July 24, 1956 E. VOSSEN 2,755,648

OPEN LATCH DETECTOR FOR KNITTING MACHINES WITH LATCH-TYPE NEEDLES

Filed Dec. 15, 1954

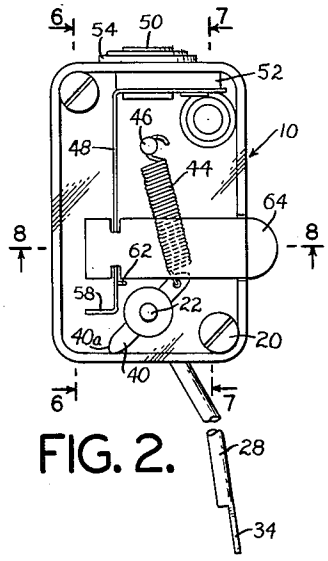


FIG. 2.

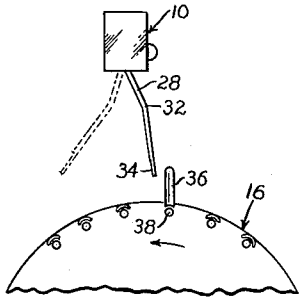


FIG. 1.

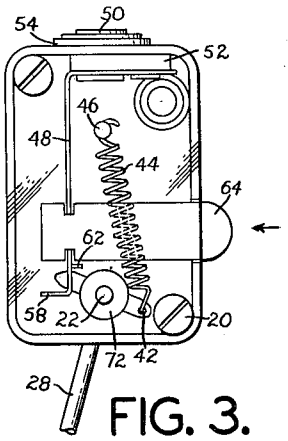


FIG. 3.

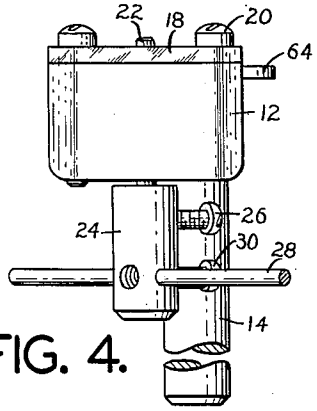


FIG. 4.

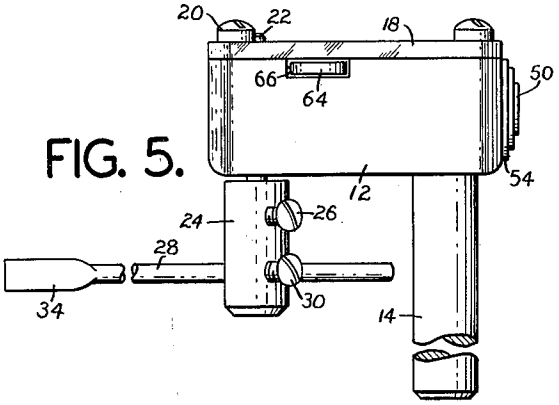


FIG. 5.

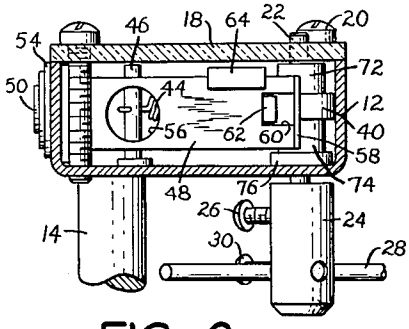


FIG. 6.

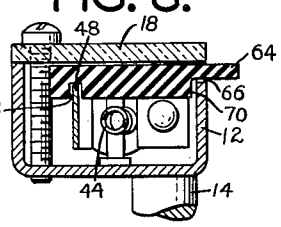


FIG. 8.

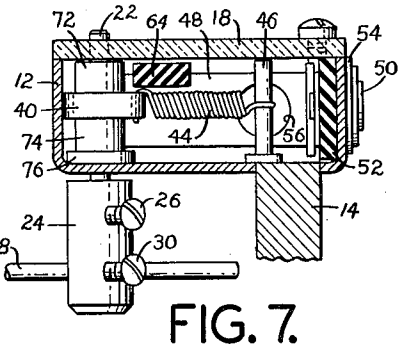


FIG. 7.

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OPEN LATCH DETECTOR FOR KNITTING MACHINES WITH LATCH-TYPE NEEDLES

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3 Claims. (Cl. 66—157)

This invention relates to an open latch detector for knitting machines with latch-type needles.

This invention is particularly useful in connection with circular knitting machines on which fine gauge women's hosiery is made. These machines employ fine gauge needles with pivotally mounted latches. The invention is also of great use in connection with other knitting machines in which latch-type needles are provided.

It is important in knitting machines of these types, as well as in all other knitting machines, to provide a means of automatically and instantaneously detecting broken or slack yarn or thread in order to stop the operation of these machines until repairs or replacements of the broken yarn can be made. Should a broken yarn or thread remain undetected for a period of time, continued operation of the machine during this period of time would result in the production of defective knitted goods and possibly bent or broken needles.

The present invention relates to detecting means for detecting an open latch on a latch-type needle. It will be understood that it is the yarn itself which holds the latch of the needle in a vertical closed position. When the yarn breaks, the latch will fly open. This is particularly true of circular knitting machines where the needles are caused to move in a circular path and centrifugal force is exerted upon each latch to cause it to fly open to a horizontal position upon the breaking of the yarn. Consequently, the detection of an open latch is the equivalent to the detection of a broken thread or yarn.

It is the principal object of this invention to provide automatic means for instantaneously detecting broken yarn by detecting an open latch. The open latch is detected when it strikes a probe or feeler in the detecting mechanism herein described and claimed. This probe or feeler is connected to a switch which controls a stop motion circuit. When an open latch engages the probe, the probe is caused to close the stop motion circuit and operation of the machine is brought to an abrupt stop.

The latch, especially of fine gauge needles, is a very delicate element and it is therefore essential that the probe and stop motion switch operate freely and without any serious resistance to the movement of the open latch. Otherwise, the open latch would bend or break under the impact of its engagement with the probe.

It is therefore an important feature of this invention that the probe and switch mechanism are so designed and the forces which operate on them are so balanced that an open latch is able to strike the probe and swing it from one position to another and thereby to close the switch to the stop motion circuit without bending or breaking or experiencing any undue stress or strain. The probe itself is simply a light-weight wire which is pivotally mounted for arcuate movement against the action of a relatively weak spring when struck by an open latch. The spring may be made as strong or as weak as circumstances would require so that the resistance to the impact of the latch may readily be controlled. Connected to the wire, and more particularly to its pivotal support, is the movable switch element itself which is engageable with the fixed switch element when the probe pivots. This fixed switch element is itself a very flexible, delicate leaf spring and consequently there is very little friction between the two switch elements when an open latch swings the probe around to switch closing position.

Another important feature of this invention is the wiping action between the two switch elements which is advantageous for two reasons: In the first place, it wipes the switch elements clean and keeps them clean. This is important since lint and dust are very apt to collect in switches situated in and about knitting machines and this would be detrimental to the proper functioning of the switches. In the second place, a wiping contact or engagement between switch elements involves a minimum of friction and therefore reduces to a minimum the resistance of the switch elements to the force which actuates them.

Still another important feature of this invention is the quick release means for opening the switch and resetting it and the probe in readiness for an encounter with another open latch. The release or resetting means is simply a push button which engages the leaf spring switch element and disengages said element from the movable switch element. As has above been indicated, the movable switch element to which the probe is attached is spring biased to open position. The leaf spring switch element functions in the manner of a catch or keeper to hold the movable switch element in engagement therewith. Consequently, when the push button disengages the leaf spring switch element from the movable switch element, said latter element, together with the probe which is connected thereto, will move under the influence of the spring to a position of readiness, awaiting the next break in the yarn.

A still further important feature of the invention is the positive ground connection between the movable switch element and the housing which contains the switch elements. The movable switch element is grounded two ways: Through the axle or pin on which it pivots and through the spring to which it is connected. One end of the spring is secured directly to the movable switch element. The other end of the spring is secured to a pin or post which is fixed to the switch casing. Consequently, despite the movable nature of the movable switch element, it is directly and positively grounded at all times.

The invention is illustrated in the accompanying drawing in which:

Fig. 1 is a plan schematic view showing the general arrangement of latch-type needles in a circular knitting machine and showing how the latch detector herein described and claimed should be positioned to engage the open latch of one of said needles.

Fig. 2 is an enlarged plan view of said latch detector, showing it in a position of readiness for the interception of an open latch.

Fig. 3 is a similar view but showing the switch in closed position following engagement of the probe by an open latch.

Fig. 4 is a front end view of the latch detector herein claimed.

Fig. 5 is a side view thereof.

Fig. 6 is a sectional view therethrough on the line 6—6 of Fig. 2.

Fig. 7 is another sectional view therethrough on the line 7—7 of Fig. 2.

Fig. 8 is a sectional view, transverse of the other two sections, taken on the line 8—8 of Fig. 2.

The latch detector 10 shown on the drawing includes a metal casing 12 and a vertical post 14 secured to said casing and supporting it on a suitable bracket or support connected to the frame of a knitting machine such as the circular knitting machine 16 schematically shown in the

drawing. Casing 12 is provided with a cover plate 18 which is removably secured thereto by means of screws 20. Cover plate 18 may be made of metal or, if desired, it may be made of transparent plastics, as shown in the drawing, to expose the detector mechanism to view without exposing it to dust and other foreign matter.

Projecting vertically through the casing and cover plate 18 is a shaft 22 which is journaled therein for angular movement about its longitudinal axis. A sleeve 24 is adjustably secured to shaft 22, below the casing, by means of set screw 26. Projecting laterally through a diametrically extending hole in sleeve 24 is a wire probe or feeler 28 and said probe or feeler is adjustably held in place therein by means of a second set screw 30. The probe, in the form of invention illustrated, is provided with a bend 32 intermediate its ends and one end is provided with a flattened portion 34. The use of set screw 30 makes it possible to set the probe in any selected angular and longitudinal position.

It will be understood that it is the flat portion 34 of probe 28 which is engageable with open latch 36 of a latch type needle 38. When the yarn on such needle is whole and in proper tension, it holds the latch in vertical closed position. When the yarn breaks or becomes unduly slack, it will no longer maintain the latch in its closed vertical position and centrifugal force will cause the latch to fly outwardly to horizontal position, as is the case with one of the latches in Fig. 1. It will be noted that the needles are caused to move in a circular path in accordance with the curved arrow in Fig. 1 and consequently the open latch will strike the probe and cause it to swing around with sleeve 24 and shaft 22 about the longitudinal axis of said shaft. This will actuate the switch mechanism as hereinafter described.

Affixed to shaft 22, within the casing 12, is a double ended contact member 40. One end has a hole 42 formed therein. The opposite end serves as the movable contact member of the switch. An expansion spring 44 is provided in casing 12, one end being hooked through hole 42 in the contact member 40 and the opposite end of said spring is hooked through or around a post 46 secured to the floor of the casing. The action of the spring is to urge contact member 40 to turn with shaft 22 and about the longitudinal axis of said shaft in counter-clockwise direction as viewed in Figs. 2 and 3. The action of an open latch 36, however, is to cause probe 28 and shaft 22 to swing in clockwise direction about the longitudinal axis of said shaft as viewed in the same Figs. 2 and 3. Consequently, spring 44 acts to hold the probe in a position of readiness where it is able to intercept an open latch, and the action of the open latch intercepting said probe is in opposition to the action of said spring.

An L-shaped leaf spring contact member 48 is secured to one of the side walls of the casing, by means of a rivet 50 which also serves as a binding post or terminal for a conductor leading to a stop motion device. Contact member 48 is suitably insulated from the casing wall by means of insulation 52 and rivet 50 is also insulated from the casing by means of insulation 54. A hole 56 may be provided in the leaf spring contact member 48, if desired or required, to decrease its resistance to flexing. At its free end, said leaf spring contact member may be provided with a lip 58 and a hole 60 adjacent said lip. Hole 60 is large enough to receive the free end of movable contact member 40 as Fig. 3 clearly shows.

When an open latch 36 strikes the flat end 34 of probe 28, said probe is caused to swing about the axis of shaft 22 and movable contact member 40 swings with it, the free end of said movable contact member entering into engagement with the lipped end of the leaf spring contact member 48. For the purposes of this specification and of the claims, contact member 40 will be termed the "movable contact member" and the leaf spring contact member 48 will be termed the "flexible fixed contact member." The movable contact member is so situated relative to the fixed contact member that when it engages said fixed contact member, the latter is cammed or flexed to move its lipped end out of the way of said movable contact member, thereby enabling the movable contact member to enter hole 60 in said fixed contact member. Once it enters said hole, it is trapped and cannot leave the same unless and until the fixed contact member is once again flexed to disengage its lipped end from said movable contact member, thereby enabling said movable contact member to swing back in counter-clockwise direction as viewed in Figs. 2 and 3 in response to the action of spring 44.

There are two stops involved in connection with the engagement of the movable contact member with the fixed contact member. One is the lip 58 itself which prevents the movable contact member from leaving hole 60 once it enters said hole without flexing of said fixed contact member. This is seen in Fig. 3. The other stop is a lug 62 which is struck out of the fixed contact member in the forming of hole 60. This lug 62 serves as a stop to limit the clockwise movement of the movable contact member as viewed in Fig. 3. If desired, the spring-hooked end of the movable contact member 40 may be allowed to engage the adjacent side wall of the casing to prevent such clockwise movement beyond a predetermined point. The opposite end of the movable contact member which engages the fixed contact member may serve as its own stop against the same side wall of the casing on the counter-clockwise movement thereof as viewed in Fig. 2. This not only positions the movable contact member against the action of spring 44 but it also positions the probe 28 and holds said probe in operative position, ready to intercept an open latch.

It is when the movable contact member engages the fixed contact member that electrical contact is made and the circuit to the stop motion mechanism closed or grounded. This contact remains in effect until the fixed contact member is flexed out of engagement with the movable contact member by means of a push-bar 64. This push-bar is made of electrically non-conductive material and its outer end projects outwardly from the casing through an opening 66 formed therein. A slot 68 is provided in the inner end of push-bar 64 to receive the fixed contact member 48. A shoulder 70 is provided adjacent the outer end of said push-bar for engagement with the inner side of the casing wall in which hole 66 is formed. This shoulder may be employed to serve as a stop in order to prevent outward movement of said push-bar beyond a predetermined point. It will be understood that the fixed contact member 48 may be flexed out of engagement with the movable contact member 40 by simply pushing upon the outwardly projecting end of the push-bar. Once this is done and the push-bar is released, the resilience of the fixed contact member 48 will return both itself and the push-bar to their original positions.

It will be observed that the movable contact member 48 is provided with a rounded or cam faced end portion 40*a* which engages the fixed contact member. It is this rounded or cam faced portion which effects a wiping action against the lipped end of the fixed contact member, thereby keeping both members clean and reducing the friction between them. It has been stated that the fixed contact member 48 is connected to the stop motion mechanism through rivet 50 and a suitable conductor connected thereto. The movable contact member 40 is also connected to the stop motion mechanism through the ground and it will be observed that there are three ground connections between said movable contact member and the casing. In the first place, the movable contact member, being fixed to shaft 22, is grounded to the floor of the casing since said shaft is journaled into said floor. In the second place, the movable contact member is connected to spring 44 which, in turn, is connected to post 46 on the same casing floor and this, too, is an excellent ground connection. In the third place, there are two spacer sleeves or collars 72 and 74 respectively which

are mounted on shaft 22 above and below the movable contact member 40. A washer 76 may also be provided between spacer 74 and the floor of the casing. All three elements, the two collars 72 and 74 and the washer 76, are made of metal and they serve as conductors between the movable contact member 40 on the one hand and shaft 22 on the floor of the casing on the other hand.

It will be understood at this point that spacers 72 and 74 and washer 76 serve to maintain the movable contact member 40 in alignment with opening 60 in the fixed contact member 48. Collar 74 and washer 76 also help to support the movable contact member 40 on the floor of the casing and they thereby also support shaft 22, sleeve 24 and probe 28 and they provide such support with relatively little friction during the swinging movements of said probe and all of the other elements connected therewith.

The foregoing is illustrative of a preferred form of this invention and it will be understood that this preferred form may be modified and other forms may be provided within the broad spirit of the invention and the broad scope of the claims.

I claim:

1. A latch detector for detecting the open latches of latch-type knitting machine needles, comprising a casing, a fixed contact member in said casing, a movable contact member mounted in said casing for movement into and out of engagement with the fixed contact member, and a probe connected to said movable contact member to move said movable contact member into engagement with the fixed contact member when said probe is engaged by the open latch of a latch-type knitting machine needle, said movable contact member and said probe being pivotally mounted on a common shaft, said movable contact member being a double-ended member, a tension spring being connected between one end of said double ended movable contact member and the casing to resiliently urge said double-ended movable contact member and probe to pivot in one direction, the opposite end of said double-ended movable contact member being engageable with the fixed contact member when the probe is engaged by an open latch and caused to swing in the opposite direction against the action of said spring, said fixed contact member comprising a substantially L-shaped leaf spring which is secured at its foot to the casing wall, insulating material being provided between said foot and said casing wall to prevent electrical contact therebetween, the opposite end of said L-shaped leaf spring being provided with a lip and an opening formed adjacent said lip, said double-ended movable contact member being engageable with said lip when the probe is engaged by an open latch to cam and flex said L-shaped leaf spring out of the way to enable said double-ended movable contact member to enter said opening in said L-shaped leaf spring and to be trapped therein.

2. A latch detector for detecting the open latches of latch-type knitting machine needles, comprising a casing, a fixed contact member in said casing, a movable contact member mounted in said casing for movement into and out of engagement with the fixed contact member, and a probe connected to said movable contact member to move said movable contact member into engagement with the fixed contact member when said probe is engaged by the open latch of a latch-type knitting machine needle, said movable contact member and said probe being pivotally mounted on a common shaft, said movable contact member being a double-ended member, a tension spring being connected between one end of said double-ended movable contact member and the casing to resiliently urge said double-ended movable contact member and probe to pivot in one direction, the opposite end of said double-ended movable contact member being engageable with the fixed contact member when the probe is engaged by an open latch and caused to swing in the opposite direction against the action of said spring, said fixed contact member comprising a leaf spring, an insulated pusher bar being connected at one end to said leaf spring and projecting outwardly from the casing at its opposite end to render it possible to manually flex said leaf spring away from the movable contact member.

3. A latch detector in accordance with claim 2, wherein the probe comprises a wire which projects through a hole formed transversely in the shaft, a set screw being provided in said shaft to lock said probe therein at any selected angular and longitudinal position relative thereto.

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