#### April 2, 1963

W. E. PATRICK

THREAD PULL-OFF FOR SEWING MACHINES

Filed Oct. 13, 1959

4 Sheets-Sheet 1

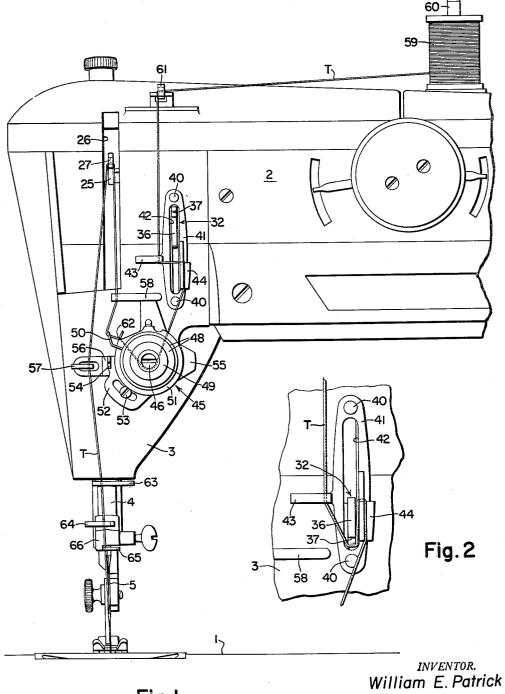


Fig.l

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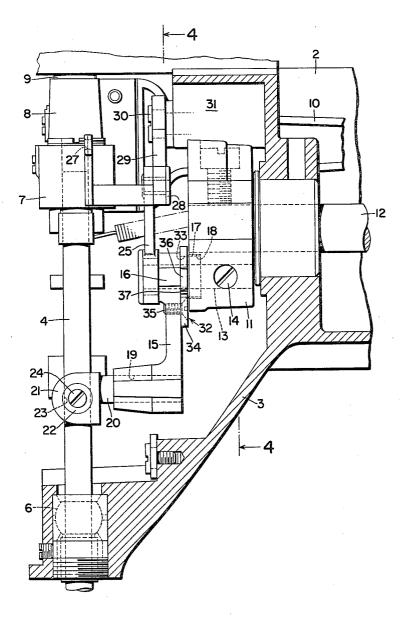
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3,083,661

THREAD PULL-OFF FOR SEWING MACHINES

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# Fig. 3

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### W. E. PATRICK 3,083,661

THREAD PULL-OFF FOR SEWING MACHINES

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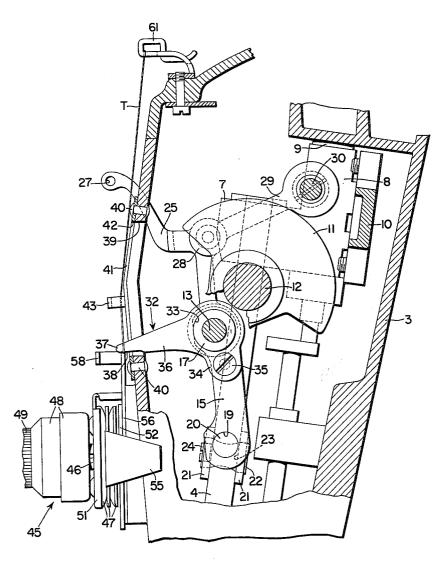


Fig.4

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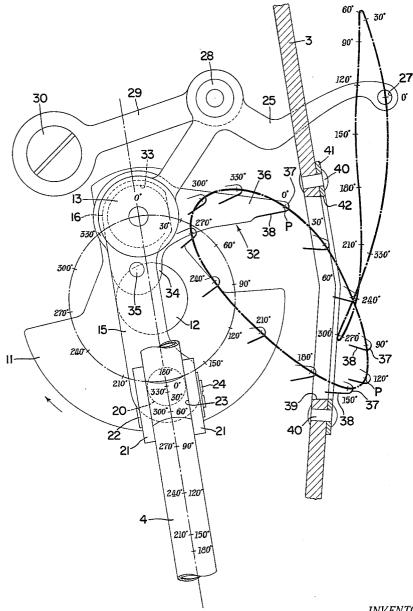
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### W. E. PATRICK 3,083,661

THREAD PULL-OFF FOR SEWING MACHINES

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4 Sheets-Sheet 4





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WITNESS

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## 3,083,661

Patented Apr. 2, 1963

**1** 

#### 3,083,661

THREAD PULL-OFF FOR SEWING MACHINES William E. Patrick, Colonia, N.J., assignor to The Singer Manufacturing Company, Elizabeth, N.J., a corporation of New Jersey

Filed Oct, 13, 1959, Ser. No. 846,130 3 Claims. (Cl. 112-242)

The present invention relates to sewing machines and, more particularly, to a thread pull-off for sewing ma- 10 chines.

In a sewing machine, the needle thread is usually run from a supply through a tension device and take-up mechanism to the needle and then to the work. At stitch setting, the take-up mechanism tensions the thread by 15 pulling on it between the end that is anchored in the work and the tension device, which is adjustable and which at a particular setting offers a certain specific resistance to drawing thread from the supply. The tension device determines the amount of tension that the 20 take-up mechanism can apply to the thread in that any tension applied to the thread greater than the resistance offered by the tension device at the particular setting will pull thread through the tension device from the supply. By limiting the tension that can be applied to 25 the thread, the tension device determines the stitch setting characteristics of the machine.

The total tension on the thread, however, is not solely a function of the tension device since the thread guides and other elements of the thread handling system also 30 offer a resistance to the passage of the thread and, in addition, there is a certain pull required to draw the thread from the supply. The resistance to the passage of the thread offered by most of the various elements in the thread system is substantially constant from stitch 35to stitch. This is not always true, however, of the effort required to pull thread off the supply. For example, in a family type sewing machine, the thread supply usually consists of a thread spool mounted on a spool pin on the top of the bracket arm of the machine and when thread is 40 pulled from the supply, the entire spool is rotated. Pulling thread from the supply occurs in a very small portion of the sewing cycle and is very quick so that, in effect, the thread is pulled in jerks.

Assuming that on one particular stitch the thread is 45taut between the tension device and the spool, all the thread pulled into the thread system at the end of that stitch must be pulled off the spool. As the spool is jerked to supply the thread, because of inertia of the 50 spool, it will tend to continue rotating after pulling has ceased and will thus spill a certain amount of thread. Consequently, on the subsequent stitch, there is slack thread between the tension device and the thread spool so that no thread need be drawn off the spool. When 55 the slack thread is consumed, thread must again be drawn off the spool. The effort required to jerk the thread off the spool has a considerable effect upon the total tension placed on the thread so that there is a substantial variation between the total tension on the thread on one stitch 60 when thread must be drawn from the spool and the subsequent stitch when there is slack thread available. The result, of course, is erratic stitch setting.

In zigzag sewing machines, for example in sewing a satin stitch, a considerable amount of thread is required for each stitch and, in addition, a very low tension setting is required. In such a situation, the problem is aggravated since spilling of thread from the spool is more pronounced and the effects of the variations in the total tension are greater and are more readily apparent because the bobbin thread is laid in a very erratic and very noticeable pattern. 2

vide a thread pull-off means for a sewing machine, which means will provide a slack thread on the supply side of the tension device for every stitch, thereby effectively isolating the thread supply from the thread tension system and providing a more nearly uniform thread tension. More particularly, it is an object of this inven-tion to provide a thread pull-off means that is simple and economical, and at the same time, effective and reliable. The above objects have been attained in accordance with this invention by the provision of a thread pull-off finger mounted on the needle bar driving crank and operable between a pair of spaced thread guides to pull a predetermined quantity of thread from the supply, the device being disposed between the thread supply and the tension device of the sewing machine and thereby providing slack thread on the supply side of the tension so that the stitch will be set against the tension alone and will not be affected by the varying force required to pull the thread from the supply. The arrangement of the pulloff finger on the needle bar driving crank provides for the use of a simple and economical element having an orbital movement which, in use for example with a link take up, is automatically optimumly timed with respect to stitch setting, will uniformly engage and release the thread upon each stitch, can be substantially concealed within the frame of the machine, and comprises a smooth and readily balanced action.

Having in mind the above and other objects that will be evident from an understanding of this disclosure, the invention comprises the devices, combinations and arrangements of parts as illustrated in the presently preferred embodiment of the invention which is hereinafter set forth in such detail as to enable those skilled in the art readily to understand the function, operation, construction and advantages of it when read in conjunction with the accompanying drawings in which:

FIG. 1 is a fragmentary elevational view of the head end of a sewing machine embodying the present invention,

FIG. 2 is a fragmentary detail view in elevation of that portion of FIG. 1 showing the thread pull-off, but with the parts in a different operative position,

FIG. 3 is a fragmentary vertical sectional view longitudinally of the sewing machine of FIG. 1,

FIG. 4 is a fragmentary vertical sectional view taken substantially on the line 4—4 of FIG. 3,

FIG. 5 is a schematic view showing the paths of motion of the take-up lever and the pull-off finger of the machine.

With reference to the drawings, there is illustrated a fragmentary portion of a zigzag sewing machine embodying the present invention, and particularly the sewing machine forming the subject matter of the United States patent of Johnson, No. 2,862,468. The machine includes a frame having a bed defining a work supporting surface 1 and a bracket arm 2 overhanging the work supporting surface 1 and terminating in a head 3.

Mounted in the head 3 for vertical endwise reciprocation is a needle bar 4 carrying a needle 5 at its lower end. The needle 5 is adapted to penetrate work on the work supporting surface 1 and cooperate therebeneath with a loop taker (not shown) in the formation of lock stitches. For zigzag stitching, the needle bar 4 is adapted to be oscillated to vibrate the needle 5 laterally of the line of feed. For this purpose, the needle bar 4 is supported in the lower portion of the head 3 by a spherical bearing 6 which provides for endwise reciprocation of the needle bar 4 and for universal pivotal movement as defined by the bearing 6. At its upper end, the needle bar 4 is journaled in a bore 7 in a gate member 8 that is pivotally mounted on a presser bar bushing 9 and is

Accordingly, it is an object of this invention to pro-connected by a link 10 to a zigzag mechanism for im-

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parting vibrations to the needle bar 4 for moving the needle 5 laterally of the line of feed. The details of the above mechanism form no part of the present invention and so are not herein disclosed. However, the disclosed mechanism is substantially the same as in the above mention Johnson patent, No. 2,862,468, to which reference may be had for a more detailed disclosure thereof.

Endwise reciprocation is imparted to the needle bar 4 by a counterbalanced crank 11 mounted on the head end 10 of a main shaft 12 journaled longitudinally of the bracket arm 2. A crank pin 13 is secured in the crank 11 by a set screw 14. One end of a connecting link 15 is provided with a hub 16 having a bore for receiving the crank pin 13, the hub 16 having a reduced portion 17 received 15 within a recess in the crank 11. The other end of the link 15 has a bore 19 slidably receiving a pin 20 having integral thereof spaced cheeks 21 disposed upon opposite sides of the needle bar 4. The cheeks 21 support a cross pin 22 having a vertical bore 23 for receiving the needle 20 bar 4 and a set screw 24 for locking the same relatively to the needle bar.

The take-up mechanism of the machine is of a conventional link type and comprises a take-up lever 25 pivotally mounted at one end on the crank pin 13 and 25 having a free opposite end extending through a vertical slot 26 to the exterior of the head. A threading eye 27 is formed in the free end of the take-up lever. Intermediate its ends, the take-up lever 25 is pivotally connected by a pin 28 to one end of an anchor link 29 30 that is pivotally connected at its other end by a pivot screw 30 to a boss 31 formed in the head 3.

The thread pull-off mechanism in accordance with this invention comprises a planar thread pull-off element 32 formed of sheet metal and secured to the needle bar driv-35 ing link 15. The element 32 is provided with a hole 33 receiving the reduced end 17 of the hub 16 of the link 15 and has an arm 34 secured to the face of the link 15 by a screw 35. The element 32 has a pull-off finger 36 having a free end 37 formed on the underside thereof with a thread-engaging surface 38. Upon rotation of the crank 11, the free end 37 of the finger 36 is projected through a vertically-arranged slot 39 in the front wall of the head 3.

Secured on the front face of the head 3, as by rivets  $_{45}$ 40, is a plate 41 having a slot 42 substantially coinciding with the slot 39 in the head 3. The plate 41 carries a first thread guide 43 on one side of the slot 42 and a second guide 44 on the other side of the slot 42. The guides 43 and 44 are designed to direct the thread lead 50 laterally across the slot 42 at a point intermediate the ends of the slot 42.

The machine includes a thread tension device 45, for example, of the type illustrated in the United States patent application of Johnson, Serial No. 692,323, filed October 26, 1957, now Patent No. 2,955,775. Briefly, this thread 55 tension device comprises a mounting stud 46 on which are arranged a plurality of tension discs 47 that are biased into engagement with each other by a spring (not shown) disposed within a pair of telescoping spring covers 60 48, the compression of the spring and thus the tension imposed upon a thread adapted to pass between the discs 47 being regulated by an adjusting nut 49. The tension device also includes a check spring 50 and a guard plate 51. A stop plate 52 is disposed between the tension de-65 vice and the face of the head 3 and is adjustably secured thereto by a screw 53. The stop plate 52 includes an abutment 54 for the check spring 50 and a guard 55 to facilitate threading. Behind the stop plate 52 there is disposed a plate 56 carrying thread guides 57 and 58. 70

The thread supply in the illustrated machine comprises a thread spool 59 mounted on a spool pin 60 on the top of the bracket arm 2. From the spool 59, the thread T passes through a guide 61 to the guide 43 of the plate 41 and then laterally across the slot 42 to the guide 44. 75

From the guide 44, the thread passes through the tension device 45 between a pair of the tension discs 47 and around the stud 46, through a guide 62 formed on the guard plate 51, the check spring 50, guide 58, the eye 27 of the take-up lever 25, the a-guide 57, guide 63 mounted beneath the head 3, and a pair of guides 64 and 65 on a needle clamp 66, to the eye of the needle 5.

With reference to FIG. 5, during operation of the machine, the crank 11 is rotated to move the crank pin 13 in the direction of the arrow. As the needle bar approaches the top of its stroke, the take-up lever 25 is simultaneously approaching the top of its stroke. At this time, the take-up lever is pulling the sewing thread to set the stitch in the work and, in the final movements, drawing thread into the system through the tension device from the supply to replace the thread that was consumed in the stitch. The take-up lever 25 then begins to descend to make slack thread available for forming the next stitch and the needle bar 4 begins to descend. It is at this time in the cycle that the thread pull-off acts to pull thread from the supply to make slack thread available on the supply side of the tension device. In FIG. 5, there is illustrated the path of movement at a point P on the thread engaging surface 38 of the free end 37 of the finger 36. The free end 37 of the finger 36 is projected through the slot 39 at a point above the thread lead between the guides 43 and 44 and then moves downwardly. The thread is isolated by the tension device 45 from the thread system of the machine so that as the thread lead between the guides 43 and 44 is expanded by the finger 35, as illustrated in FIG. 2, a certain amount of thread is pulled from the spool 59. Thereafter, the free end of the finger 36 is drawn back into the head 3 and moves upwardly to begin another pull-off stroke, the upward movement of the finger 36 leaving slack thread between the guides 43 and 44 which thread is available for when the take-up mechanism again pulls thread into the system through the tension device 45.

The pull-off mechanism, in accordance with this invention, is designed to provide a constant amount of slack thread which is calculated to be greater than the maximum requirements of the machine. At any stitch setting having a lesser thread requirement, there is a certain amount of slack thread left between the guides 43 and 44 which is the fixed amount initially provided by the pull-off mechanism less the amount drawn into the thread system to replace the thread consumed in the stitch. When the pull-off mechanism is again operated, the thread limb between the guides 43 and 44 is expanded to the same extent as on the previous stitch, drawing from the spool 59 only the amount of thread required to replace the thread drawn from there into the thread system.

In accordance with this invention, there has been provided a novel, simple and effective thread pull-off mechanism that provides slack thread on the supply side of the tension and thereby completely isolates the thread supply from the system so that it will be unable to effect the tensioning of the needle thread at stitch setting. At the same time, the thread pull-off mechanism in accordance with this invention is substantially concealed in that it projects from the head only during the pull-off stroke and then only a minimum amount, thus contributing to the safety of the machine. The mechanism is also disposed to provide a favorable thread lead to a conveniently located tension device and further, where it does not detract from the appearance of the machine, does not constitute an obstruction to manipulation of the work, and is protected so that it is not subject to damage.

Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to a preferred embodiment of my invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications 5

which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

Having thus described the nature of the invention, what I claim herein is:

1. In a sewing machine having a frame, a needle bar mounted in said frame for endwise reciprocation and having a work-penetrating stroke and a return stroke, a rotary shaft journaled in said frame, a crank on said shaft, a needle bar driving link pivotally connected at one end 10 said pull-off element engages and expands said thread to said crank and at the other end to said needle bar for imparting endwise reciprocation to said needle bar upon rotation of said shaft, a thread take-up mechanism mounted in said frame, means operatively connecting said take-up mechanism and said shaft for actuating said 15 head, a needle bar mounted in said head for endwise take-up mechanism in synchronism with said needle bar to effect a maximum take-up action substantially simultaneously with the end of the return stroke of said needle bar, a tension device disposed between said take-up mechanism and the thread supply and a thread pull-off 20 mechanism disposed on the thread supply side of said tension device and comprising a pull-off element on said needle bar driving link and having a thread engaging free end movable in a plane parallel to the plane of movement of said link and having a path of movement 25 defined by the movement of said link, said frame having an opening in the plane of movement of the thread engaging end of said pull-off element, said pull-off element being extended to project said thread engaging end through said opening during the work-penetrating stroke 30 of said needle and to retract the same during the return stroke thereof, and thread guides defining a thread lead transversely of the path of movement of said thread engaging end of said pull-off element whereby said thread engaging end of said pull-off element engages and ex- 35 pands said thread lead during the work-penetrating stroke of said needle and releases said thread lead during the return stroke of said needle.

2. In a sewing machine having a frame including a head, a, needle bar mounted in said head for endwise 40 reciprocation, a rotary shaft journaled in said frame and extending into said head, a crank on said shaft within said head, a crank pin carried by said crank, a needle bar driving link pivotally connected at one end to said crank pin and at the other end to said needle bar for im- 45 parting endwise reciprocation to said needle bar upon rotation of said shaft, a take-up mechanism comprising a take-up lever pivotally mounted at one end on said crank pin and having a thread eye at the other end, an anchor link pivotally connected at one end to an 50 intermediate point of said take-up lever and at the other end to said frame, a tension device disposed between said take-up mechanism and the thread supply, and a thread pull-off mechanism disposed on the thread supply side of said tension device and comprising a pull-off 55 element on said needle bar driving link and having a thread engaging free end movable in a plane parallel to the plane of movement of said needle bar driving link and having a path of movement defined by the move-60

ment of said link, said head having an opening in the plane of movement of the thread engaging end of said pull-off element, said pull-off element being extended to project said thread engaging end through said opening during the work-penetrating stroke of said needle and to retract the same on the return stroke thereof, and thread guides defining a thread lead transversely of the path of movement of said thread engaging end of said pull-off element whereby said thread engaging end of lead during the work-penetrating stroke of said needle and releases said thread lead during the return stroke of said needle.

3. In a sewing machine having a frame including a reciprocation, a rotary shaft journaled in said frame and extending into said head, a crank on said shaft within said head, a crank pin carried by said crank, a needle bar driving link pivotally connected at one end to said crank pin and at the other end to said needle bar for imparting endwise reciprocation to said needle bar upon rotation of said shaft, a take-up mechanism comprising a take-up lever pivotally mounted at one end on said crank pin and having a thread eye at the other end, an anchor link pivotally connected at one end to an intermediate point of said take-up lever and at the other end to said frame, a tension device disposed between said take-up mechanism and the thread supply and a thread pull-off mechanism disposed on the thread supply side of said tension device and comprising a pull-off element formed of sheet metal and having a thread engaging free end, means for pivotally mounting said element on said crank pin at one point and releasably securing said element to said needle bar driving link at another point for movement of said element in a plane parallel to the plane of movement of said needle bar driving link and having a path of movement defined by the movement of said needle bar driving link, said head having an opening in the plane of movement of the thread engaging end of said pull-off element, said pull-off element being extended to project said thread engaging end through said opening during the work-penetrating stroke of said needle and to retract the same on the return stroke thereof, said thread guides defining a thread lead transversely of the path of movement of said thread engaging end of said pull-off element whereby said thread engaging end of said pull-off element engages and expands said thread lead during the work-penetrating stroke of said needle and releases said thread lead during the return stroke of said needle.

#### References Cited in the file of this patent

#### UNITED STATES PATENTS

557,730	Trowbridge
1,133,608	Berger Mar. 30, 1915
1,166,834	Hemleb Jan. 4, 1916
1,549,081	Hohmann Aug. 11, 1925
2,430,084	Smith Nov. 4, 1947
2,704,987	Court et al Mar. 29, 1955