed transmitter, this being done under suitable control, such as manual control.

The train of connections from the driving shaft for shifting the wheel 25 will now be described, it being understood that those connections are not constantly engaged and, in fact, are normally disengaged, becoming engaged only at suitable points of time, for example, at the will of the operator, when the friction wheel is to be shifted from full speed to stopping position or vice versa. The connections include first a pair of clutch members, then a cam and follower, then a rock shaft and yoke. Engagement of the clutch members causes the yoke to shift the friction wheel. Clutch member 30 is not directly connected to driving shaft 17, but loosely surrounds the shaft and is turned one revolution by each two revolutions of the shaft by pinion 31 on the shaft and idle pinion 32 engaging interior gear 33 on clutch member 30. Proper thrust bearings are supplied at different points to keep the shaft and other parts in position. The opposing or upper clutch member 34 is adapted to be engaged with and disengaged from the first or lower clutch member by vertically shifting. The upper member is provided with teeth 35 at its lower side (see Fig. 5), and the lower clutch member has corresponding teeth. The upper clutch member is keyed to the controlling cam member 37 or, rather, to the depending sleeve portion thereof. A coiled spring is interposed between the parts 34 and 37 tending to hold the former down in engagement with the lower clutch member. The cam member 37 has a cam groove 38 in its upper side engaged by a following means. Preferably a single follower is employed in the form of a roller stud at the extremity of a rock arm 40, and the cam preferably is continuous, having one portion for throwing the follower out to move the friction wheel toward the center of the disk and another portion for the reverse thereof. As seen in Fig. 3, the cam groove is of a generally heart-shape, consisting of a pair of opposed spirals. The rock arm 40 is at the foot of a rock shaft 41 and at its upper end the rock shaft has a second rock arm 42 in the form of a yoke, whose upper and lower arms straddle and engage with a ring 43, which in turn is engaged in a groove formed in the hub 44 of the friction wheel 25, the hub and wheel being keyed to the driven shaft 12, as seen in Fig. 1.

The parts are shown in their position when the machine is stopped, the stud of

rock arm 40 being in the outward portion of cam groove 38 and the friction wheel at the center of the disk. Now, if the cam 37 should make a half turn, the rock arm would swing inward to the dotted position (Fig. 3), and this would shift the friction wheel to the left, causing the periphery of friction disk to drive it. Therefore, it is only necessary to turn the cam a half revolution to readjust the machine from stopping to running position or vice versa. The engagement of the clutch members 30, 34, will effect the automatic rotation of the cam.

Next will be described the control of the clutch members, namely, their engagement to rotate the cam and their disengagement after a half revolution. For controlling the engagement and disengagement of the clutch members 30 and 34, any suitable means may be employed operated, for example, by treadle. Such treadle-operated controlling means may be in the nature of an escapement such that, whenever the treadle is depressed, the clutch members are engaged only to be automatically disengaged after a half revolution, the lifting of the treadle permitting a second engagement and half revolution, each half revolution being followed by a disengagement of the clutch members. Thus, a pair of opposed escapement pins 50 are shown mounted to slide radially and carried on supporting arms 51 secured to a sliding rod 52, by which the pins are moved. The upper clutch member 34 is provided with a flange 53 having at one portion a downstanding cam surface 54. The flange 53 rests upon one or the other of the pins 50, and is held up by them against the resistance of the spring which tends to hold down the clutch member 34. The purpose of the cam surface 54 is to cause the lifting of the clutch member 34, and, therefore, its disengagement from the clutch member 30 whenever the cam surface 54 rides upon one of the pins 50. As the parts are shown, the front pin 50 is supporting the clutch member and holding it out of engagement. If the rod 52 be shifted forward, the front pin will be withdrawn from operative position and the rear pin thrust into operative position. The front pin thereby releases the clutch member 34, which drops into engagement with the under clutch member, thereupon rotating with the latter for a half revolution, when the cam surface 54, riding upon the rear pin, again elevates the upper clutch member, which disengages the latter and comes to rest.

The operating treadle or lever is indicated by the treadle rope 57, which is attached to the forwardly extending arm 58 of a bell crank lever, whose upright arm 59 is adapted to move forwardly and rearwardly and engages a collar 60 on the slide rod 52. By this arrangement the depression of the treadle throws forwardly the slide rod and the escapement pins 50, 50, thereby permitting the clutch members to engage for a half revolution, which serves to shift the cam 37 a half revolution, which in turn serves to shift the rock arm 40 from its full line to its dotted line position in Fig. 3, thereby shifting the friction wheel from the center to the periphery of the friction disk and causing the starting of the machine. Upon the release of the treadle, a spring 62, acting upon the collar 60, restores the slide rod 52, thereby permitting another half revolution of the cam 37, which again becomes stationary at the position shown in all the figures with the friction wheel at the center of the disk.

As already explained, the shifting of the friction wheel across the disk effects acceleration in starting and retardation in stopping the machine. Therefore, change of driving power is accompanied, in the case of stopping the machine, by a proper retarding action, so that the parts are brought easily and definitely to rest. By employing a cam, namely the cam 37, in the connections which adjust the transmitter, I am enabled to govern the precise mode of stopping and starting. Thus, instead of forming the cam groove 38 as a true spiral with uniformly increasing radii, I prefer to so shape the curve that, in starting the machine, the rate of speed increase is first low and then higher, while in stopping the speed decrease is first rapid and slows up toward the final stopping point. This action is represented by the diagram, (Fig. 6), in which the curve shows by the ordinals thereof the speed changes, either in starting or stopping, the cam groove 38 being shown symmetrical. To insure the stoppage of the needle in the proper position I have shown a guard device which prevents the transmitter adjusting connections from being closed except at the proper point in the stitch cycle. This guard device includes an eccentric 65 on the main shaft 12 and an eccentric strap 66 surrounding the same and connected by a resilient device 67 with the guard rod 70. It will be understood that the guard rod thereby reciprocates vertically during the operation of the machine. The slide rod 52, which is horizontal, carries a lock rod 68 which has an upstanding offset 69 capable of engaging in front of the lower end of the guard rod 70, so that the lock rod 68 and the slide rod 52 can only move rearwardly during the periods when the guard rod is raised and the lock rod thus released. The eccentric 65 is so timed that the guard rod releases the slide rod at the proper point in the revolution of the main shaft, so that the action of the transmitter adjusting connections will

always be to bring the machine to a stop with the needle out of the work, the amount of rotation of the shaft 12 during the stoppage of the machine being definitely known.

The operation of the described machine is merely that a light depression of the treadle serves to couple the clutch long enough to give a half revolution to the cam, thus adjusting the transmitter to a full speed position where it remains, owing to the unclutching of the clutch members until, at the will of the operator, upon the release of the treadle, the clutch members are permitted to reëngage to restore the cam, thereby effecting the stoppage of the machine with the friction wheel at the center of the disk and the clutch members again disengaged. As the parts are designed, a half revolution of the cam 37 or one complete revolution of the shaft 17 will effect the stoppage.

It will thus be seen that there has been described a driving mechanism embodying the advantages and attaining the objects hereof, and other advantages will be apparent to those skilled in the art. Since many matters of design, arrangement, combination and detail may be varied without departing from the described principles, no limitations to features are intended excepting so far as set forth in the appended claims.

What is claimed is:

1. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, and connections actuable from one of the constantly running driving parts for adjusting said transmitter.

2. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, a clutch included in said connections, and means for closing the clutch at suitable times and for opening it.

3. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, a clutch included in said connections, and means for closing the clutch at suitable times and means for automatically opening the clutch when a predetermined transmitter adjustment is attained.

4. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter a clutch included in said connections, and means for closing the clutch at suitable times and means for automatically opening the clutch when either zero or working speed is attained.

5. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, said connections including a rotary device or cam shiftable to one position for starting the machine, and shiftable in the same direction to a second position for stopping the machine.

6. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, said connections including a rotary device or cam shiftable to one position for starting the machine, and shiftable in the same direction to a second position for stopping the machine, means for rendering said connections and rotary device operative at suitable times to cause transmitter adjustment, and means for auto-

matically rendering the same inoperative after effecting such adjustment.

7. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, said connections including a rotary device or cam shiftable to one position for starting the machine, and shiftable in the same direction to a second position for stopping the machine, and means whereby upon stoppage the driven shaft comes to rest in a definite predetermined position.

8. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a constantly-engaged-variable-speed-transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter to or from zero adjustment.

9. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a constantly-engaged-variable-speed-transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter to or from zero adjustment, and means whereby upon stoppage the driven shaft comes to rest in a definite predetermined position.

10. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a constantly-engaged-variable-speed-transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter to or from zero adjustment, and means whereby upon stoppage the driven shaft comes to rest in a definite predetermined position, including a to-and-fro moving guard actuated from one of the driven parts.

11. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, said connections including a rotary endless device or cam operative intermittently always in the same direction and having portions corresponding to full speed and zero speed respectively.

12. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, said connections including a rotary endless device or cam operative intermittently always in the same direction and having portions corresponding to full speed and zero speed respectively, said rotary device shaped to produce gradual and easy stopping and starting action.

13. In a power operated machine, a driving train of parts including a driving shaft, a driven train including a driven shaft, a variable speed transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter, said connections including a rotary endless device or cam operative intermittently always in the same direction and having portions corresponding to full speed and zero speed respectively, and automatic means to render the rotary device inoperative when the transmitter device is reversed.

14. In a power operated machine, a driving train of parts including a vertical driving shaft, a driven train including a horizontal driven shaft, an adjustable face friction transmitter the members of which constitute respectively parts of the driving and driven trains whereby while the driving shaft is constantly running the driven shaft may be running or not according to the adjustment

of the transmitter, connections actuable from one of the constantly running driving parts for adjusting said transmitter either to full speed or zero position, and a controller operable at suitable times, as at will, for causing said connections to become operative.

In testimony whereof, I have affixed my signature in presence of two witnesses.

AUGUST R. SCHOENKY.

Witnesses:
F. A. SHEA,
DONALD CAMPBELL.