July 21, 1942. E. VOSSEN 2,290,303

ELECTRIC STOP MECHANISM FOR KNITTING MACHINES

Filed July 19, 1940

Fig. 1.

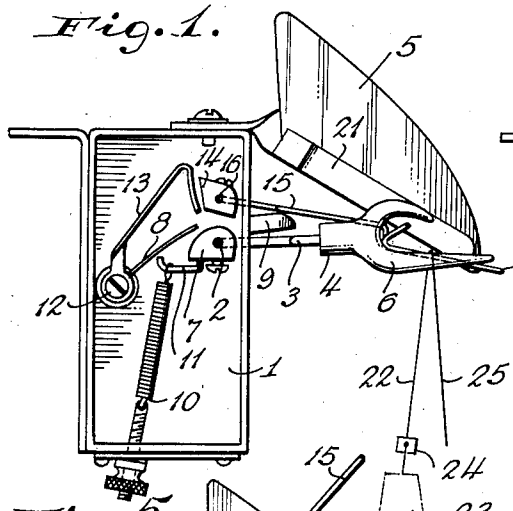


Fig. 2.

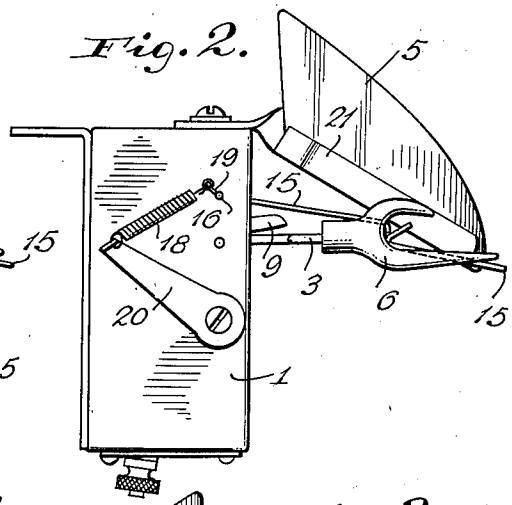


Fig. 5.

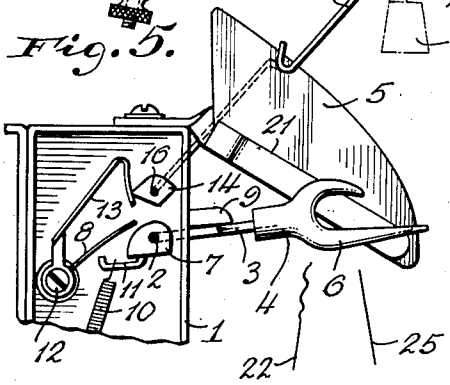


Fig. 3.

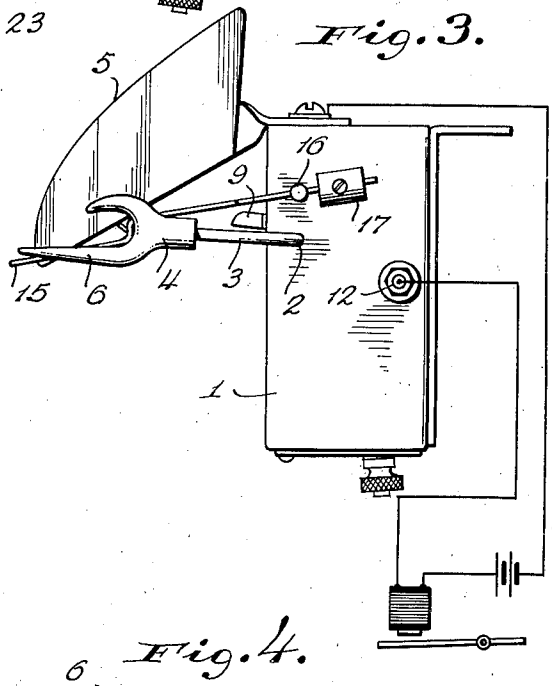


Fig. 6.

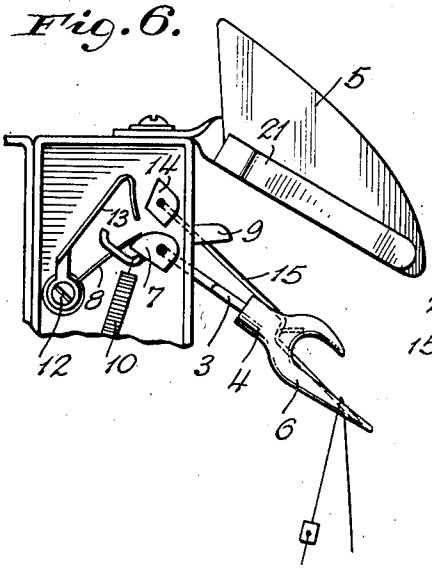
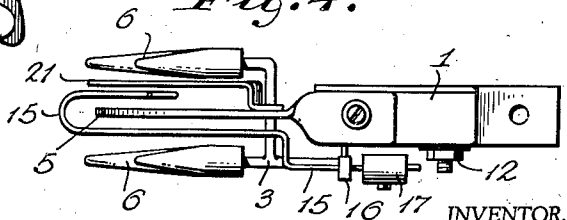


Fig. 4.



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UNITED STATES PATENT OFFICE

2,290,303

ELECTRIC STOP MECHANISM FOR KNITTING MACHINES

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Application July 19, 1940, Serial No. 346,273

1 Claim. (Cl. 66—163)

This invention relates to automatic electrical stop mechanisms for knitting machines, commonly called stop motions, and provides a form which, in addition to being perfectly serviceable for knitting with ordinary threads of all kinds, is especially adapted to operating with natural and artificial threads of very light weight which have an excessive tendency to curl and twist into loops upon the occurrence of a slack. The problem which the invention meets is to construct a stop motion containing all the best features of such mechanism for use with ordinary threads, which in addition thereto will set in motion firmly, quickly and precisely a mechanism strong and heavy enough to effect without fail in case of need the stoppage of the knitting machine, yet so light in structure and ready and smooth in operation as to minimize, in knitting with very light threads, breakage from frictional and pressure strains, and which will also prevent any catching as result of the tendency of this class of thread to curl and loop upon the occurrence of a slack.

In knitting with very light threads where the minimization of pressure and frictional strains on the thread is necessary, there is but one suitable location for the mechanism, and the friction arising from duplication of parts is to be avoided. In consequence great advantage is gained by combining the knot detector, or mechanism for stoppage in case of a knot, with the end detector, or mechanism for stoppage in case an end occurs in the travelling thread.

The drawing and disclosure present a typical form of the device but do not limit the scope of the invention, which covers all forms of its embodiment.

Fig. 1 shows the device with the side wall of the housing removed to disclose the interior. Fig. 2 shows the same view but with the side wall in place supporting the tension spring and its adjusting lever. In Fig. 3 the device is seen from the reverse side, and Fig. 4 is a top plan view. Fig. 5 shows a breakage in the thread releasing the end detector lever to move into stopping position. Fig. 6 shows both levers depressed by thread tension caused by the catching of a knot in the strainer.

All electrical stop motions are essentially devices to close an electrical circuit and energize an electromagnet to actuate a mechanical trip which cuts the driving power from the knitting machine, and allows it to come to a stop. Since the outside circuit, electromagnet and trip are not separately covered by the patent they are merely indicated without description or specific drawing.

The device (Fig. 1) consists of a housing 1 within which a horizontal pin 2 passes at right angles from side wall to side wall and serves as a pivot pin for the knot detector lever 3. The outer arm of lever 3 carries a horizontal crossbar 4 (Fig. 4) from which the two parallel outer portions 6 of knot detector lever 3 extend on either side of center guard 5 and in parallel planes, each outer portion 6 being forked, with a straight lower tine extending out beyond center guard 5, and an upper tine somewhat shorter and curved downwardly to make with the lower tine a partially enclosed space giving full play to the tendency of light threads to curl and twist upon occurrence of a slack but preventing them from fouling the mechanism near the housing. This outer portion 6 of lever 3 is ordinarily made of porcelain to minimize thread friction.

Knot detector lever 3 carries on its inner or pivot end a metal piece 7 suitably shaped to serve as a contact heel for closing an electrical circuit with leaf spring 8. The pivot pin 2 passes through contact piece 7 about the center thereof leaving a substantial part of the contact piece to act as inner counterarm of lever 3. Spiral spring 10 serves in normal operation to hold heel 7 out of electrical contact with leaf spring 8 and the outer arm of lever 3 pressed upwardly against the backstop extension 9 of housing 1. Spring 10 is attached at its lower end to the bottom of housing 1 by a screw permitting regulation of the spring's length and tension and at its upper end to the inner or counterarm part of contact piece 7 by means tending to keep the tension on lever 3 at a minimum at all angles of the latter's inclination. In the drawing such means of attachment is typified by a ring at the upper end of spring 10 which, as the angle of inclination of lever 3 increases, slides down an extension bar 11 attached to the inner or counterarm part of contact heel 7 and minimizes the elongation of spring 10 and increase of its tension caused by the increasing angle. A contact unit 12 is screwed into but insulated from housing 1 and carries two leaf springs, the one spring 8 already referred to serving to make circuit with contact heel 7 of the knot detector lever 3 upon depression of the outer arm thereof, and the other spring 13 serving to make circuit with contact heel 14 of the inner counterarm of end detector lever 15 upon elevation of the outer arm thereof.

End detector lever 15 (Figs. 1, 3) is pivoted on

a pin 16 fixed thereto, which passes through the housing 1 at right angles to its side walls and turns in the perforations thereof as bearings. Lever 15 rotates in a plane parallel to that of knot detector lever 3 and lies wholly outside of housing 1 (Fig. 3). The lever 15 is exactly balanced on its pivot 16 by means of weight 17 fixed at its inner end so that there is a total absence of gravity actuation.

A spring 18 attached to the end of a very short crank 19 (Fig. 2) consisting of the upturned end of pivot pin 16 (Fig. 1) serves to hold the outer arm of lever 15 resting upwardly against the travelling thread in normal operation and move that lever into circuit-closing contact when the thread is broken, the contact being made between the contact piece 14 fixed at the inner end of lever 15 and the charged spring 13. By means of a lever 20 pivoted at its lower end to the side wall of housing 1 and fastened at its upper end to spring 18 the tension on the latter can be regulated. The outer portion of end detector lever 15 is made of a single wire and is bent or looped around the outer end of guard 5 and back parallel to itself on the opposite side thereof to a point within the path of the travelling thread, so that upon occurrence of a slack in the thread the rise of lever 15 is limited by the looping of the thread over the lever-arms and under guard 5, and unnecessary stoppage is avoided. Other factors which contribute to prevent the excessive movement of lever 15 are the weight of the loops and their friction, both external and internal.

Guard 5 has, in addition to the foregoing, the primary purpose of aiding to position the travelling thread, the lower edge of guard 5 cooperating with knot detector lever arm 6 and end detector lever 15 to form an enclosed space as a path. Guard 5 is usually high in shape with a curved contour to its upper edge. This shape not only tends to protect the stop motion from accidental contacts but also saves the time of the operator in placing or replacing the thread. The stop motion is ordinarily located well above the floor and when the thread has been displaced from the stop motion and the knitting machine has come to a stop the operator can readily replace the thread by lifting it with a stick to the curved upper edge of guard 5 and then drawing it down along that edge, the thread engaging and bringing down with it the raised end detector lever 15 and knot detector lever 6 till the thread passes below the end of guard 5 and is released to slip into normal operative position in the enclosed space made by the lower edge of guard 5 with said levers.

An arm 21 is fixed at its inner end to the lower inner corner of center guard 5 and extends parallel to the lower edge thereof outwardly from the housing, in a plane parallel to that of the guard and that of the movement of knot detector lever 3, but closer to the latter than the former, so that the accumulation of any fuzz in normal operation between arm 21 and guard 5 which would obstruct the free vertical play of end detector lever 15 is prevented. The purpose of arm 21 is to hold the light travelling thread from curling and twisting off the lever arms in case of a slack, which it tends to do if any width of space is allowed it.

Fig. 1 shows the device in operative position. The travelling thread 22, 25 under the drawing force of the knitting needles leaves the spool 23 and passes through the eye of the strainer 24 designed to catch any knot, then passes upward and over the nearer porcelain arm 6 of the knot detector lever 3, under the fixed arm 21, over the nearer bight of the looped wire end detector lever 15, under guard 5, over the farther bight of wire lever 15 and the farther porcelain arm 6 of lever 3 and downward 25 to the needles.

Fig. 5 together with Figs. 1 and 2 show the operation of the device when a break in the thread occurs. In normal operation the travelling thread passing over the outer arm of end detector lever 15 holds it down at the level of the knot detector arm 6 against the tension of spring 18 (Fig. 2) and thereby holds the contact piece 14 at the inner end of lever 15 out of electrical contact with leaf spring 13. A break or end in the thread (Fig. 5) releases lever 15 to rise (Fig. 2) under the tension of spring 18 operating on the upturned end 19 of the pivot wire 16 as a crank, and the contact heel 14 at the inner end of lever 15 to lower into electrical contact with leaf spring 13. The circuit is closed and the electromagnet (Fig. 3) is energized to move a trip which cuts the power from the knitting machine.

Fig. 6 with Fig. 1 shows the operation when a knot occurs in the travelling thread. As it passes from the spool it catches in the eye of the strainer 24, stopping the movement of the thread at this point. The pull of the knitting needles draws the thread 22, 25 tense from the strainer over the stop motion and depresses both end detector lever 15 and knot detector lever 3, the contact heel 7 on the inner or counterarm of lever 3 rising into electrical contact with leaf spring 8, closing the electric circuit, energizing the electromagnet and actuating the trip to cut the power from the knitting machine. The loop of thread then slips down off of both levers and furnishes slack for the knitting machine to consume till it comes to rest, thus preventing breakage of the thread from tautening between the strainer 24 and the needles.

The device is intended to serve in addition to all ordinary purposes the special purpose of knitting with very light threads and it is necessary to design the actuating forces of the levers to place a minimum strain on the thread. An elastic bed or positioning base is necessary to cushion the strain on the travelling thread, and the porcelain arms 6 of knot detector lever 3 are utilized to serve this purpose. The downward spring tension on counterarm 7 holding lever 3 up against backstop 9 must be sufficient to provide the necessary steadiness of bed, but not enough to break the thread, allowing for additional strains from end detector lever 15. The quick even pressure of levers 3 and 15 on the thread under spring control is indispensable, and gravity actuation inoperable because under the latter the levers overstrain the thread by bouncing against it owing to the normal vibrations of the knitting machine, the jerky and irregular sticking and detachment of the thread on leaving the spool and the effect of alternately working and idling needles in certain types of knitting.

Since a firm positioning bed for the thread is desirable and the stronger the controlling spring on lever 3 the firmer the bed, as much as possible of the limited tensile strength of the thread should be employed to move lever 3 against its spring, and as little as possible thereof made sufficient to govern lever 15. To attain even pressure and rapid and accurate operation of lever 15 with a minimum of strain on the thread,

that lever is lightly built and exactly counterbalanced on its pivot **16** by a counterweight **17** (Fig. 3), leaving no gravity actuation to add strain to the thread.

The use of actuating spring **18** (Fig. 2) with the short crank **19** serves two purposes (*a*) of maintaining an even and adjustably minimum tension on lever **15** at all angles of inclination thereof, and (*b*) of permitting the use without excessive tension on lever **15** of a spring **18** as strong as can be properly regulated, exerting sufficient pressure at the point of juncture with crank **19** to insure good electrical contact between the two notwithstanding deposits of dust and fuzz inescapable in knitting operations, which deposits would be sufficient to interfere with proper electrical connection between pivot **16** under the light weight of lever **15** and its bearings in housing **1**. The circuit is therefore led from lever **15** and its pivot **16** and crank **19** to spring **18**, lever **20** and housing **1**.

In the foregoing manner all parts are constructed, positioned, and adjusted to provide in knitting with all types of thread smooth operation with a minimum of frictional and other strains on the thread, and in knitting with very light threads, on occurrence of a knot or end a rapid and precise shifting of levers to close an electric circuit, actuate a trip and cut off the power from the knitting machine.

I claim:

In a stop motion for knitting machines, a housing, a pivot bar extending therethrough at right angles to the sides thereof and rotating in apertures in said sides as bearings, a contact heel fixed to said pivot bar interiorly to said housing, a lever fixed to said pivot bar exteriorly to said housing and having the end of its exterior arm bent back into a loop, means on the interior counterarm of said lever to counterbalance the two arms thereof, a crank fixed at one of its ends to said pivot bar exteriorly to said housing on the opposite side thereof from said lever, a spring governing said lever attached to the free end of said crank and having a path of travel sufficiently long with reference to the length of said crank to equalize spring tension thereon at all angles of rotation of said pivot, means attached to said housing and to said spring to regulate the tension thereof, a second lever pivoted interiorly to said housing and having a plane of rotation parallel to that of the first lever, the exterior arm of said lever being vertically bifurcated and each bifurcation vertically forked, a spring governing said lever attached to the interior counterarm thereof and to said housing and holding said lever resiliently in position as bed for the travelling thread, means for regulating the tension of said spring and equalizing said tension at all angles of inclination of said lever, a contact heel attached to the interior counterarm of said second lever, a contact piece attached to but insulated from said housing and carrying two leaf springs cooperating respectively with the contact heels of said first and second levers, a flat vertical rigid member attached to said housing and extending therefrom in a plane parallel to the planes of rotation of said first and second levers and between the two bights of the looped exterior end of said first lever and the bifurcations of said second lever, a second rigid member fixed at its interior end to said first rigid member and extending in a plane parallel thereto and having its lower edge parallel with the lower edge thereof, and lying close to the bifurcation of said second lever which is first reached by the travelling thread, so that in normal operation the circuit for carrying the stoppage actuating current is open and the travelling thread rides over the exterior arms of said first and second levers and under said rigid members and within the tines of said second lever in an enclosed space by said members and levers formed, and on occurrence of a slack is restrained from escape therefrom by said second rigid member, but when a break or end occurs in the travelling thread the first lever rises and its interior heel meets the contact piece and closes said circuit, and when a knot occurs in the thread a tension results therein depressing the second lever and making electric contact with the interior heel thereof, closing said circuit.

EDWARD VOSSEN.