April 21, 1931. E. B. ALLEN 1,801,252

THREAD FEEDING MECHANISM

Filed Feb. 11, 1928 2 Sheets-Sheet 1

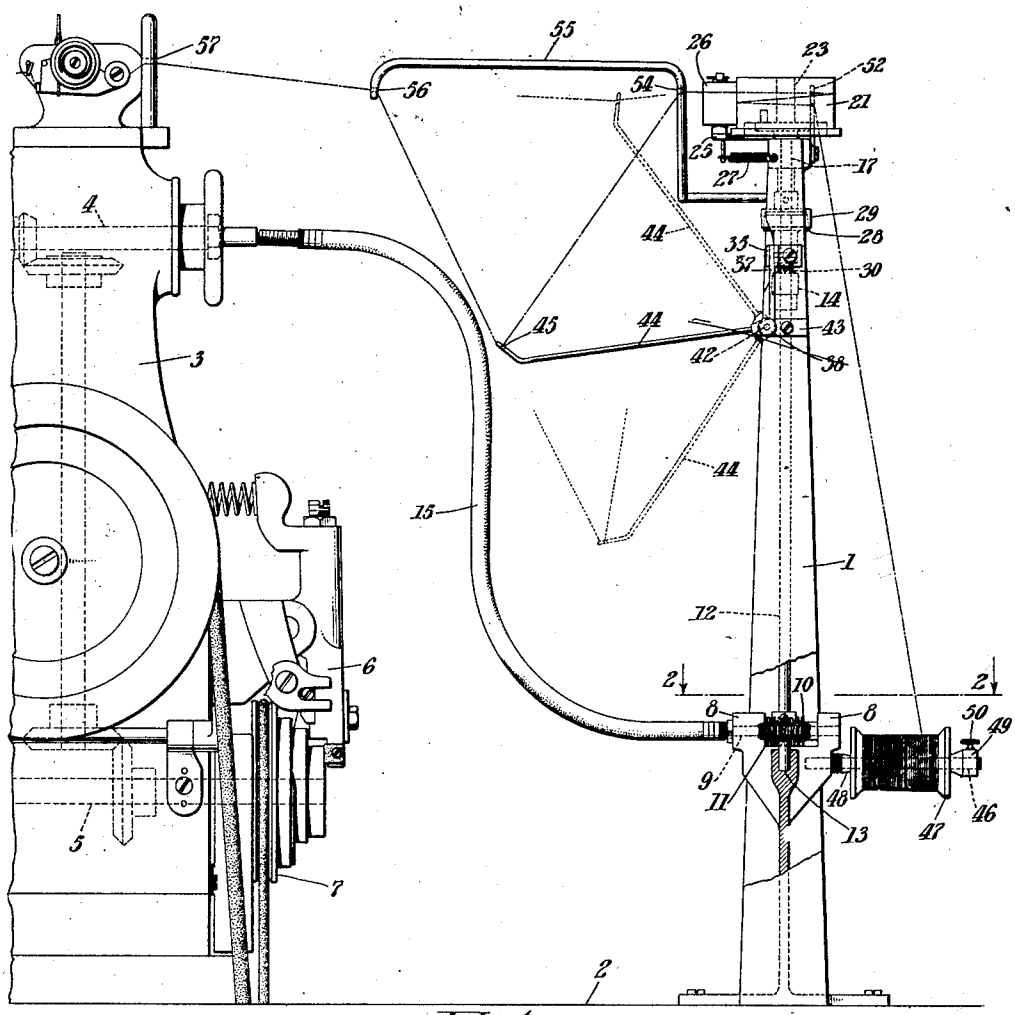


Fig. 1.

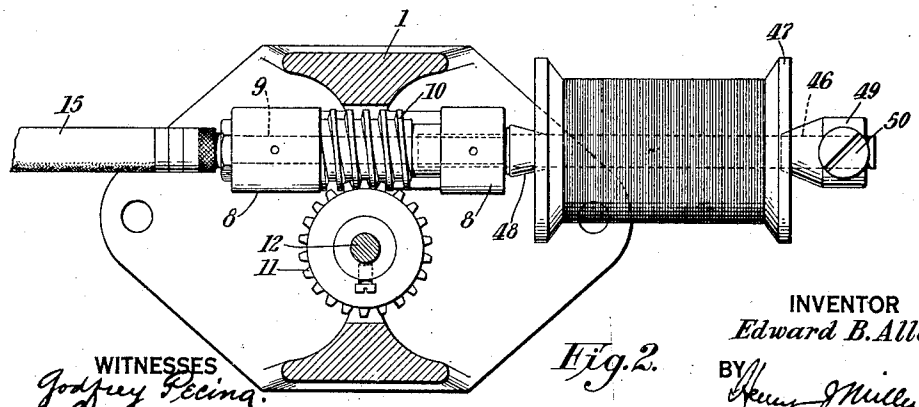


Fig. 2.

WITNESSES

Godfrey Pecina.

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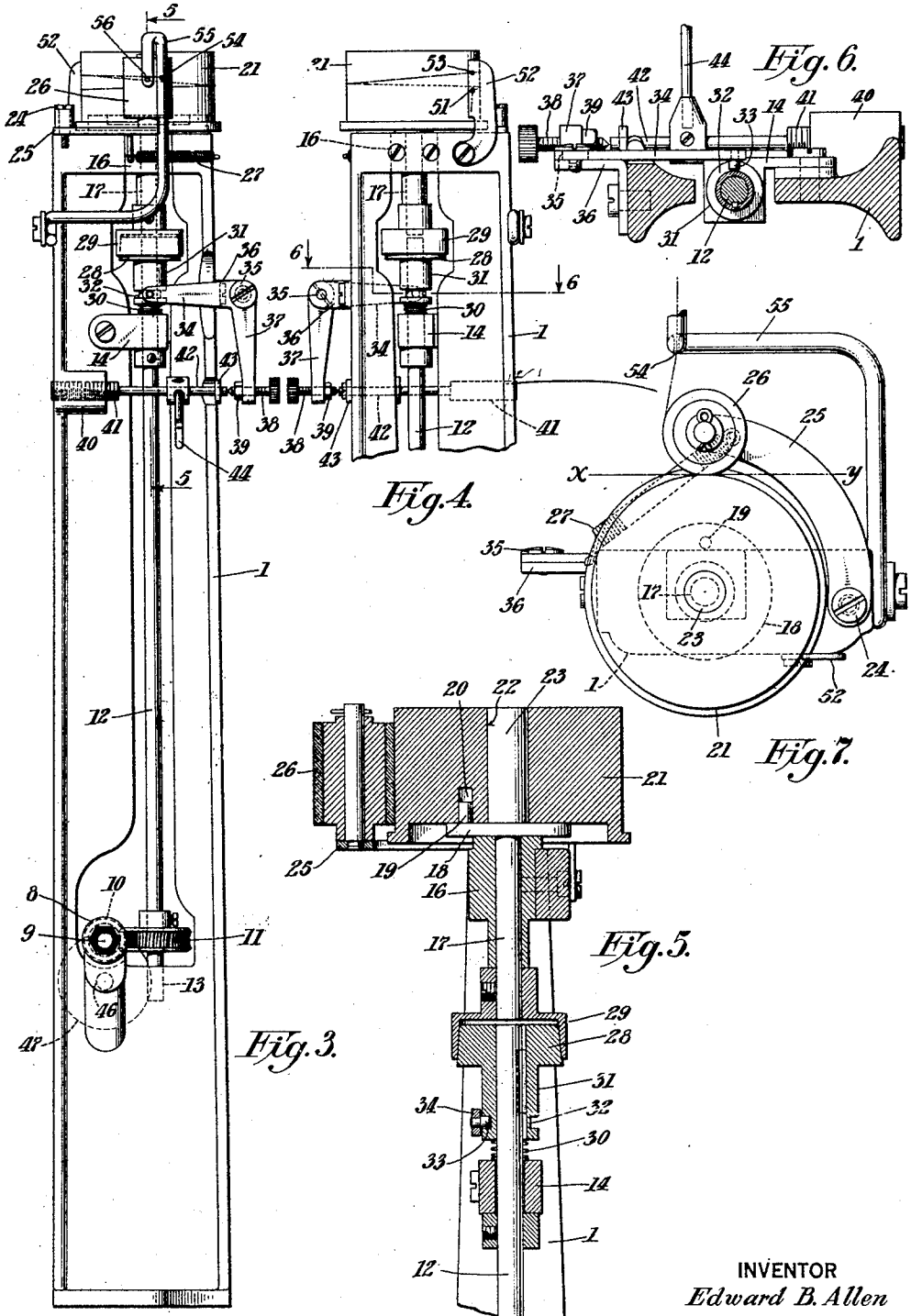


Fig. 3.

Fig. 4.

Fig. 6.

Fig. 7.

Fig. 5.

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UNITED STATES PATENT OFFICE

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THREAD-FEEDING MECHANISM

Application filed February 11, 1928. Serial No. 253,567.

This invention relates to sewing machines and more particularly to means for automatically pulling off thread from the supply-spool and for supplying slack thread free from twists and kinks at the rate required by the machine, regardless of variation in sewing conditions. Another object of the invention is to pull the thread from the supply-spool without jerking the thread or causing overthrow of the spool, with the consequent dangers of thread-breakage and thread-entanglement. A further object of the invention is to relieve the stitch-forming mechanism of the necessity of pulling thread from the supply, which has heretofore been done in a more or less jerky manner, causing unevenness in the sewing and thread-breakage.

With the above and other objects in view, as will hereinafter appear, there is provided, in the preferred embodiment of the invention hereinafter more particularly disclosed, a pull-off wheel which is driven through a slack-thread-controlled clutch from a shaft running with the sewing shaft of the machine. The speed of the pull-off wheel is such as to provide for the maximum thread-requirements of the machine. The clutch is operated by a thread-arm, the position of which is controlled by the amount of slack thread between the pull-off wheel and the sewing machine. As the amount of slack thread increases, the thread-arm drops and disconnects the pull-off wheel from its driving means. As the slack thread is used, the thread-arm is elevated and throws in the clutch for renewal of the pull-off action. The result is that for anything less than maximum thread-requirements, the pull-off wheel is driven intermittently, supplying slack thread at an average rate equal to that at which it is used by the sewing machine. Although the pull-off wheel is driven intermittently, it does not jerk the thread from the supply-spool and causes no overthrow of the latter. The clutch-mechanism insures an easy pick-up of the pull-off wheel by its driving shaft.

In the accompanying drawings, Fig. 1 is a side elevation of a pull-off device embodying the invention, the pull-off device being shown as operatively connected with the sewing mechanism of a buttonhole sewing machine. Fig. 2, is a section on an enlarged scale on the line 2—2, Fig. 1. Fig. 3 is a front elevation of the pull-off device. Fig. 4 is a rear elevation of the mechanism at the upper end of the pull-off device. Fig. 5 is a section on the line 5—5, Fig. 3. Fig. 6 is a section on the line 6—6, Fig. 4, and Fig. 7 is a top plan view of the pull-off device.

In the preferred embodiment of the invention illustrated, 1 represents the standard or supporting frame for the pull-off device. This frame may be secured to the table-top or power-bench 2 on which is stationed the sewing machine 3 in conjunction with which the pull-off device is intended to operate. The sewing machine 3 may be of any type; the one illustrated herein being a buttonhole sewing machine such as disclosed in the patent to Allen, No. 1,548,815 of August 11, 1925.

Such a machine has the usual stitch-forming mechanism driven by the connected upper and lower sewing shafts 4 and 5 which are under the control of the stop-motion device 6 and receive power from the belt-driven pulley 7. Journaled horizontally in the standard 1, in bearings 8, is a shaft 9 carrying a worm 10 which meshes with a gear 11 fixed to the vertical shaft 12 which is journaled in the lower bearing 13 and the upper bearing-bracket 14. The shaft 9 of the pull-off device is connected to the shaft 4 of the sewing machine by means of the flexible shaft 15. Journaled in the upper end of the standard 1, in the bearing 16, is the shaft 17 which is in end-to-end relation and in line with the shaft 12. The shaft 17 has fixed thereto, or formed therewith, a flange or collar 18 which rests upon the bearing 16 and carries an upstanding steady-pin 19 entering the hole 20 in the pull-off wheel 21. The central aperture 22 of the wheel 21 receives the upper enlarged end 23 of the shaft 17.

Pivoted at the upper end of the standard 1 by means of the screw 24 is a curved arm 25 carrying a rubber faced presser-roller 26 which is yieldingly held in engagement with the cylindrical surface of the pull-off wheel 21 by means of the tension-spring 27.

Splined to the upper end of the shaft 12 so as to rotate therewith and slide lengthwise thereof is the male cone-clutch member 28 which is adapted to mate with the female cone-clutch member 29 fixed to the lower end of the shaft 17. The clutch-element 28 is urged toward the clutch-element 29 by means of the spring 30 coiled about the shaft 12 between the element 28 and the bearing-bracket 14. The clutch-element 28 is formed with a hub 31 in which is cut a peripheral groove 32 for reception of the pin 33 projecting laterally from the free end of the horizontal arm 34 of a bell-crank clutch-operating lever fulcrumed at 35 on the bracket 36 fixed to the side of the standard 1. The downwardly extending arm 37 of the bell-crank lever carries an adjusting screw 38 and lock-nut 39.

Freely threaded into the horizontal aperture in the boss 40 on the standard 1, in line with the adjusting screw 38, is the screw-threaded end 41 of a clutch-governing shaft 42, the other end of which is journaled in the bearing-bracket 43 and terminates closely adjacent the end of the adjusting screw 38. Fixed to the shaft 42 is the gravity operated clutch-governing arm 44, the free end of which is formed with the thread-eye 45, Fig. 1. Fixed to and projecting rearwardly from the standard 1 is the spool-pin 46 carrying the thread-supply spool 47. A slight tension is preferably supplied to the spool 47 by means of the spring-pressed cone 48 slidably mounted on the pin 46 and acting in conjunction with the cone 49 adjustably secured to the pin 46 by the thumb-screw 50.

The thread runs upwardly from the supply-spool 47, through the thread-eye 51 in the bracket 52, thence once around the thread pull-off wheel 21 and through the thread-eye 53 in the bracket 52, from which the thread runs further around the wheel 21 to and between the presser-wheel 26 and the pull-off wheel 21. From the presser-wheel the thread runs through the thread-eye 54 in the thread-guiding arm 55, thence downwardly through the thread-eye 45 in the arm 44 and upwardly through the thread-eye 56 in the arm 55, from which the thread extends to the thread-receiving guide 57 of the sewing machine.

It will be noted that the gravity-operated clutch-governing arm 44 bears lightly downwardly on the slack thread between the thread-eyes 54 and 56. The adjusting screw 38 is so set that when the arm 44 drops to substantially the lower dotted line position, Fig. 1, the clutch-elements are disengaged. As the slack thread between the eyes 54 and 56 is used, the arm 44 is elevated and, due to the screw-threaded connection 40, 41 between the shaft 42 and the standard 1, the shaft 42 is moved to the left, Fig. 3, thus allowing the spring 30 to urge the lower clutch-element 28 into driving relation with the upper clutch-element 29, whereby the pull-off wheel 21 is connected to its source of power and pulls thread from the supply-spool 47; supplying the thread to the arm 44. As the pull-off wheel 21 is geared to the sewing machine so as to feed the thread at a speed meeting the maximum thread-requirements of the machine, there will, for ordinary requirements, be an accumulation of slack thread between the thread-eyes 54 and 56 when the pull-off 21 is operating. When the accumulation of slack thread reaches a certain amount, the thread-arm 44 will drop far enough to turn the shaft 42 sufficiently to actuate the bell-crank lever 34, 37 and withdraw the driving clutch-member 28 from the driven clutch-member 29, thereby disconnecting the pull-off wheel 21 from its source of power.

The pitch of the screw 41 is so chosen that elevation of the thread-arm 44 to, preferably, its mid-position (full line position, Fig. 1) is sufficient to throw in the clutch. There is thus a certain amount of slack thread between the thread-eyes 54, 56 at the end of a sewing operation and this amount of slack thread may be readily drawn upon by the operator in removing the work. However, if the operator desires to pull thread from the supply-spool while the machine is stationary, the thread will readily pass the pull-off and presser-wheels, since a pull on the thread tends to move the presser-wheel 26 away from the pull-off wheel 21; the wheel 26 being then free to turn while the thread slides freely over the hard surface of the then stationary pull-off wheel. The location of the thread-eye 54 on the presser-wheel side of the plane x—y, Fig. 7, which is tangent to the wheels 21, 26 at their line of contact, results in the presser-wheel 26 moving out of contact with the pull-off wheel 21 when a pull is exerted on the thread by the operator.

The invention is not to be understood as limited to the details of construction and relative arrangement of parts shown and described, as such details and relative arrangement of parts may obviously be materially modified by one skilled in the art within the scope of the invention. The foregoing disclosure is to be construed in an illustrative sense and not in limitation of the invention.

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

1. The combination with a sewing machine, of a movable pull-off device, and slack-thread-controlled means for governing the motion of said pull-off device.

2. The combination with a sewing machine, of a pull-off device operating to pull thread from the supply faster than it is used by the sewing machine, and means controlled by the slack thread between said pull-off device and the sewing machine for operating said pull-off device intermittently.

3. The combination with a sewing ma-

chine, of a pull-off device, actuating means running with the sewing machine for driving said pull-off device, and means controlled by the thread between said pull-off device and the sewing machine for establishing and interrupting driving relation between said pull-off device and said actuating means.

4. The combination with a sewing machine, of a pull-off, a driving shaft running with the sewing machine, a clutch-connection between said drive-shaft and pull-off, and means controlled by the thread between the pull-off and the sewing machine for governing the operation of said clutch.

5. The combination with a sewing machine, of a pull-off device including a rotary thread-feeding wheel, and slack-thread-controlled means for governing the turning movement of said wheel.

6. The combination with a sewing machine, of a pull-off device including a rotary thread-feeding wheel, and slack-thread-controlled means for starting and stopping said wheel.

7. A pull-off device comprising a standard, end-to-end shaft-sections journaled in said standard, a pull-off wheel fixed to one of said shaft-sections, means for driving the other shaft-section, a clutch-connection between said shaft-sections, and a slack-thread-controlled arm pivoted to said standard and connected to operate said clutch.

8. In a pull-off device, a thread-feeding wheel, a presser-wheel bearing yieldingly against said thread-feeding wheel, and a thread-guide disposed beyond the presser-wheel in a position to cause the thread leaving the thread-feeding wheel to be bent around the presser-wheel, whereby a pull on the thread will tend to relieve the pressure of the presser-wheel on the thread-feeding wheel.

9. In a pull-off device, a thread-feeding wheel, a presser-wheel movable toward and away from the thread-feeding wheel, means for yieldingly urging the presser-wheel toward the thread-feeding wheel, and a thread-delivery guide disposed beyond the presser-wheel side of a plane tangent to said wheels at their line of contact.

10. In a pull-off device, a drive-shaft, a driven shaft, a clutch-connection between said shafts, a pull-off connected to said driven shaft, a screw-threaded clutch-governing shaft, a clutch-operating connection between said screw-threaded shaft and said clutch, and a slack-thread-controlled element connected to turn said screw-threaded shaft to effect engagement and disengagement of said clutch.

11. The combination with a sewing machine, of a pull-off device, and a movable slack-thread-controlled element connected to said pull-off device to govern the operation of the latter.

12. The combination with a sewing machine, of a pull-off device, and a movable pull-off governor the movement of which is controlled by the thread between the pull-off device and the sewing machine.

13. The combination with a sewing machine, of a pull-off device, and a slack-thread-controlled pull-off governor operating to maintain slack thread in excess of a predetermined minimum amount between the pull-off device and sewing machine.

14. The combination with a sewing machine, of a pull-off device, and a governor for said pull-off device including a gravity-operated arm engaging the thread between the pull-off device and the sewing machine.

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

EDWARD B. ALLEN.