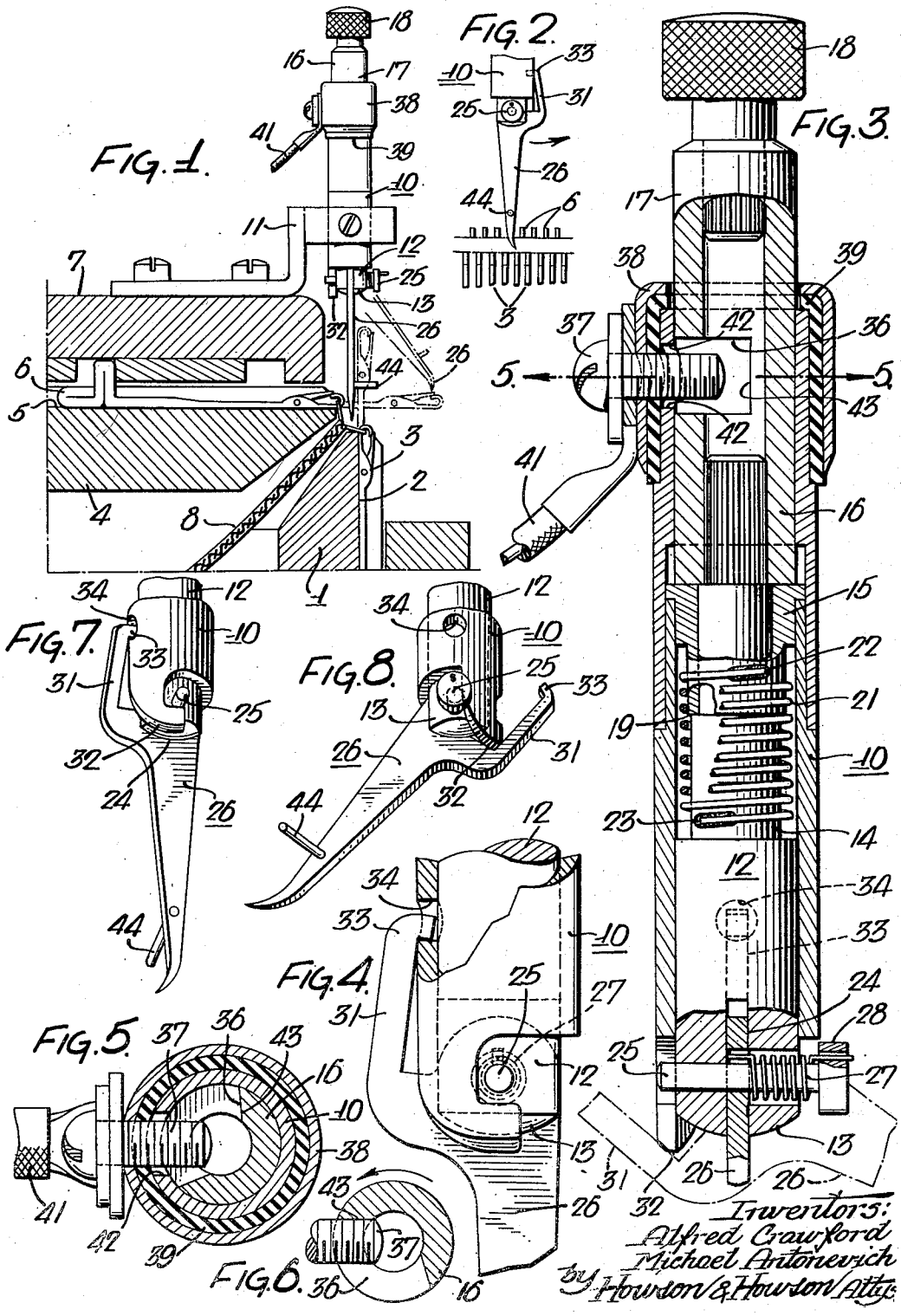
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NEEDLE SAVER STOP MOTION

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NEEDLE SAVER STOP MOTION

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This invention relates to stop motions for knitting machines and more particularly to devices for detecting faulty needles and faulty needle function arising from defective or snarled threads. A device of this general character is disclosed in United States Patent No. 2,257,037 dated September 23, 1941, and the present invention involves an improvement over prior devices of this type.

Detectors of the type to which the invention relates are adapted primarily to detect broken or bent needles or snarls or bunches of thread on a needle resulting from improper functioning of the latter or from a knot or other defect in the knitting thread. Conventionally, the device includes a detector finger which is mounted for engagement with a faulty or displaced needle or a snarled thread at a needle, the finger in turn controlling a spring loaded element which, when released as a result of displacement of the finger by contact with the needle or snarled thread, will trip the stop motion of the machine either mechanically or by electrical means to bring the operation of the machine to a halt. In devices of this character it is customary also to so mount the detector finger so that displacement thereof in the process of detecting will result in the finger being moved to a position remote to the needles.

A principal object of the present invention is to provide a detector device of this character characterized by extreme compactness of form and simplicity of mechanical structure and which, when mounted on the machine, will involve a practical minimum of obstruction to the normal machine structure and its operation.

The invention contemplates also the provision of a device of this character adapted for operation in knitting machines of the rib type employing two cooperative sets of needles operating respectively in vertical and horizontal planes.

The invention resides further in certain mechanical and structural details hereinafter described and illustrated in the attached drawings, wherein:

Figure 1 is a fragmentary sectional view of a rib knitting machine showing a detector device made in accordance with the invention mounted on the dial cam plate with the detector finger in operative position with respect to the needles of both sets;

Figure 2 is a fragmentary front elevational view of the detector needle showing the lower portion of the detector device as a whole;

Figure 3 is an enlarged sectional view of the detector device;

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Figure 4 is a fragmentary side elevational view, partly in section, showing details of the detector finger mounting;

Figure 5 is a sectional view on the line 5—5, Figure 3;

Figure 6 is a fragmentary sectional view on the same line illustrating certain of the elements in an alternative operation of adjustment;

Figure 7 is a view in perspective of the lower portion of the detector device showing the detector finger in the normal operative position; and

Figure 8 is a similar view in perspective showing the detector finger in the released and retracted position.

In the drawings, reference numeral 1 indicates the needle cylinder of a rib knitting machine, this cylinder being provided with the conventional vertical grooves 2 in which the cylinder needles 3 are mounted for vertical reciprocation in the usual manner. The needle dial plate of the machine is indicated by the reference numeral 4, this plate being provided with the usual radial grooves 5 in which the dial needles 6 are slidably mounted for radial reciprocation by action of cams on the underside of a dial cam plate 7. As far as described, the machine is conventional, and its mode of operation will be readily understood by those familiar with the art. Threads conducted to the needles in the usual manner are worked by action of the needles into a circular fabric 8 which, as produced, passes inwardly of the cylinder 1 and between the upper end of the cylinder and the outer edge of the dial plate 4, as well illustrated in Figure 1.

The detector device comprises a cylindrical casing 10 which is supported in the present instance upon a bracket 11 attached to the top of the plate 7, as shown in Figure 1, so that the cylinder overhangs the edge of the plate. The casing contains and forms a bearing for a cylindrical member 12, the lower end of which projects from the lower open end of the casing as indicated at 13. An integral stem 14 extends upwardly from the member 12 through a sleeve 15 which is press-fitted or otherwise secured in the casing 10, and the upper end of the stem 14 is secured in a hollow cylindrical member 16 which fits within the upper end of the casing 10 and projects upwardly through the open top of the latter as indicated at 17. The upper end of this member 16 carries a knurled head 18 by means of which the composite rock shaft comprising the member 12 and its extension 14 and the member 16 may be rocked manually in the

casing. It will be noted that a shoulder 19 on the stem 14 of the member 12 lies in proximity to the lower end of the sleeve 15 and, by engagement with the latter, prevents upward movement of the rock shaft in the casing. Movement of the shaft in the other direction is prevented by engagement of the lower end of the member 16 with the upper end of the sleeve 15.

A coil spring 21 surrounds the lower end of the sleeve 15 and the adjoining portion of the stem 14 and has one end attached at 22 to the said sleeve, the other end being attached at 23 to the stem 14. This spring tends to retain the rock shaft in a predetermined angular position within the casing, as hereinafter described, but permits angular displacement of the shaft from this position for a purpose also hereinafter set forth.

The lower end of the member 12 of the rock shaft is bifurcated, as illustrated at 24, and pivotally supported within this bifurcation upon a pin 25 is a detector finger 26. A spring 27 supported on the pin 25, and having its ends attached respectively to the head 28 of the pin and to the finger 26, exerts resilient pressure on the finger tending to retain it in an extended position in which the finger 26 is in substantial alignment with the axis of the rock shaft. This position of the finger can be obtained, however, only when the shaft has been rocked within the casing against the tension of the spring 21 to a predetermined position, shown in Figs. 3 and 7, since in the other permissible shaft positions an arm 31 at the upper end of the finger will interfere with a cam surface 32 at the lower end of the casing, as shown in Figure 8, and will hold the finger in a retracted inoperative position angularly disposed with respect to the shaft axis, as shown in Fig. 8.

When the finger is in the extended or operative position (see Figures 4 and 7) an offset extremity 33 of the arm 31 will engage in an aperture 34 in the side of the casing, the spring 27 acting to move the finger about its pivot pin 25 into the position wherein the extremity 33 occupies the said aperture. The interlocking action thus obtained between the finger and the casing prevents the spring 21 from turning the rock shaft in the return direction, so that the detector finger in effect is locked in the extended operative position. A slight pressure on the lower end of the finger 26, however, is sufficient to turn it on its pin 25 to an extent sufficient to withdraw the offset extremity 33 of arm 31 from the aperture 34, whereupon the rock shaft is free to turn under action of the spring 21. The spring 27 will tend to maintain the finger 26 in the extended position in which, as previously set forth, it lies substantially in alignment with the rotary axis of the rock shaft, but movement of the finger with the shaft under action of the spring 21, as described above, will bring the inner end of the arm 31 into contact with the cam 32 which will then act to rock the finger about the pin 25 into the retracted angular position in which it is shown in Figure 8.

As shown in Figure 1, the casing 10 is mounted in an upright position above the needles of the two sets so that the finger 26 when in the operative position will extend substantially vertically downward into operative relation to the needles. When the finger is tripped, as hereinafter more fully described, to release the offset extremity 33 from the aperture 34, the resulting angular movement of the finger under action of the spring 21 and cam 32 will carry the finger to a position illustrated in broken lines in Figure 1 wherein the finger is elevated above the plane of the dial needles 6 and outwardly beyond the cylinder needles 3.

To reset the finger in the operative position it is merely necessary to rotate the rock shaft against the pressure of the spring 21 through the medium of the knurled head 18 at the top of the shaft, the spring 27 operating to return the finger to the normal operative position wherein it is interlocked with the casing through the offset extremity 33 of the arm 31 and the aperture 34. In this resetting movement the arm 31 moves progressively along the surface of the cam 32 until the offset 33 comes into registration with the aperture 34 into which it moves under action of the spring 27.

As illustrated in Figures 3, 5 and 6, the hollow member 16 of the rock shaft has a circumferential slot 36 into which projects the inner end of a screw 37, this screw being threaded into a ferrule 38 on the upper end of the casing 10. The ferrule is electrically insulated from the casing by an insulating sleeve 39. The screw 37 forms a terminal for a wire 41 which constitutes a part of the stop motion circuit of the knitting machine with which the detector device is associated. The screw 37 also passes through an enlarged aperture 42 in the casing 10 and has no direct contact with the latter. The slot 36 in its relation to the screw 37 is best illustrated in Figures 5 and 6. It will be noted that when the finger 26 is in the operative position the composite rock shaft will occupy a position wherein the inner projecting end of the screw is spaced from the ends of the slot as shown in Figure 5; but when the shaft has been moved by the spring 21, after tripping of the finger 26 as described above, the opposite end 43 of the slot 36 will be brought into contact with the screw, as shown in Figure 6, thereby electrically connecting the wire 41 with the shaft and through the shaft with the casing 10 which is grounded to complete the circuit. The screw 37 thereby acts as a stop limiting the rocking movement of the shaft, and also forms with the end wall of the slot 36 a switch which controls the stop motion circuit and when closed will interrupt the operation of the knitting machine.

The operation of the detector finger with respect to the needles will be well understood by those familiar with the art. As illustrated in Figure 1, the tip of the needle occupies a position immediately adjoining the lower edges of the dial needles and the inner edges of the cylinder needles at the point of stitch formation, so that when a knot or slub causes a thread accumulation on a needle of either of the sets such accumulation will necessarily project into the path of travel of the tip of the detector finger. Similarly, any of the dial needles which from any cause occupies an abnormal or displaced position will lie in the path of the lower end of the detector finger. For coaction of the cylinder needles the finger carries a transversely projecting pin 44 which extends outwardly across the cylinder defined by the needles, as clearly shown in Figure 1, for engagement with any defective dial or defective cylinder needles which might occupy an abnormal position. The movement of the detector device with the cam plate 7 is in the direction of the arrow in Figure 2 so that contact of the lower end of the finger with a needle or thread accumulation will result in a tripping of the finger as described above and immediate re-

traction of the needle to the position clear of both the dial and cylinder needles.

The device is extremely compact and is designed to occupy a position above and in substantial alignment with the needles of the cylinder group with the detector finger normally in alignment with the axis of the rock shaft upon which it is supported. When tripped the finger will move in a path resultant from its simultaneous movements about the axes of the pin **25** and of the rock shaft to lift the finger above the dial needles and to shift the finger angularly outwardly to a position clear of the cylinder needles, this compound movement being effected by a simple angular movement of the rock shaft under action of the cam **32**.

We claim:

1. In a detector device of the character described, the combination with an axially fixed rock shaft, of a detector finger pivotally mounted on the shaft for movement about an axis transversely disposed with respect to the shaft axis and between alternative positions in one of which the finger lies approximately parallel to the axis of the rock shaft and in the other of which the finger is angularly disposed with respect to said axis, and means responsive to movement of the rock shaft about its axis for effecting angular movement of the finger about its axis between said alternative positions.

2. A detector device according to claim 1 wherein the means for effecting angular movement of the finger comprises resilient means tending to move the finger about its axis in one direction and a cam for reversely moving the finger in opposition to the spring.

3. A detector device according to claim 2 wherein the resilient means tends to retain the finger in the position approximately parallel to the axis of the rock shaft, and the cam is relatively fixed in the path of the finger in its movement with the shaft so as to move the finger into the alternative position angularly disposed with respect to the shaft axis.

4. A detector device according to claim 3 including a latching means releasable by angular displacement of the finger about its pivotal axis for preventing angular movement of the rock shaft when the finger is in the position approximately parallel to the axis of the shaft, together with a second resilient means connected to the shaft and exerting pressure on the latter tending to effect said angular movement and operative when the latching means is released to rock the shaft and to thereby shift the finger to the alternative position angularly disposed with respect to the shaft axis.

5. A detector device according to claim 4 wherein the latching means comprises an arm on the finger having an offset end for engagement in an aperture in the relatively fixed structure of the cam.

6. A detector device according to claim 1 wherein the finger is movable between an alternative extended position in which it is approximately parallel to the shaft axis and a retracted position angularly disposed with respect to the shaft axis, there being resilient means tending to retain the finger in the extended position, a second resilient means tending to turn the shaft so as to move the finger to the retracted position, and latching means releasable by movement of the finger about its pivot for releasably retaining the finger in extended position.

7. A detector device according to claim 6 including electric switch means operatively associated with the shaft, said switch being closed only when the shaft occupies a position wherein the finger is retracted.

8. A detector device according to claim 1 including a casing wherein the rock shaft is rotatably mounted, the means for effecting the angular movement of the finger comprising a cam on the casing located in the path of movement of the finger with the shaft.

9. In a detector device for knitting machines, a rock shaft and means for mounting said shaft in a position above and approximately parallel to needles of the said machine, a detector finger depending from the lower end of the shaft into proximity to the needles and pivotally supported on the shaft for movements between alternative operative and inoperative positions in the first of which the finger is approximately parallel to the shaft axis and in the second of which it is angularly disposed with respect to said axis, said shaft having corresponding positions of angular adjustment about its own axis, and a spring tending to rock the shaft into the position corresponding to the inoperative position of the finger, resilient latch means for retaining the finger in operative position releasable by angular displacement of the finger about its axis, and cam means operative by movement of the shaft by said spring for moving the finger into the inoperative position.

10. A detector according to claim 9 wherein the finger has a transverse pin projecting across the line of needles.

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