Aug. 12, 1969 L. BONO 3,460,772

THREAD-WINDING DEVICE FOR SEWING MACHINES

Filed March 13, 1967 2 Sheets-Sheet 1

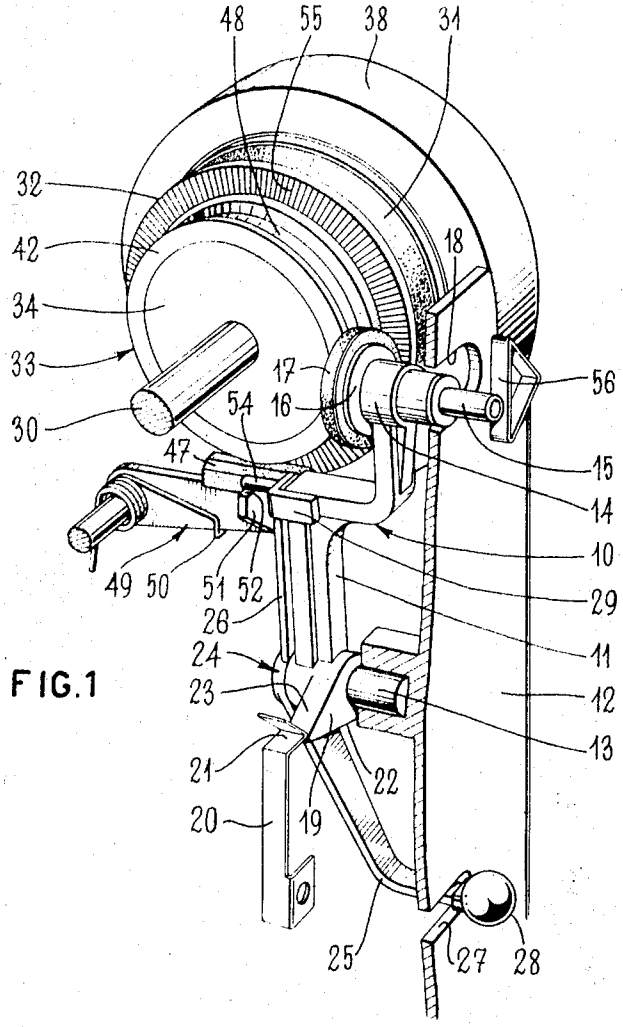

FIG.1

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THREAD-WINDING DEVICE FOR SEWING MACHINES

Filed March 13, 1967 2 Sheets-Sheet 2

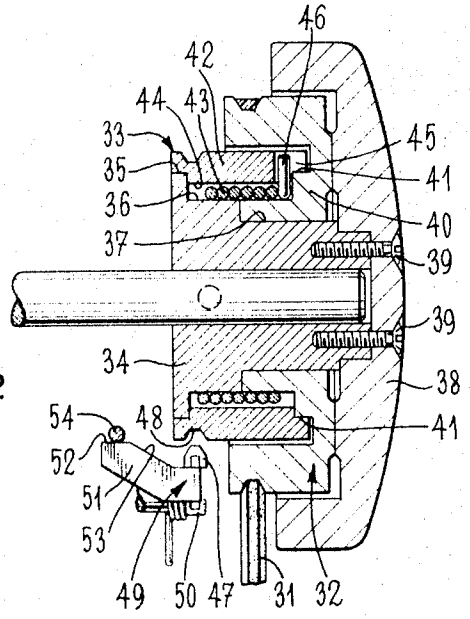

FIG. 2

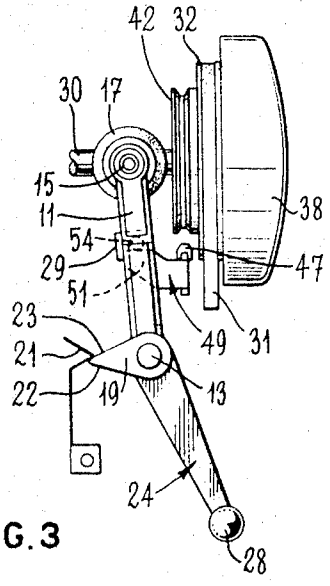

FIG. 3

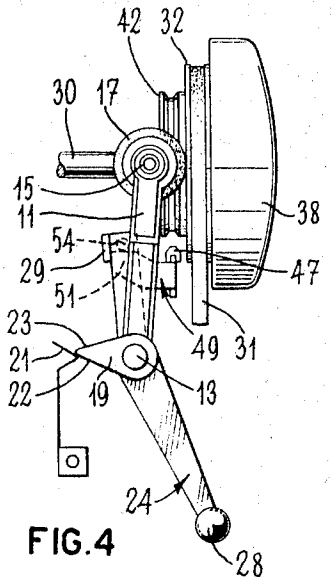

FIG. 4

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THREAD-WINDING DEVICE FOR SEWING MACHINES

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Int. Cl. B65h 54/82
U.S. Cl. 242—20 10 Claims

ABSTRACT OF THE DISCLOSURE

A sewing machine having a spool winding device wherein the respective driving engagements of the winding device and of the machine main shaft relative to the power driving means are controlled simultaneously and automatically relative to each other through a single maneuver of the machine operator upon a single control member.

The present invention relates to improvements in a spool winding device of the type commonly associated with sewing machines.

In known devices of this type it is usual for the thread spool to be replenished with thread while the machine sewing members are stopped and with only the drive means operating so as to realize maximum thread winding speeds higher than the normal machine speed while sewing. In order, therefore, to rewind the spool with thread under such conditions, the machine operator is required to perform various distinct maneuvers or actuations of the pertinent parts in order to engage the winding means and in order to disengage the sewing members relative to the machine drive means. The machine operator must, in fact, exercise extreme caution in bringing about the disengagement of the sewing members since, if this is not completely effected, there is the danger of the sewing members starting to function while the spool rewinding operation is still in progress, and especially when the spool is that which has just been removed from the hook.

It is an object of the present invention, therefore, to simplify the spool rewinding operation especially with regard to elimination of the aforenoted danger.

It is a further object of the present invention to provide a spool winding device whereby the engagement of the spool winding members and the disengagement of the normal sewing members relative to the machine drive means is effected via a single actuation maneuver by the machine operator and by means of a single actuation member.

Another object of the present invention is to provide a spool winding device whereby the spool may be rewound even during normal sewing operations while the sewing members are engaged with the machine drive means.

Other objects are those which are inherent in the herein disclosed apparatus.

The foregoing objects are generally realized through the provision of a friction roller keyed upon the winding spool shaft which in turn is mounted in a support member which is displaceable between a rest position and a working position in which the roller is driven by the machine drive shaft through suitable coupling means. Further, a control member is provided having two portions, a first of which is operatively connected with said support member and the second of which is operatively connected with the aforementioned coupling means, said control member being operable to displace the support in only one direction whereby the support is free to function independently of the control member in the other direction.

The features of the present invention will become manifest from the detailed description which follows of a preferred embodiment of realization, this description being referred to the attached drawings, wherein:

FIGURE 1 is a pictorial view showing the device of this invention and related parts of the sewing machine;

FIGURE 2 is a partial sectional view of the device of of FIGURE 1; and

FIGURES 3 and 4 are front elevation views showing two respective operative positions of the parts of the inventive device.

The winding device **10** comprises a support member **11** pivotally mounted at one end thereof to the machine frame **12** by means of pivot pin **13**. Friction wheel **16** having friction rim **17** is keyed to spindle **15** which, in turn, is freely rotatably mounted at the free end **14** of support **11**. A portion of spindle **15** extends outwardly of the machine frame through opening **18**, this portion being adapted to receive and hold the thread spool thereon (not shown) for the rewinding thereof.

Integrally pivotable with support member **11** about the axis of pivot pin **13** is a wedge-shaped tooth member **19** continuously acted upon by blade spring **20** which is fixedly mounted at one end thereof to the machine frame by suitable means, the other or free end of said spring pressing against either of the opposed sides **22** or **23** of the tooth member in order to resiliently maintain said support member **11** in either of two pivotal positions thereof, one being the rest or disengaged position and the other being the active or engaged position of the friction roller **16** relative to the machine drive means.

A control lever **24** is provided in order to permit the machine operator to bring about engagement between said friction roller **16** and the machine drive means, lever **24** being comprised of two arms **25** and **26** extending in different directions from and integrally pivotable about pivot pin **13**. Arm **25** extends to outwardly of the machine frame through opening **27** and terminates in a hand grip knob **28**.

Arm **26** extends parallel to support member **11** and terminates in an L-shaped end portion **29** which is adapted to drivingly engage support member **11** only for movement thereof in one direction. For example, with reference to FIGURE 1, it will be seen that movement of the control arm **25** from right to left will bring about clockwise pivoting of the support member **11**. On the other hand, the support member **11** could be pivoted in a clockwise direction independently of the control member **24**.

The sewing machine **12** includes the conventional main shaft **30** which receives its driving force from an electric motor, which is not shown, through a trapezoidal driving belt **31** which engages driving pulley **32** which in turn is detachably connectable by coupling means **33** with a sleeve **34** keyed to the shaft **30**. Sleeve **34** includes a peripheral flange **35** (FIGURE 2) and a first cylindrical portion **36** adjoining a second cylindrical portion **37** of smaller diameter than the first. The second cylindrical portion **37** serves as a bearing for pulley **32** which is freely rotatably mounted thereon and which is axially held in place thereon by flywheel **38** which is fixedly connected to one end of sleeve **34** by suitable means such as machine screws **39**.

Pulley **32** is formed with an axially extending recess which is inwardly defined by a hub portion **40** whose external surface is contiguous with and of the same diameter as that of cylindrical portion **36**, said hub portion terminating in a flange portion **41** of the same configuration as flange **35** and axially opposed thereto.

A coupling means **33** comprising a cylindrical member **42** and a helical friction spring is mounted between

pulley 32 and sleeve 34 and serves to releaseably drivingly connect said pulley with said sleeve. The bore of cylindrical member 42 is defined by surface 44 which is of smaller diameter than the largest diameter of flanges 35 and 41 but is of larger diameter than that of the external surfaces of cylindrical portions 36 and 40. The respective elements 35, 41, 42, 36, and 40 thereby define a closed annular recess for housing the helical spring 43 and for restricting axial displacement of same.

As is seen in FIGURE 2, spring 43 is wound tightly about the external surfaces of sleeve 34 as well as hub 40 and one end 46 of said spring is anchored in radially extending recess 45 in one end of cylindrical member 42. Rotation of pulley 32 causes spring 43 to tighten its coils about hub 40 thereby eliminating any rotational slippage between said hub and said spring whereby said spring is forced to rotate with the pulley 32, this rotation being imparted to sleeve 34 and to shaft 30 through the spring coils which are wound about said sleeve. Cylindrical coupling member 42 also is caused to rotate since it is connected thereto via the spring end 46. A rotational restraining force exerted upon coupling member 42 has the effect of loosening the spring coils so that the coupling effect between pulley 32 and sleeve 34 is interrupted and said sleeve and the shaft 30 are no longer driven in rotation by said pulley. Such a restraining force is exertable upon the cylindrical member 42 by means of a brake block 47 which is engageable in circumferential groove 48 in the surface of member 42, said block and groove being correspondingly configured in cross section. Block 47 is mounted on a lever 49 pivotally mounted on the machine and resiliently urged by spring 50 in a direction to effect engagement of said block in said groove.

Lever 49 includes, at its free end, a lug 51 which extends generally parallel to the rotational axis of lever 49. The upper edge of lug 51 is configured so as to provide a substantially horizontal ledge 52 contiguous with a downwardly inclined surface 53. The upper arm 26 of lever 24 includes a pin 54 mounted adjacent to L-shaped portion 29, said pin being slidably engaged upon the surface defined by ledge 52 and surface 53. It will be seen, therefore, that pin 54 restricts the upward pivoting of lever 49, and consequently, determines the position of block 47 relative to groove 48, this being actuable through manipulation of control lever 24 by the machine operator. FIGURE 3 shows the arm 26 pivoted towards the left in which position the pin 54 bears against ledge 52 on lever 51 thereby holding block 47 disengaged from groove 48. On the other hand, when arm 26 is pivoted towards the right, pin 54 slides downwardly along surface 53 thereby permitting lever 51 to pivot upwardly under the urging of spring 50 and permitting block 47 to engage in groove 48 to stop rotation of coupling member 42 and of sleeve 34 as aforedescribed.

Simultaneously with the engagement of block 47 in groove 48, friction rim 17 on wheel 16 engages the knurled radial surface 55 on pulley 32, which at this time is disengaged from driving relationship with the shaft 30, and the not shown thread spool which has previously been fitted onto spindle 15 is now rewound with thread.

When the winding of the thread spool is completed, the winding operation is automatically interrupted by means of a feeler 56 (FIGURE 1) mounted on the machine frame 12 at a position adjacent to spindle 15. The surface of feeler 56 lies in a plane whereby as the spool becomes filled with thread, the thread on the spool presses against feeler 56 with increasing force and in a direction transverse to the axis of pivot pin 13 until support member 11 pivots sufficiently to the left to interrupt contact between friction rim 17 and knurled surface 55 on the drive pulley 32. The force between feeler 56 and the wound thread, however, is not sufficient to overcome the combined urging forces of springs 20 and 50, spring 20 acting upon surface 22 of tooth 19 (FIGURE 4) and urging support member 11 towards the right and spring 50 acting upon lever 49 and also urging member 11 to the right because of inclined surface 53 bearing against pin 54. The rotation of spindle 15 is nevertheless interrupted although block 47 is still engaged in groove 48. A slight additional force to the left upon spindle 15, applied by the machine operator, completes the pivoting of support member 11 to its at rest position of FIGURE 3 whereby block 47 completely disengages from groove 48 and the driving engagement between pulley 32 and shaft 30 is resumed.

It is evident from FIGURES 3 and 4 that spring 20 is an inversion or snap-over type spring in that it acts upon member 11 in either of two opposite directions dependent upon the position of tooth 19 relative to the corner of the V-shaped portion 21 of said spring. The machine operator, therefore, need only exert sufficient force upon spindle 15 to move tooth 19 just below the corner of V-portion 21; thereafter, spring 20 itself assures the complete pivoting of support member 11 to the at rest position of FIGURE 3. This action of spring 20 upon member 11 is also transmitted to control lever 24 which is forced to pivot counterclockwise with member 11 because of the abutting relationship of member 11 with L-shaped portion 29 on arm 26 of said control lever 24. This pivoting of lever 24, in turn, causes pin 54 to slide along surface 53 and onto ledge 52 thereby forcing block 47 completely out of engagement from groove 48, against the urging of spring 50.

When it is desired to return the support member 11 to its active position from the at rest position of FIGURE 3, the machine operator grips the knob 28 and pivots lever 24 clockwise just sufficiently for tooth 19 to pass to the upper side of spring portion 21, spring 20 then acting against surface 22 and assuring the completion of the pivoting motion of member 11 to its active position and the maintaining thereof at said active position.

FIGURE 4 illustrates the positions of the various parts when it is desired to rewind the thread spool without interrupting the driving engagement between pulley 32 and shaft 30. In this regard, it will be noted that L-shaped portion 29 on control lever 24 is effective to restrict pivoting of support member 11 in only one direction, to the left, so that member 11 can be pivoted to the right (clockwise) independently of control lever 24. Therefore, if the machine operator were to exert a force to the right directly on shaft 15, rather than by manipulation of lever 24, wheel 16 will become engaged with pulley 32 without block 47 engaging groove 48, as is shown in FIGURE 4. Lever 24 will remain in its inactive position because of friction between pin 54 and ledge 52, said friction being concomitant to the fact that ledge 52 is urged by spring 50 against pin 54 in a direction transverse to the pivot axis of lever 24.

It is seen from the foregoing that the device of this invention permits the thread spool to be rewound either while the main drive shaft 30 is stationary or still running. Further, the spool rewinding is automatically terminated by feeler means 56. In addition, when it is desired to rewind the spool with the main shaft stopped, the stopping of this shaft and the engagement of the spool winding parts is effected in a complete and sure manner through actuation of a single control member and through a single maneuver by the machine operator.

It is understood that the herein presented details relating to a preferred embodiment of realization are illustrative and not limitative of the scope of the claims allowed herein, all modifications, adaptations, substitutions, and equivalents of either an obvious nature or well within the purview of one skilled in the art being intended to fall within the scope of the claimed invention.

What is claimed is:

1. In a sewing machine comprising a main drive shaft and a drive means for driving same, a thread spool winding device selectively engageable and disengageable relative to said drive means, a coupling means actuable to

establish and to interrupt driving connection between said drive means and said main shaft, control means to engage said device with said drive means and to automatically actuate said coupling means to interrupt said driving connection between said drive means and said main shaft pursuant to said winding device becoming engaged with said drive means, said winding device comprising a spool spindle drivably engageable with said drive means and rotatably mounted on a movable support member, said support member being displaceable between first and second positions respectively corresponding to said spindle being drivingly disengaged and engaged relative to said drive means, a snap-over type spring associated with said support member and adapted to urge same to either of said positions, said control means comprising a hand-control member which is displaceable between first and second positions thereof and is drivingly associated with said support member for displacing same from said first to said second position thereof, said control means further comprising a coupling actuation member for actuating said coupling means, said actuation member being responsive to said hand-control member whereby the positions of said hand-control member determine the actuation of said coupling means by said actuation member, said hand-control member being unidirectionally drivingly associated with said support member whereby said support member is displaceable from said first to said second position thereof independently of said hand-control member while the latter remains in the first position thereof corresponding to the first position of said support member, the first and second positions of said control member corresponding respectively to said coupling means being actuated by said actuation member to drivingly engage and disengage said drive means relative to said main shaft.

2. In the sewing machine of claim 1, said coupling actuation member being displaceable between first and second positions thereof respectively corresponding to actuation of said coupling means to drivingly engage and disengage said drive means relative to said main shaft, a resilient means continuously urging said actuation member towards said second position thereof, means on said hand-control member engaging said actuation member and adapted to maintain same in said first position thereof against the urging of said resilient means.

3. In the sewing machine of claim 2, said actuation member being comprised of an arm pivoted at one end and having a profiled surface portion at its other end defined by a ledge portion and an inclined portion extending from said ledge portion, said support member being pivoted at one end thereof and having said spindle rotatably mounted at the other end thereof, said means on said hand-control member comprising an abutment pin fixedly mounted on said support member and slidably engaged along said surface portion of said actuation arm, said ledge portion extending substantially tangent to a radius line drawn from the pivot axis of said support member and parallel to the pivot axis of said actuation arm, said resilient means continuously urging said actuation arm to pivot in a direction towards said pin.

4. In the sewing machine of claim 2, said drive means comprising a rotary drive member connectable to a motor means, said coupling means comprising a shaft member drivingly engaged with said main shaft, said drive and shaft members being coaxially rotatable and having respective coaxial circumferential surfaces extending in axial continuation of each other, a cylindrical member coaxially and freely rotatably mounted relative to said drive and shaft members, a helical spring having its coils wound about both said circumferential surfaces in axial succession, a portion of said spring being fixedly connected to said cylindrical member, a brake means for restraining rotation of said cylindrical member, said brake means being actuated by said actuation member.

5. In the sewing machine of claim 4, said brake means comprising a brake block mounted on said actuation member and frictionally engageable with the surface of said cylindrical member, said brake block engaging or disengaging the surface of said cylindrical member in correspondence to said actuation member being in said second and first positions thereof, respectively.

6. In the sewing machine of claim 4, said rotary drive member having an annular recess therein and opening at one radial face thereof, said cylindrical member extending into said recess and surrounding said circumferential surfaces in radially spaced relation thereto, said helical spring being positioned between the inner surface of said cylindrical member and said cylindrical surfaces.

7. In the sewing machine of claim 6, said rotary drive member having a radial face portion circumscribing said recess, said spindle having a friction wheel mounted at one end thereof and frictionally engageable with said radial face portion.

8. In the sewing machine of claim 7, said rotary drive member being a belt driven pulley, the axis of said spindle extending transverse to the axis of said rotary drive member.

9. In a sewing machine comprising a main drive shaft and a drive means for driving same, a thread spool winding device selectively engageable and disengageable relative to said drive means, a coupling means actuable to establish and to interrupt driving connection between said drive means and said main shaft, control means to engage said device with said drive means and to automatically actuate said coupling means to interrupt said driving connection between said drive means and said main shaft pursuant to said winding device becoming engaged with said drive means, said winding device comprising a spool spindle rotatably mounted on a pivoted spindle arm, said control means comprising a hand-control lever pivoted intermediate its end coaxially with said spindle arm, one arm of said lever extending adjacent to said spindle arm and having an abutment lug extending across one side of said spindle arm thereby restricting pivoting of same relative to said lever arm in only one direction, said control means further comprising a pivoted actuation arm for actuating said coupling means, a resilient means continuously urging said actuation arm towards a first position corresponding to actuation of said coupling means to disengage said drive means from said main shaft, an abutment means on said lever for holding said actuation arm in a second postion against the urging of said resilient means, said second position corresponding to actuation of said coupling means to engage said drive means with said shaft.

10. In the sewing machine of claim 9, including a snap-over type spring associated with said spindle arm and urging same to pivot in either of opposite directions corresponding to respective positions of engagement or disengagement of said winding device relative to said drive means, said actuation arm including a sliding surface along which said lever abutment means is slidably engaged, said sliding surface including a ledge portion extending substantially tangential to a radius line drawn from the pivot axis of said spindle arm, and an inclined portion extending from one end of said ledge portion.

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