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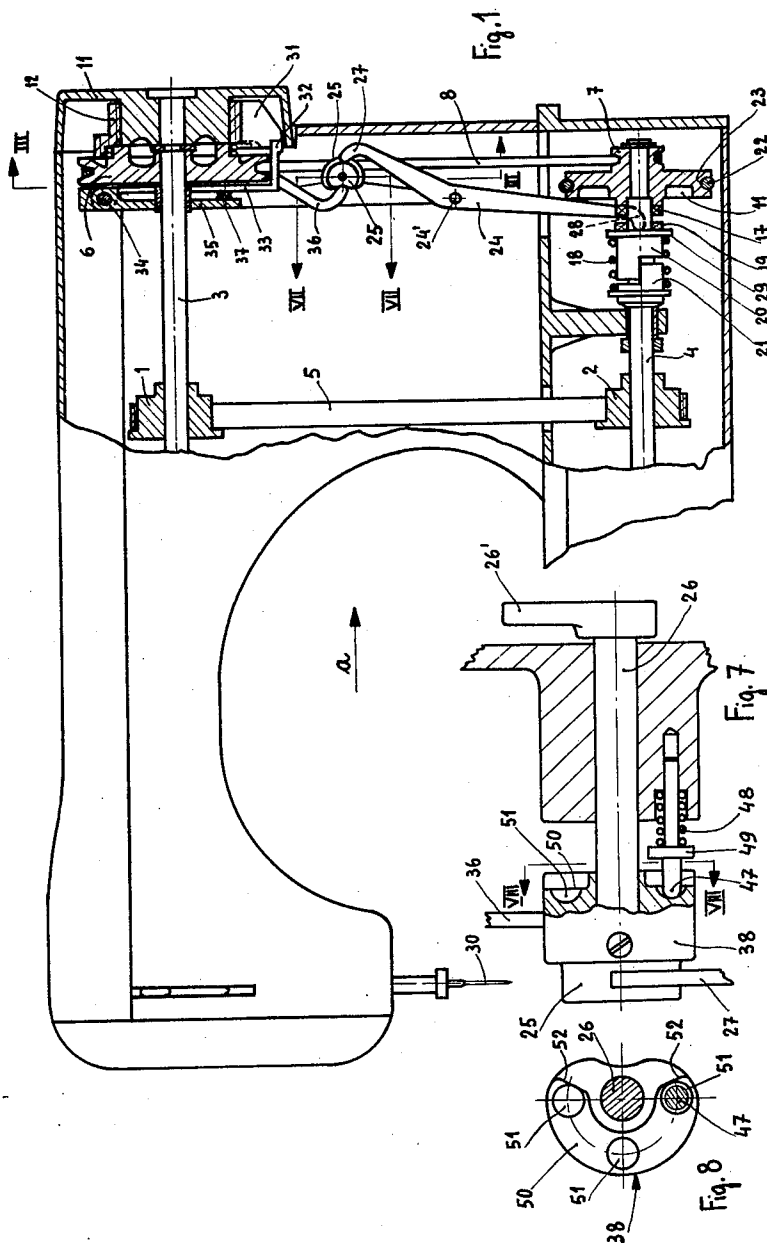
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CONTROL SYSTEM FOR A SEWING MACHINE

Filed May 2, 1960

2 Sheets-Sheet 1



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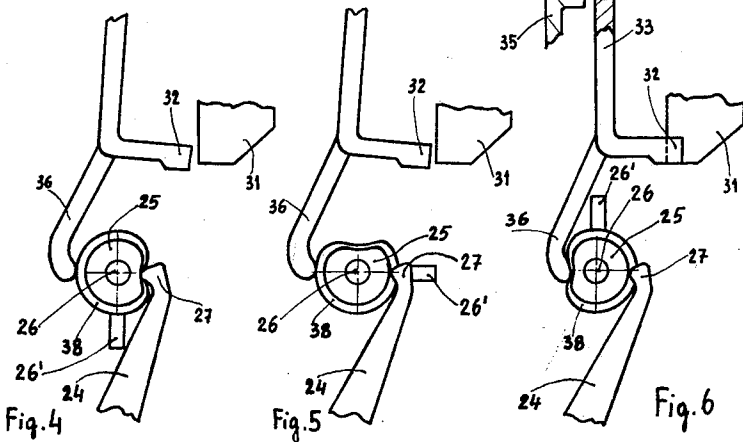
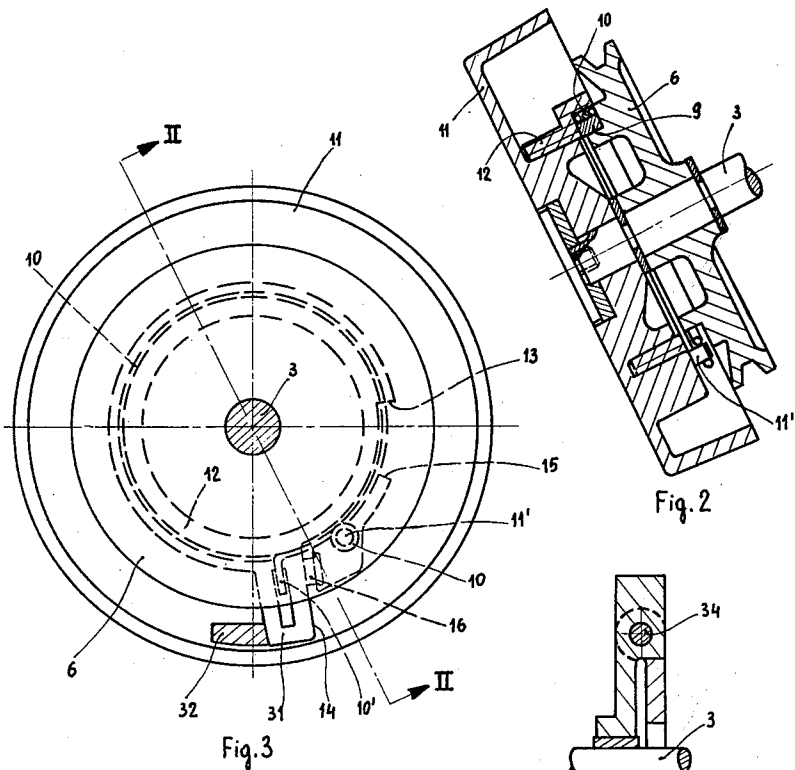
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**CONTROL SYSTEM FOR A SEWING MACHINE**  
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The present invention has for its object a control system for a sewing machine, adapted to provide a change in the speed of the machine and also a stopping of the latter when the needle is in a well-defined position at a predetermined height above the fabric which is being sewn.

Obviously, any mechanism which stops instantaneous-ly is subjected to stresses which increase with the speed at the moment of the stoppage. In particular, a sewing machine provided with means for the instantaneous stopping in a predetermined position requires that the speed of operation may not rise above a predetermined value, so as to prevent stresses from arising which might not be absorbed readily by the members forming the stopping means, in spite of the presence of damping means.

A high-speed sewing machine should therefore include a change speed gear arranged in a manner such that its stopping may be executed only when said change speed gear is in the position corresponding to a reduced speed.

The object of the present invention is to associate the change speed gear and the stopping means in a manner such that the sequence of the possible positions assumed by a single external control member may ensure operation under such conditions.

The main object of the invention consists in a common control system for the change speed gear and for the stopping means, said control system being adapted to enter selectively three positions corresponding respectively to reduced speed of operation, maximum speed and, finally, stoppage of the machine only when the machine rotates at a reduced speed.

The invention will now be described, reference being made to the accompanying drawings given by way of a mere exemplification and by no means in a binding sense. In said drawings:

FIG. 1 is a side view of a sewing machine, of which part is sectionalized, so as to show the arrangement according to the invention.

FIG. 2 is a cross-section through line II—II of FIG. 3.

FIG. 3 is a cross-section through line III—III of FIG. 1.

FIG. 4 is a view of a detail of FIG. 1, in the position corresponding to maximum speed of operation.

FIG. 5 is a view similar to FIG. 4, in the position corresponding to reduced speed.

FIG. 6 is a view similar to FIG. 4, in the position corresponding to a stopping of the machine.

FIG. 7 is a partial cross-section, through lines VII—VII of FIG. 1, of the control means.

FIG. 8 is a cross-section through line VIII—VIII of FIG. 7.

Two toothed pulleys 1 and 2 of equal diameters are keyed to the main upper shaft 3 and to the main lower shaft 4 of the sewing machine respectively and are in permanent interengagement through the belt 5, so as to ensure a constant speed and phase relationship between the actual shafts.

The two shafts 3 and 4 furthermore carry each another pulley, respectively 6 and 7, said pulleys, of different diameters, being interconnected by a belt 8. The pulley 6, which is mounted loose on the shaft 3 is provided with a cylindrical surface 9 round which is wound a spring 10 which is secured through one end to a stud 11' on the small hand wheel 11 and through the other end, 10', to a ring 12 adapted to rock round the axis of the handwheel within the limits defined by the impact of the radial stops

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13 and 14 on said ring against the stops 15 and 16 secured to the actual handwheel. In particular, the stop 16 is constituted by a rubber pad or the like elastic means adapted to damp the shock arising when the machine is suddenly stopped with its needle at a predetermined level above the fabric. The oscillations of the ring with reference to the handwheel ensure a tightening or an expansion of the spring with reference to the surface 9 of the pulley, said spring sliding over said surface when it has expanded.

The handwheel is rigid with the shaft 3 and is secured to the latter in a well-defined relative angular position.

The spring 10 is wound over the pulley in a direction such that it is tightened over the cylindrical surface 9 and causes the pulley 6 to be rigid with the handwheel 11 and thereby with the shaft 3 only when the relative movement of said pulley with reference to the handwheel has a tendency to be performed clockwise for an observer looking at the machine in the direction of the arrow *a*.

If the relative movement of the pulley with reference to the handwheel is directed anti-clockwise, the spring 10 expands and slides over the surface 9, so that the pulley 6 is now loose with reference to the handwheel 11.

In contradistinction, the pulley 7 is rigidly associated with the shaft 4 through the agency of the clutch component 17 engaging, under the action of a spring 18, the cooperating clutch component 19 formed on a sleeve 20 slidably carried by the shaft 4 and lying in permanent radial contact with the sleeve 21 secured to said shaft. It should be understood that, without widening unduly the scope of the invention as defined in the accompanying claims, the clutch system disclosed as lying between the pulley 7 and the shaft 4 may be replaced by other suitable friction means.

The pulley 7 is furthermore connected with driving means which are not illustrated and which act through a belt 22 engaging a groove 26 formed in the actual body of the pulley 7. Said driving means produce a rotation of the machine in a clockwise direction for an observer looking in the direction of the arrow *a*.

When the pulley 7 is rigidly connected with the shaft 4 through said clutch 17—19, the machine runs at the maximum speed allowed by the driving means. Under such conditions, the shaft 4 revolves at the speed imparted to it by the driving means and it transmits said speed to the shaft 3 and to the handwheel 11 through the pulleys 2 and 1.

At the same time, the pulley 7 actuates, through the belt 8, the pulley 6, but at a reduced speed with reference to that of the shaft 3, the reduction and speed being proportional to the ratio between the diameters of the pulleys 7 and 6 and therefore the relative rotation of the pulley 6 with reference to the handwheel is obtained anticlockwise for an observer looking at the machine in the direction of the arrow *a*. The spring 10 expands then with reference to the surface 9, so as to allow the pulley 6 to revolve with reference to the handwheel 11 and to the shaft 3. Obviously, under such conditions, the shaft 4 forms the driving member for the shaft 3.

When, in contradistinction, it is desired to make the machine operate at a reduced speed, the pulley 7 is loose on the shaft 4 and, consequently, the rotation provided by the driving means is transmitted through the belt 8 to the pulley 6 and thence through the spring 10, to the handwheel 11, to the shaft 3 and, finally, through the pulleys 1 and 2, to the shaft 4.

In such case, the shaft 3 acts as a driving member for the shaft 4 and the speed obtained is a reduced speed, since the diameter of the pulley 6 is larger than that of the pulley 7. To allow a disengagement between the pulley 7 and the shaft 4, a lever 24 is adapted to rock round a stud 24' on the frame of the machine and its

rocking may be obtained through action of the eccentric member or cam 25. Said cam is rigidly carried by a spindle 26 revolvably carried by the frame and it may be angularly set from the outside of the machine through the handle 26', as described with further detail hereinafter.

When the cam 25 is shifted by said handle 26', so that its minor radius may register with the upper end 27 of the lever 24, the other end 28 of the lever remains inoperative and engages the flange 29 on the sleeve 20 without acting on it, so that the latter is free to urge the corresponding clutch component 19 into the cooperating clutch component 17 in the pulley 7, which produces operative conditions required for high speed running of the machine.

When, in contradistinction, the cam 25 is angularly shifted, so as to set its major radius into registry with the end 27 of the lever 24, said lever engages, through its end 28, the flange 29 and exerts a pressure thereon so as to overcome the pressure of the spring 18 and to disconnect the clutch components 19 and 17, which provides the operative conditions for the machine to run at a reduced speed.

When the machine operates at a reduced speed, it is possible to stop it at any desired moment in a manner such that the needle 30 stops instantaneously at its upper dead center without this subjecting the mechanical parts to exaggerated stresses which might lead at maximum speed to a damaging of these parts.

Obviously and without widening the scope of the invention, as claimed in the accompanying claims, the machine may also be caused to stop at the moment at which the needle is in any other desired level with reference to the fabric, by merely modifying the angular position of the handwheel with reference to the shaft 3.

To allow stopping the machine under the abovementioned conditions, the ring 12 is provided with a radial projection 31 (FIG. 3) against which may impinge an abutment 32 which holds said ring fast and thereby locks the handwheel in an angular position corresponding to the upper dead center of the needle and simultaneously it produces an expansion of the spring 10, which makes the pulley 6 revolve loose with reference to the shaft 3. The abutment 32 is formed on a lever 33 pivotally secured to a stud 34 formed on a support 35 incorporated with the frame of the machine. The lower end 36 of said lever is urged under the action of the spring 37 against an eccentric member or cam 38 rigid with the same spindle 26 as the cam 38. If the cam 38 is caused to rock in a manner such that its minor radius registers with the end 26 of the lever 33, the abutment 32 engages the projection 31 and produces the desired instantaneous stopping of the machine during which the pulley 6 revolves loose with reference to the shaft 3.

Furthermore, taking into account the position of the levers 24 and 36, as shown in the accompanying drawings, the two cams 25 and 38 keyed to the same spindle 26 should have outlines such as will satisfy the following fundamental conditions:

The first condition consists in that, when sewing at maximum speed, the lever 24 should engage a point on a minor radius of the cam 25 and, at the same time, the lever 36 should be in contact with a point of the cam 25 corresponding to a major radius (FIG. 4).

The second condition consists in that, for sewing at reduced speed, the lever 24 should be in contact with a point of major radius of the eccentric 25 and the lever 36 should be in contact with a point of major radius of the cam 35 (FIG. 5).

The third condition consists in that, for the instantaneous stopping of the machine, when the needle is in a predetermined position as to height above the fabric, the lever 24 should be in contact with a point of maximum radius of the cam 25 and the lever 36 should be in contact with a point of a minor radius of the cam 38 (FIG. 6).

Above all, it is particularly important for the lever 36

not to engage a point of the cam 38 corresponding to a minor radius when the lever 24 is in contact with a point of a minor radius on the cam 25. As a matter of fact, when the lever 24 is in contact with a minor radius of the cam 25, the machine revolves at maximum speed and the shaft 4 drives the shaft 3 through the belt 5. Under such conditions, if the abutment 32 were to engage the projection 31 on the ring 12, this would completely lock the shaft 3, in spite of the rotation imparted to it by the shaft 4, which would lead to damaging the machine.

The two cams 25 and 38 are therefore designed in a manner such and they are angularly set with reference to each other on the spindle 25 in a manner such that they may be set selectively in the three positions to be assumed by them through the agency of the handle 26' acting on the spindle 26 carrying the cams.

FIG. 4 shows the position corresponding to the first above-mentioned condition.

FIG. 5 shows how the second condition can be executed.

The position illustrated in FIG. 6 corresponds to the third condition.

In order to obtain an accurate positioning of the cams, it is possible to resort not only to suitable reference marks which are not shown in the drawings but also to a control system associated with the two cams, so as to hold the latter accurately in the above-mentioned positions. Such a system may be constituted, for instance, by a short rod 47 housed slidably in a corresponding opening in the frame of the machine and adapted, under the action of the spring 48 inserted between the bottom of said opening and the flange 49 in the short rod, to engage the lateral surface 50 of the cam 38 (FIG. 7).

Said lateral surface 50 is provided with three seats 5' adapted to be engaged selectively by the short rod 47 when the handle 26' is set in the corresponding accurate position. The two radial steps 52 formed on the surface 50 engage the short rod 47, so as to define the end of the allowed path of the handle 26'.

It should, obviously, be understood that, without unduly widening the scope of the invention, as defined in the accompanying claims, the two cams 25 and 38 which are rigid with each other may be designed otherwise and that, consequently, the angular shifting thereof may be different from that illustrated in the accompanying drawings.

I claim:

1. In a sewing machine drive having a control system and including a change speed means and a stopping means for stopping the machine for a position of the needle at a predetermined level above the fabric, said control system comprising a first lever controlling the change speed means and adapted to assume two different positions providing respectively high speed and reduced speed, a second control lever controlling the stopping means and adapted to be set selectively in two positions providing respectively operation and stoppage of the machine, two control members rigid with each other and adapted to engage respectively said levers, a handle on the outside of the machine adapted to actuate the control members in unison to make them occupy selectively three different positions, the first position of the control members setting the first lever in its position of maximum speed and the second lever in its position corresponding to operation of the machine, the second position of the control members setting the first lever in its position of reduced speed and the second lever in its position corresponding to operation of the machine and the third position of the control member setting the first lever in its position of reduced speed and the second lever in its position corresponding to stoppage of the machine.

2. In a sewing machine drive having a control system and including a change speed means and a stopping means for stopping the machine for a position of the needle at a predetermined level above the fabric, said control sys-

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tem comprising a first lever controlling the change speed means and adapted to assume two different positions providing respectively high speed and reduced speed, a second lever controlling the stopping means and adapted to be set selectively in two positions providing respectively operation and stoppage of the machine, two cams rigid with each other and adapted to rotate round their common axis while engaging respectively said levers, a handle on the outside of the machine adapted to actuate the cams in unison to make them occupy selectively three different angular settings, the first angular setting of the cams setting the first lever in its position of maximum speed and the second lever in its position corresponding to operation of the machine, the second angular setting of the cams setting the first lever in its position of reduced speed and the second lever in its position corresponding to operation of the machine and the third angular setting of the cams setting the first lever in its position of reduced speed and the second lever in its position corresponding to stoppage of the machine, the outlines of said cams being such that the levers are set simultaneously in the corresponding positions when the cams enter one of the selected angular settings.

3. In a sewing machine drive having a control system and including a change speed means and a stopping means for stopping the machine for a position of the needle at a predetermined level above the fabric, said control system comprising a first lever controlling the change speed means and adapted to assume two different positions providing respectively high speed and reduced speed, a second lever controlling the stopping means and adapted to be set selectively in two positions providing respectively operation and stoppage of the machine, two control members rigid with each other and adapted to engage respectively said levers, a handle on the outside of the machine adapted to actuate the control members in unison to make them occupy selectively three different positions, the first position of the control members setting the first lever in its position of maximum speed and the second lever in its position corresponding to operation of the machine, the second position of the control members setting the first lever in its position of reduced speed and the second lever in its position corresponding to operation of the machine and the third position of the control members setting the first lever in its position of reduced speed and

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the second lever in its position corresponding to stoppage of the machine, and stationary stops adapted to engage selectively the control members for each of their selected positions to hold same accurately in each of said positions.

4. In a sewing machine drive having a control system and including a change speed means and a stopping means for stopping the machine for a position of the needle at a predetermined level above the fabric, said control system comprising a first lever controlling the change speed means and adapted to assume two different positions providing respectively high speed and reduced speed, a second lever controlling the stopping means and adapted to be set selectively in two positions providing respectively operation and stoppage of the machine, two cams rigid with each other and adapted to rotate round their common axis while engaging respectively said levers, a handle on the outside of the machine adapted to actuate the cams in unison to make them occupy selectively three different angular settings, the first angular setting of the cams setting the first lever in its position of maximum speed and the second lever in its position corresponding to operation of the machine, the second angular setting of the cams setting the first lever in its position of reduced speed and the second lever in its position corresponding to operation of the machine and the third angular setting of the cams setting the first lever in its position of reduced speed and the second lever in its position corresponding to stoppage of the machine, the radii of the two cams engaging the corresponding levers for the different angular settings of the cams succeeding each other in a manner such that said settings follow each other in the sequence just recited.

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