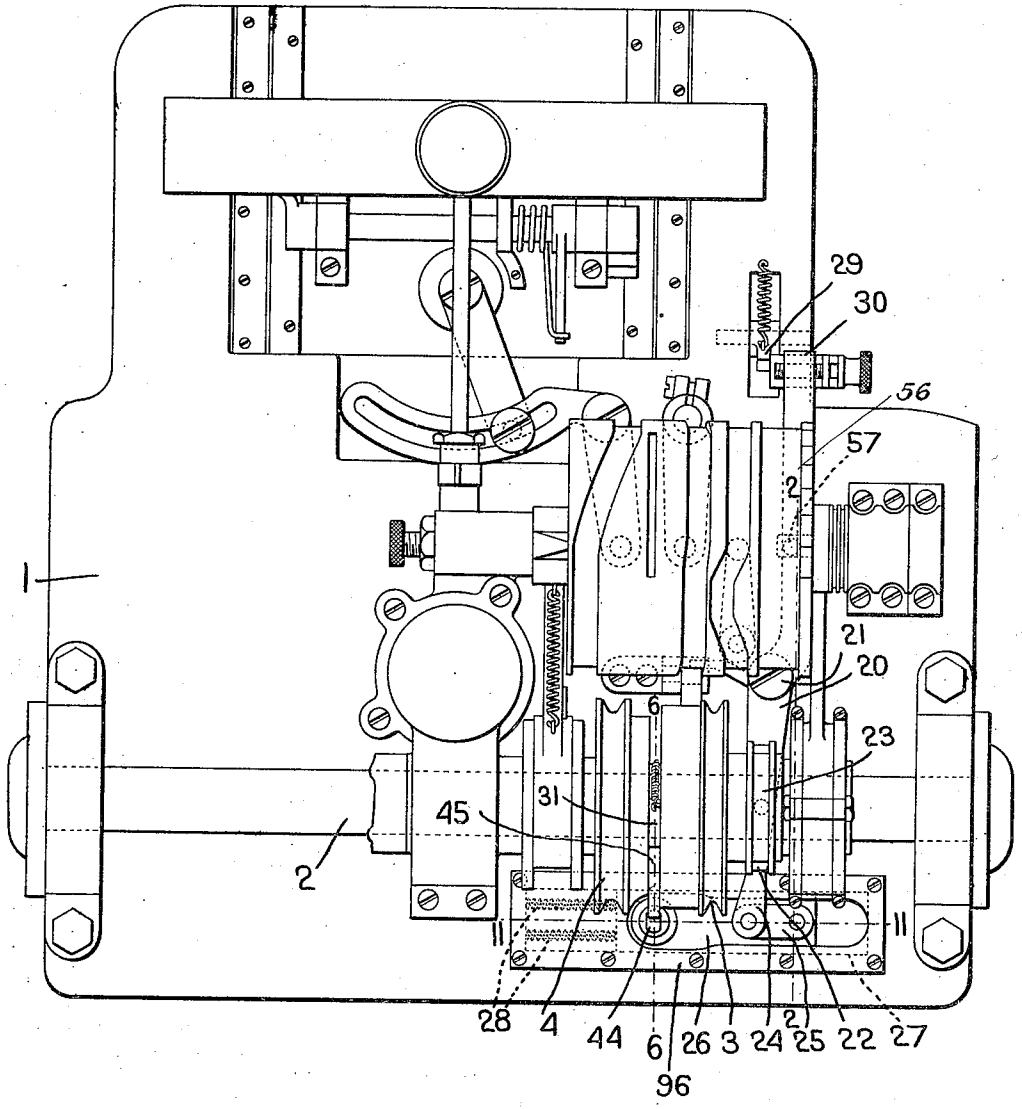
Oct. 1, 1929. F. A. REECE 1,730,014

DRIVING AND STOPPING MECHANISM

Original Filed June 3, 1924 5 Sheets-Sheet 1

Fig. 1.



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Oct. 1, 1929. F. A. REECE 1,730,014

DRIVING AND STOPPING MECHANISM

Original Filed June 3, 1924 5 Sheets-Sheet 2

Fig. 2.

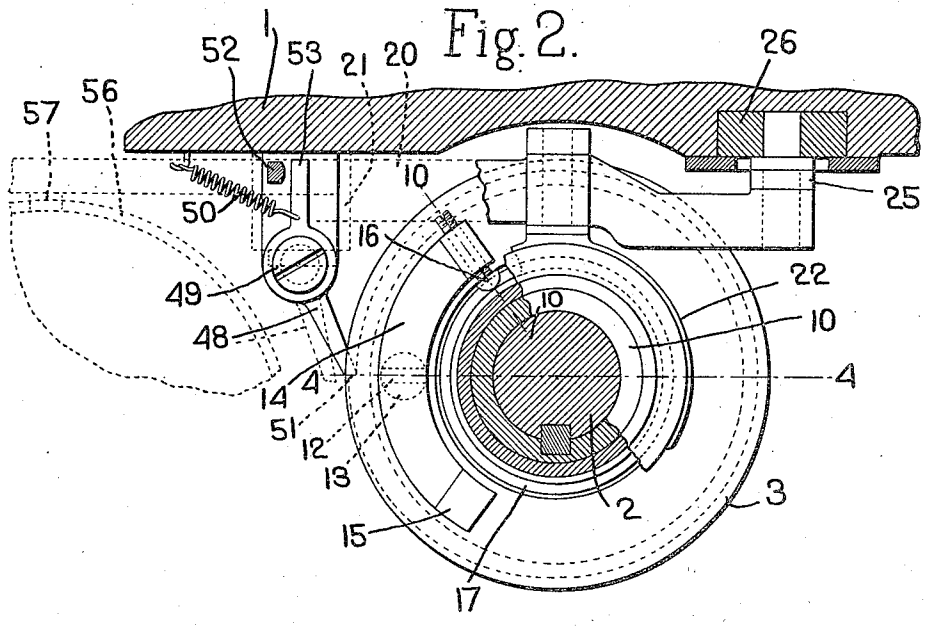


Fig. 3.

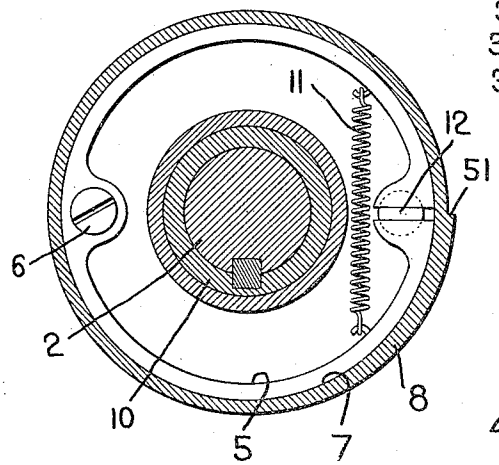
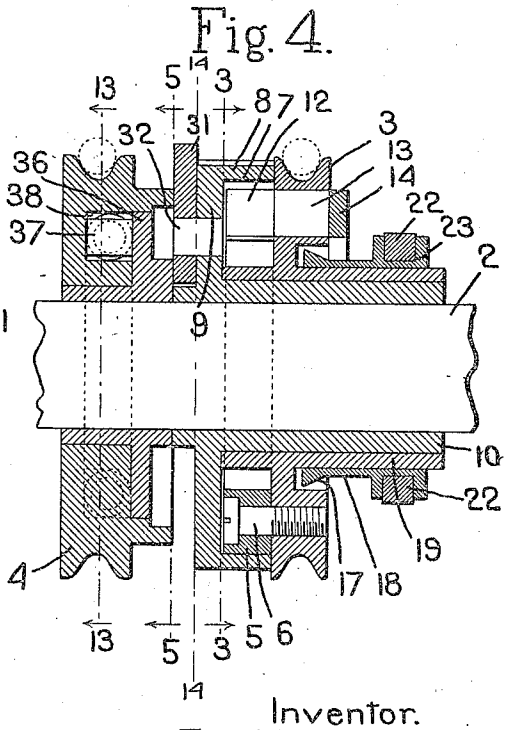


Fig. 4.



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DRIVING AND STOPPING MECHANISM

Original Filed June 3, 1924 5 Sheets-Sheet 3

Fig. 5.

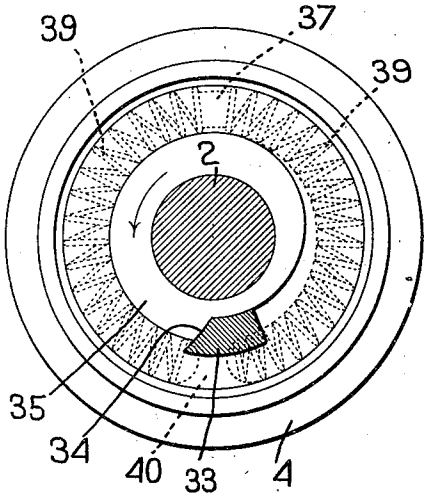


Fig. 6.

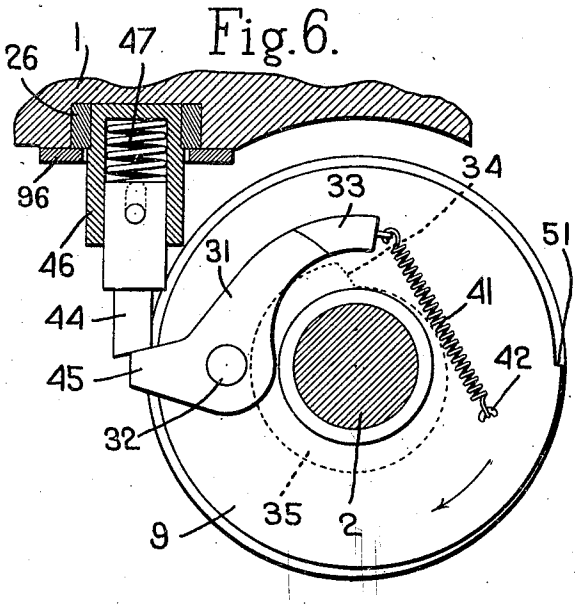


Fig. 7.

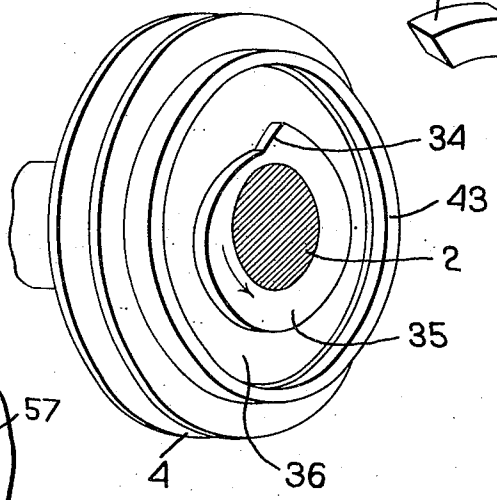


Fig. 8.

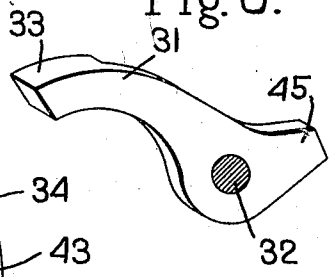
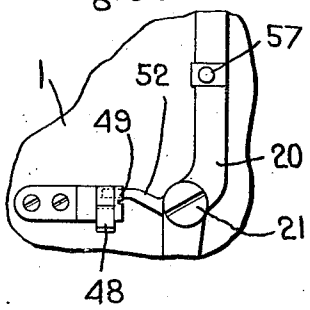


Fig. 9.



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DRIVING AND STOPPING MECHANISM

Original Filed June 3, 1924 5 Sheets-Sheet 4

Fig. 10.

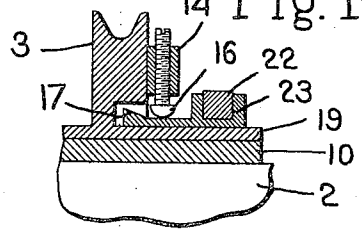


Fig. 11.

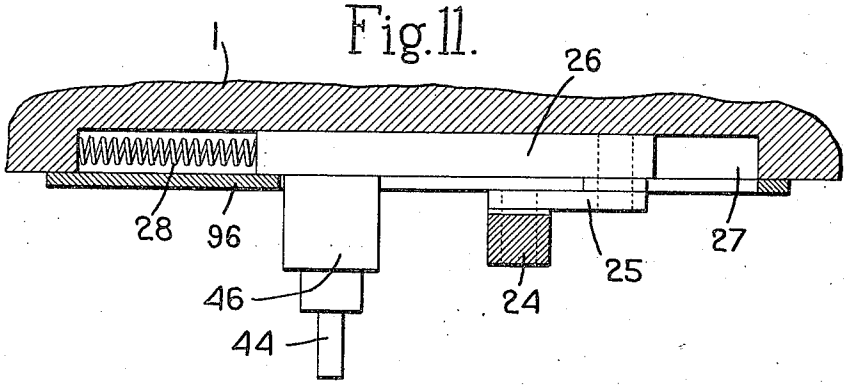
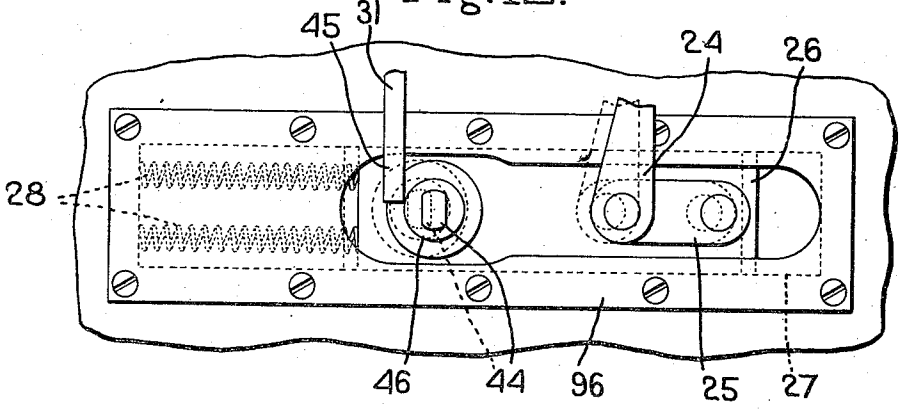


Fig. 12.



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Oct. 1, 1929. F. A. REECE 1,730,014

DRIVING AND STOPPING MECHANISM

Original Filed June 3, 1924 5 Sheets-Sheet 5

Fig. 13.

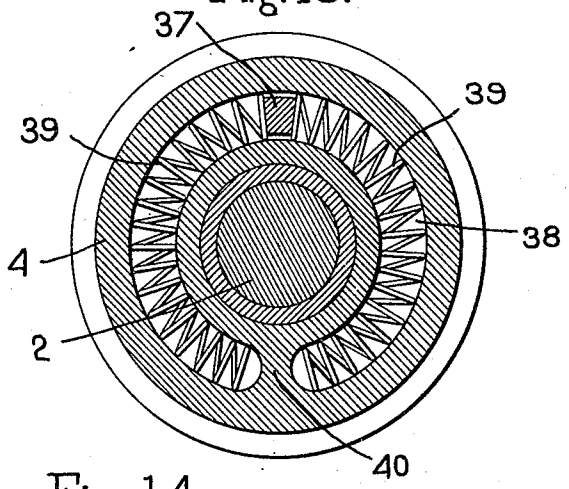


Fig. 14.

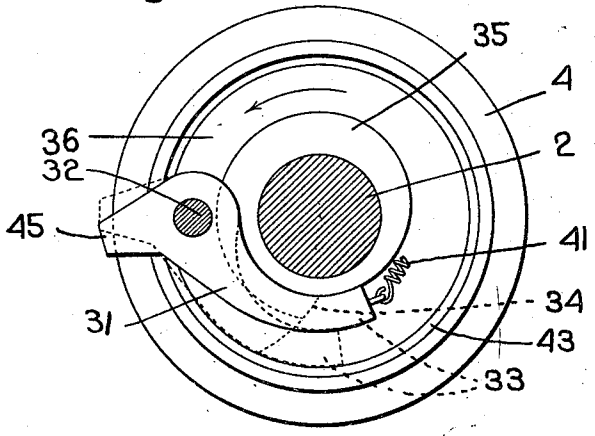
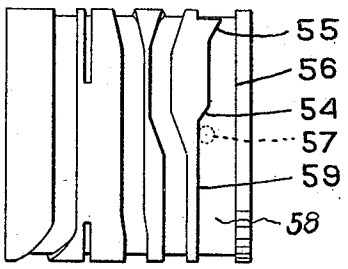


Fig. 15.



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UNITED STATES PATENT OFFICE

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DRIVING AND STOPPING MECHANISM

Original application filed June 3, 1924, Serial No. 717,643. Divided and this application filed June 10, 1925. Serial No. 36,262.

This invention relates to a driving and stopping mechanism which is specially designed to be used in connection with machines that normally operate at high speed, one purpose of the invention being to provide a driving and stopping mechanism by which a machine operating at high speed can be brought to rest with an easy cushioned movement and with the parts in a predetermined position.

The device comprises two driving devices, a high speed driving device by which the machine is normally operated and a low speed driving device which is brought into action during the stopping of the machine. When the machine is to be stopped the high speed driving device is rendered inoperative and the machine will then continue movement by the momentum of its parts until its speed is reduced to that at which the low speed driving device is operated at which time the low speed driving device becomes active to positively drive the machine at the low speed and to continue such positive driving operation clear up to the instant of stopping.

During the final stopping movement, therefore, the machine is under absolute control as the positive drive is not released until the machine is actually stopped.

In order to give an understanding of my invention I have illustrated it as it might be applied to a sewing machine of the type shown in my Patent No. 1,343,278, dated June 15, 1920 and also shown in my co-pending application Serial No. 717,643, June 3, 1924, of which this is a division.

In the drawings, Fig. 1 is an under side view of a sewing machine such as illustrated in the above-mentioned patent, this view being chosen because it shows the driving connections;

Fig. 2 is an enlarged sectional view on substantially the line 2—2, Fig. 1;

Fig. 3 is a section on the line 3—3, Fig. 4;

Fig. 4 is a section on the line 4—4, Fig. 2;

Fig. 5 is a section on the line 5—5, Fig. 4;

Fig. 6 is a section on the line 6—6, Fig. 1;

Fig. 7 is a perspective view of the slow speed driving pulley;

Fig. 8 is a perspective view of the clutch dog for the slow speed driving clutch;

Fig. 9 is a fragmentary detail view of the dog which prevents rebound and its actuating mechanism;

Fig. 10 is a section on the line 10—10, Fig. 2;

Fig. 11 is an enlarged section on the line 11—11, Fig. 1;

Fig. 12 is a bottom plan view of Fig. 11;

Fig. 13 is a section on the line 13—13, Fig. 4;

Fig. 14 is a section on the line 14—14, Fig. 4;

Fig. 15 is a view of the main cam by which the stop motion is set in operation.

While the present invention may be used for driving and stopping a wide variety of different machines that are intended for high speed operation yet as stated above I have chosen to illustrate it as it would be embodied in a sewing machine such as illustrated in my Patent No. 1,343,278. Inasmuch, however, as the invention relates simply to the driving and stopping mechanism I have not thought it necessary to show the sewing machine in detail and have, therefore, illustrated herein only such parts of the sewing machine as are necessary to give an understanding of the invention.

In Fig. 1, 1 indicates an under side view of the bed of the sewing machine and 2 represents the main drive shaft by which the operative parts of the machine are actuated. The present invention relates to means for driving this shaft at a high speed and for stopping it at a predetermined point in its rotation but with an easy cushioned movement.

I have stated above that a device embodying my invention comprises a high speed driving device for driving the shaft 2 during the operation of the machine and a low speed driving device which is operative during the stopping of the machine. At the time that the machine is to be stopped the high speed driving device is disconnected from the shaft 2 and the latter continues to rotate by reason of the momentum of the parts of the machine but at a rapidly reduced rate of speed. As

soon as the speed of the machine is decreased to correspond to that at which the low speed driving device is operating then the latter will automatically act to positively drive the shaft 2 forward at a low speed until the shaft is brought to rest by the stopping mechanism, the positive low speed driving continuing up to the instant of stopping. The high speed driving device is herein shown in the form of a pulley 3 which is loosely mounted on the shaft and is adapted to be clutched thereto. The low speed driving device is also shown in the form of a pulley, the latter being indicated at 4, and suitable means being provided for clutching it to the shaft at the proper time when the machine is being stopped. The pulley 3 is rotating at a high speed while the pulley 4 rotates at a relatively low speed.

The clutch for clutching the high speed belt pulley 3 to the shaft is shown in Figs. 2, 3 and 4. This comprises an internal expanding clutch ring 5 which is mounted on a stud 6 carried by the pulley 3, and which is adapted to frictionally engage a friction surface 7 formed on the interior of a flange 8 of a member 9 which is fast to the shaft 2, said member having a hub 10 which is keyed to the shaft. The clutch member 5 is normally held in its contracted inoperative position by means of a spring 11, (see Fig. 3), and it is expanded into clutching engagement with the clutch surface 7 by means of a cam member 12 which is situated between the two ends of the clutch ring 5. This cam member 12 is mounted on a stud 13 that is carried by the pulley 3, said stud extending through the pulley. The stud has rigid therewith a lever 14 which is counterweighted at 15 and which is provided at one end with an adjustable projection in the form of a screw 16, the head of which is adapted to engage a conical surface 17 on a clutch-actuating sleeve 18 that is slidably mounted on the hub 19 of the pulley. When the sleeve is moved to the right (Figs. 4 and 10) the engagement of the conical face 17 with the stud or projection 16 will swing the lever 14 thereby turning the cam 12 and expanding the clutch ring 5 into clutching engagement with the surface 7.

The clutch-actuating sleeve 18 is operated by a control lever 20 which is pivoted at 21 to the frame 1 and which is provided with a yoke 22 which is received in a groove 23 formed in the sleeve 18. The lever 20 is a spring-actuated lever, the spring operating to throw the clutch into engagement when said lever is released. The lever 20 is shown as provided with an extension 24 which is connected by a link 25 to a slide 26 that is slidable in ways 27 formed in the bed 1. 96 is a plate which is secured to the bed and which retains the slide in the guiding groove 27. This slide 26 is acted upon by springs 28 which tend normally to move the slide 26 to the right in Fig. 1, which movement will also tend to swing the lever 20 into a position to cause the pulley 3 to be clutched to the shaft 2.

When the machine is at rest the lever 20 is held in its inoperative position shown in Fig. 1 by means of a latch 29 which engages the end 30 of the lever 20. When the parts are in the position shown in Fig. 1 the spring 28 is under compression and as soon as the latch 29 is released, said spring 28 will operate to shift the slide 26 into the position shown in full lines Fig. 12, in which position the pulley 3 is clutched to the shaft 2 thereby driving the shaft.

When the machine is to be stopped the high speed pulley 3 is unclutched from the shaft 2 and the low speed pulley 4 is then automatically coupled to the shaft so that it will drive the shaft at a low speed clear up to the point of stopping.

The means for actuating the lever 20 to unclutch the pulley 3 will be presently described.

The low speed pulley 4 is clutched to the shaft by means of a device shown in Figs. 6, 7 and 8. The member 9, which it will be remembered is keyed to the shaft 2, has a clutch dog 31 pivoted thereto, said clutch dog being pivotally mounted on a stud 32 carried by the member 9. This clutch dog is provided with a nose or lateral projection 33 which cooperates with a shoulder 34 formed on a hub portion 35 of a member 36 loosely mounted on the shaft 2. The member 36 is yieldingly connected to the slow speed driving pulley 4, said member having a lateral projection 37 extending into a recess 38 formed in the pulley 4. The projection 37 is acted upon and normally centered by two springs 39 which are received in the recess 38 and which rest at one end against the projection 37 and at the other end against the partition wall 40 extending across the recess. This provides a yielding connection between the pulley 4 and the member 36 which has the shoulder 34.

The clutch dog 31 is acted on by a pulling spring 41, one end of which is connected to the clutch dog and the other member of which is connected to the member 9 at 42 and which tends to hold the clutch dog in its operative position with the nose 33 thereof in position to be engaged by the shoulder 34, as illustrated in Fig. 3. When the clutch dog is in this position the rotation of the pulley 4 and member 36 will operate to rotate the member 9 through the clutch dog 31.

The member 9 to which the clutch dog 31 is pivoted is fast on the shaft 2 and, therefore, when the high speed clutch is in operation the member 9 and the clutch dog will rotate at the same speed as the pulley 3 and considerably faster than the pulley 4. The rotation of the parts is in the direction of the arrow in Fig. 6 and, therefore, during the

operation of the high speed clutch the clutch dog 31 will overrun the clutch projection 34 and under these conditions the low speed clutch will, of course, be ineffective since it cannot be effective so long as the clutch dog is rotating faster than the shoulder 34.

In order to prevent any clicking noise which may result from the clutch projection 33 riding over the shoulder 34 during this overrunning movement said clutch dog is so designed that at the high speed at which the pulley 3 operates the centrifugal force of the end of the dog carrying the projection 33 is sufficient to overcome the tension of the spring 41 and the dog will thus be thrown by centrifugal force outwardly into the dotted line position Fig. 14, in which position the projection 33 is outside of the path of movement of the shoulder 34, the end of the dog at this time resting against the flange 43 of the pulley 4.

Whenever the machine is to be stopped and the high speed clutch is disengaged then the parts will continue to rotate by momentum but will immediately begin to slow down and the centrifugal force by which the clutch dog 31 is thrown outwardly will be correspondingly diminished. The parts are so designed that just about the time that the machine is slowed down to a speed corresponding to that of the low speed pulley 4 the spring 41 will overcome the centrifugal force on the dog 31 and pull it into its operative position shown in full lines Fig. 14 at which time the shoulder 34 will engage the projection 33 and continue to rotate the shaft positively at the low speed.

The shaft is finally brought to rest by a stop motion which engages the dog 31 and swings it outwardly against the action of the spring 41 thereby to release the nose 33 from the shoulder 34, said stop motion by its engagement with the dog also bringing the part 9 and consequently the shaft 2 positively to rest at a predetermined point in their rotative movement. This stop mechanism is in the form of a stop pin 44 which is carried by the slide 26. This stop pin is so positioned that during the sliding movement of the slide 26 the end thereof will be brought into the path of rotation of the tail 45 of the clutch dog. When the slide 26 is in the full line position Fig. 12, in which position the high speed clutch is operative, the stop projection 44 will then be out of line with the clutch dog 31 so that the dog can rotate freely. When the machine is to be stopped the slide 26 is first moved into the dotted line position Fig. 12, such movement being sufficient to unclutch the high speed clutch but insufficient to bring the stop pin 44 into line with the stop dog 31. When the slide is in this position then the machine will run by momentum until it has slowed down to the speed at which the slow speed pulley 4 is operated, at which time the shaft 2 will be automatically coupled to the slow speed driving pulley and will be driven positively forward by said driving pulley as above described. The final stopping of the machine is secured by a further movement of the slide into the position shown in Fig. 1 which brings the stop pin 44 in the path of travel of the tail 45 of the dog so that when the parts reach the position shown in Fig. 6 the tail of the dog will strike the stop pin thus disconnecting the dog from the shoulder 34 and unclutching the low speed clutch. Since the dog is secured to the member 9 which in turn is fast on the shaft 2 this engagement of the dog with the stop pin 44 will bring the shaft to rest definitely in a predetermined position. Further since the dog 31 is both a clutch dog and a stop member it will follow that the low speed clutch will operate to positively drive the shaft 2 forwardly at the low speed clear up to the instant that the machine is brought to rest, the bringing of the shaft to rest being coincident with the disengagement of the clutch.

I have herein shown the stop pin 44 as yieldingly mounted, it being slidable in a holder 46 and being backed by a spring 47. This gives a slight cushioned movement to the stopping of the shaft.

The act of stopping the shaft by the engagement of the clutch dog 31 with the stop pin 44 will, of course, place the spring 41 under tension as shown in Fig. 6 and in order to prevent any rebound of the shaft due to this tension I have provided a stop dog or pawl 48 which is pivotally mounted at 49 and is acted on by a suitable spring 50, said dog being adapted to engage a shoulder 51 formed on the flange 8 of the member 9 as illustrated in Fig. 2.

The lever 20 is provided with means for normally holding the stop dog 48 inoperative while the machine is running, said means permitting the dog to become operative at the time the machine is stopped. For this purpose the lever 20 is provided with a laterally-extending arm 52 which co-operates with an upstanding arm 53 on the stop dog (see Figs. 2 and 9). When the lever 20 is released and is swung into position to clutch the high speed pulley 3 to the shaft the arm 52 will engage the upstanding arm 53 and swing the stop dog 48 into inoperative position shown in dotted lines Fig. 2.

The particular means employed for shifting the lever 20 into position to stop the machine may be varied without departing from the invention. In many machines this shifting of the lever will be accomplished automatically by means of a stop cam and such a construction is herein shown. This stop cam is herein illustrated as in the form of two cam surfaces 54 and 55 that are formed on a main cam 56 that controls the operations of the machine and that is actuated by suitable

mechanism from the shaft 2 so that the stop cam is always being driven in timed relation with the shaft 2. The particular mechanism for driving the cam 56 forms no part of my present invention and may be such as shown in the above-mentioned Patent No. 1,343,278 or such as shown in my co-pending application, Serial No. 717,643, filed June 3rd, 1924.

The lever 20 is formed with a projection 57 which is received in the groove 58 formed in the cam 56. When the lever 20 is in its operative position, in which the pulley 3 is clutched to the shaft 2, the projection 57 will be situated adjacent the wall 59 of the groove 58. In the present machine the main cam 56 will make one rotation for each cycle of operations and when the cycle of operations is about completed the projection 57 will be engaged by the first rise 54 of the stop cam which will operate to swing the lever into a half-way position thus swinging the slide 26 into the dotted line position Fig. 12. This will unclutch the high speed pulley 3 from the shaft 2 and the machine will continue to rotate for an instant by momentum or until the speed of rotation has slowed down to a point where the clutch dog 31 will automatically engage the shoulder 34 as above described, at which time the machine continues to be positively driven by the low speed driving pulley 4 until the main cam 56 has rotated sufficiently to bring the second cam face 55 into engagement with the projection 57. This will swing the lever 20 into the position shown in Fig. 1 and will move the slide 26 so as to carry the stop dog 44 into the path of movement of the tail 45 of the clutch dog 31 so that as the clutch dog continues its rotation it will engage the stop pin and will be thereby disengaged from the shoulder 34 and at the same time will cooperate with the stop pin to bring the machine definitely to rest. The movement of the lever 20 and of the slide 26 by the cam faces 54, 55 compresses the clutch-actuating spring 28 and thus stores up energy in said spring for the operation of the clutch when the machine is to be again started.

An important feature of my invention which I desire to emphasize is that when the high speed driving device is disengaged and the low speed driving device becomes operative, said low speed driving device positively drives the driving shaft at the low speed clear up to the point at which the shaft is stopped.

I claim:

1. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing machine, the combination with a main cam for controlling the operation of said stitch-forming mechanism, of a high speed driving member from which the stitch-forming mechanism is driven during the sewing of the greater part of the seam, a slow speed driving member, means operated automatically by the cam to disconnect the high speed driving member from the stitch-forming mechanism just before the completion of the seam, means for automatically connecting the slow speed driving member to the stitch-forming mechanism when the speed of the latter has been reduced to that of the slow speed driving member, and means to bring the machine to rest at the end of the seam.

2. In a driving and stopping mechanism for a stich-forming mechanism of a sewing machine, the combination with a main cam for controlling the operation of said stitch-forming mechanism, of a high speed driving member from which the stitch-forming mechanism is driven during the sewing of the greater part of the seam, a slow speed driving member, means operated automatically by the cam to disconnect the high speed driving member from the stitch-forming mechanism just before the completion of the seam, means for automatically connecting the slow speed driving member to the stitch-forming mechanism when the speed of the latter has been reduced to that of the slow speed driving member, and means controlled by the cam to bring the machine to rest at the end of the seam.

3. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing machine, the combination with a shaft by which said mechanism is actuated, of two pulleys on said shaft rotating at different speeds, means to clutch the more rapidly rotating pulley to the shaft, automatic means to disengage said pulley from the shaft at a predetermined point in the stitch-forming cycle, a clutch for operatively connecting the slower moving pulley to the shaft, which clutch is held inoperative by centrifugal force during the time that the shaft is operated by the first-named pulley but which automatically becomes operative when the shaft slows down to the speed at which the slower moving pulley is rotating.

4. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing machine, the combination with a shaft by which said mechanism is actuated, of two pulleys on said shaft rotating at different speeds, means to clutch the more rapidly rotating pulley to the shaft, means to disengage said pulley from the shaft at a predetermined point in the stitch-forming cycle, a clutch for operatively connecting the slower moving pulley to the shaft, which clutch is held inoperative by centrifugal force during the time that the shaft is operated by the first-named pulley but which automatically becomes operative when the shaft slows down to the speed at which the slower moving pulley is rotating, and means to bring the machine to rest at the end of stitch-forming cycle.

5. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing

machine, the combination with a driving shaft by which the stitch-forming mechanism is operated, of two pulleys on said shaft rotating at different speeds, means to clutch the more rapidly rotating pulley to the shaft, means to disengage said pulley from the shaft automatically at a certain point in the sewing cycle, the machine then continuing to run under its own momentum, means controlled by the speed of the shaft for operatively connecting the slower rotating pulley to the shaft when the speed of the latter has slowed down to that of said last-named pulley, and means to bring the machine to rest at the end of said cycle.

6. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing machine, the combination with a shaft from which the stitch-forming mechanism is driven, of a member actuated by the driving shaft and controlling the operation of the stitch-forming mechanism, two driving members on said shaft operating at different speeds, means to clutch the more rapidly rotating member to said shaft during the greater part of the sewing cycle, means actuated by said controlling member to disconnect said more rapidly rotating member from the shaft before the completion of said sewing cycle, and means controlled by the speed of the shaft to connect the slower rotating driving member to said shaft when the speed of the latter is slowed down to that of the slower rotating driving member.

7. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing machine, the combination with a shaft from which said stitch-forming mechanism is driven, of two driving members operating at different speeds, means to drive the shaft from the more rapidly operating driving member during the first part of the sewing cycle, means for disconnecting said driving member from said shaft before the sewing cycle is completed, a clutch dog for connecting the slower operating driving member to said shaft during the final part of the sewing cycle, said clutch dog being held inoperative by centrifugal force thereon when the shaft is being driven from the more rapidly operating driving member and becoming automatically operative after said more rapidly driving member is disconnected from the shaft and the latter has slowed down to the speed of the slower operating driving members.

8. In a driving and stopping mechanism for the stitch-forming mechanism of a sewing machine, the combination with a shaft from which said stitch-forming mechanism is driven, of two driving members operating at different speeds, means to drive the shaft from the more rapidly operating driving member during the first part of the sewing cycle, means for disconnecting said driving member from said shaft before the sewing cycle is completed, a clutch dog for connecting the slower operating driving member to said shaft during the final part of the sewing cycle, said clutch dog being held inoperative by centrifugal force thereon when the shaft is being driven from the more rapidly operating driving member and becoming automatically operative after said more rapidly driving member is disconnected from the shaft and the latter has slowed down to the speed of the slower operating driving member, and means to render said dog inoperative at the end of the sewing cycle.

9. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations, of a high speed driving member from which the mechanism is driven during the greater part of said cycle, means operated automatically at a predetermined point in said cycle to disconnect the high speed driving member from the mechanism before the cycle is completed, a slow speed driving member, a clutch connecting the slow speed driving member to said mechanism, said clutch having a clutch member which is held inoperative by centrifugal force when the mechanism is being operated at a speed higher than that given to it by the slow speed driving member but which becomes operative when the speed of said mechanism has been reduced to that of slow speed driving member, and means to bring the mechanism to rest at the end of said cycle.

10. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a high speed driving member from which said mechanism is driven during the greater part of said cycle, means actuated by the mechanism being operated to disconnect the high speed driving member from the mechanism at a predetermined point in said cycle of operations, a slow speed driving member, a clutch for connecting the slow speed driving member to said mechanism, said clutch comprising a clutch member held inoperative by centrifugal force when the mechanism is operating at a speed higher than that given to it by the slow speed driving member but which becomes operative when the speed of the mechanism has been reduced to that of the slow speed driving member, and means to bring the mechanism to rest at the end of said cycle.

11. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a high speed driving member from which said mechanism is driven during the greater part of said cycle, means actuated by the mechanism being operated to disconnect the high speed driving member from the mechanism at a predetermined point in said cycle of operations, a slow speed driving

member, a clutch for connecting the slow speed driving member to said mechanism, said clutch comprising a clutch member which is held inoperative when the mechanism is operating at a speed greater than that determined by the slow speed driving member but which becomes operative when the speed of the mechanism has been reduced to that of the slow speed driving member, and means to bring the mechanism to rest at the end of said cycle, said slow speed driving mechanism being operative to positively drive the mechanism clear to the stopping point.

12. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a shaft from which the mechanism is operated, a high speed driving member, a low speed driving member, means to drive the shaft from the high speed driving member during the first part of the cycle of operations, means actuated by the shaft to disconnect the high speed driving member therefrom before said cycle is completed, a clutch for connecting the low speed driving member to the shaft, said clutch comprising a clutch member rotating with the shaft and held by centrifugal force in inoperative position when the shaft is rotating at a speed higher than that determined by the slow speed driving member, said clutch member becoming operative when the speed of the shaft has been reduced to that determined by the slow speed driving member, and means to throw said clutch member into inoperative position again at the end of the cycle of operations.

13. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a shaft by which said mechanism is actuated, a high speed driving member, a low speed driving member, a clutch for connecting the slow speed driving member to the shaft during the first part of the cycle of operations, means to disconnect said clutch from the shaft before the cycle of operations is completed, a second clutch for connecting the slow speed driving member to the shaft, said second clutch comprising a spring-actuated clutch dog rotating with the shaft and held in inoperative position by centrifugal force when the shaft is operated from the high speed driving member, said clutch dog becoming operative when the speed of the shaft has been reduced to that corresponding to the slow speed driving member.

14. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a shaft by which said mechanism is actuated, a high speed driving member, a low speed driving member, a clutch for connecting the slow speed driving member to the shaft during the first part of the cycle of operations, means to disconnect said clutch from the shaft before the cycle of operations is completed, a second clutch for connecting the slow speed driving member to the shaft, said second clutch comprising a spring-actuated clutch dog rotating with the shaft and held in inoperative position by centrifugal force when the shaft is operated from the high speed driving member, said clutch dog becoming operative when the speed of the shaft has been reduced to that corresponding to the slow speed driving member, and means to move the clutch member into inoperative position at the end of the cycle of operations.

15. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a driving shaft by which said mechanism is operated, two pulleys on said shaft rotating at different speeds, means to clutch the more-rapidly rotating pulley to the shaft, automatic means operated automatically at a predetermined point in said cycle of operations to disengage said pulley from the shaft, the machine then continuing to run under its own momentum, and means controlled by the speed of the shaft for operatively connecting the slower-rotating pulley to the shaft when the speed of the latter is slowed down to that of said last-named pulley.

16. In a driving and stopping mechanism, the combination with a mechanism adapted to perform a cycle of operations and then come to rest, of a shaft from which said mechanism is driven, two driving members on said shaft operating at different speeds, means to clutch the more-rapidly rotating member to said shaft during the greater part of said cycle of operations, means controlled by said mechanism for automatically disconnecting said member from the shaft before the completion of said cycle, means to connect the slower-rotating member to said shaft during the final portion of said cycle, and means to bring the mechanism to rest at the end of said cycle, the slower-rotating driving member having a positive driving connection with the shaft clear to the stopping point.

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

FRANKLIN A. REECE.