April 8, 1930. F. L. ELLIOTT 1,754,151

CIRCULAR KNITTING MACHINE

Filed June 17, 1929 3 Sheets-Sheet 1

Fig. 1.

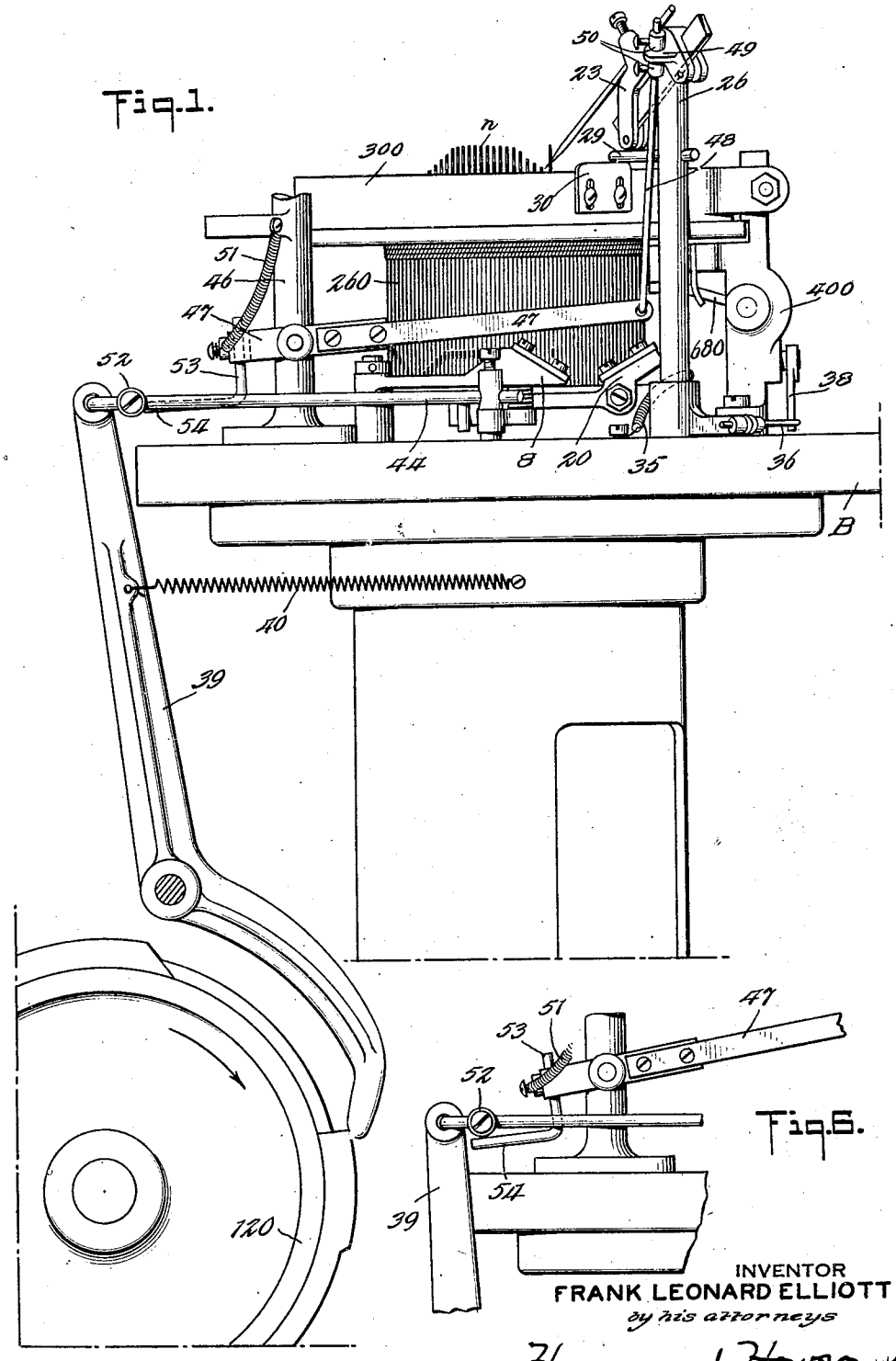


Fig. 6.

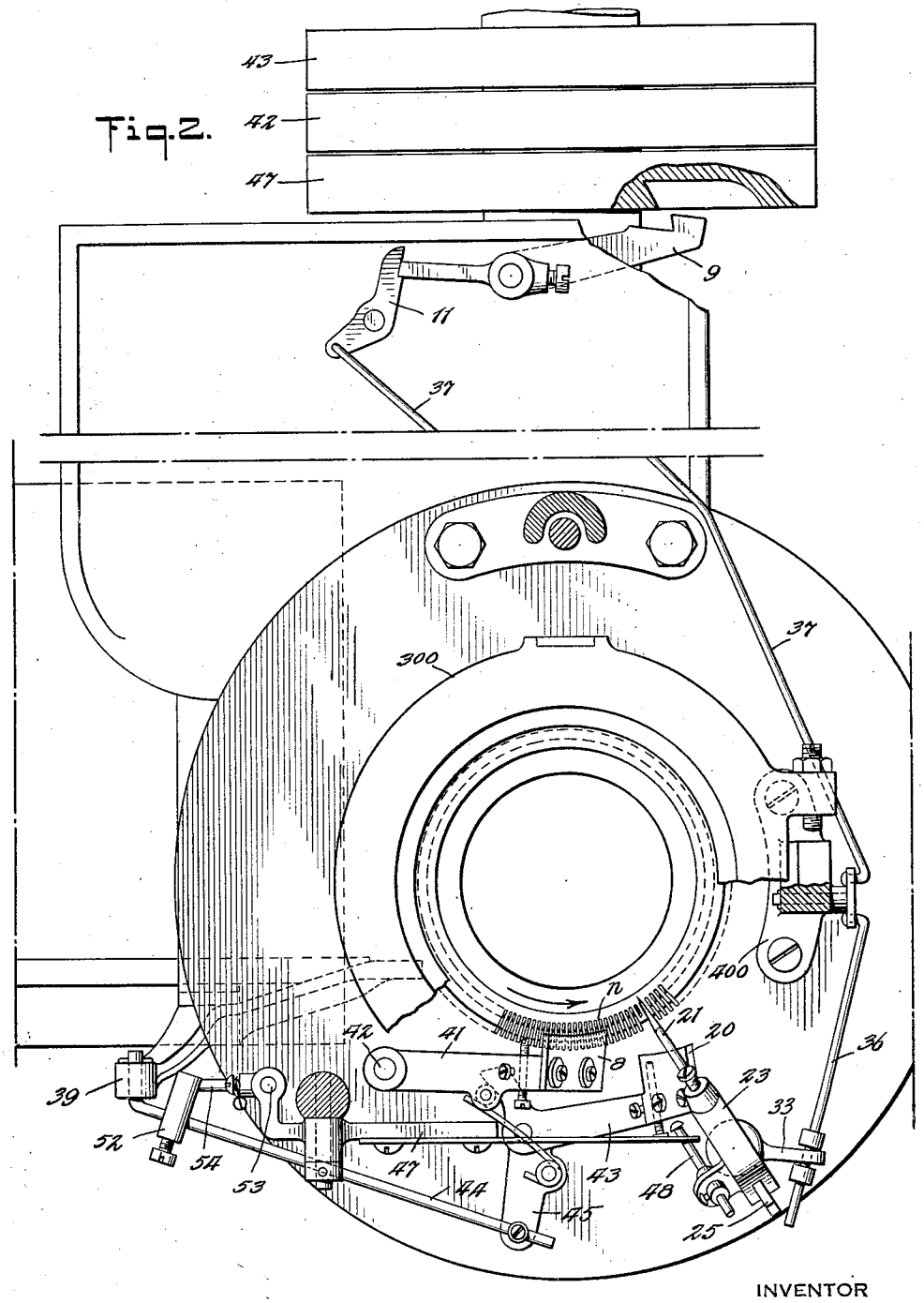
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Fig. 2.



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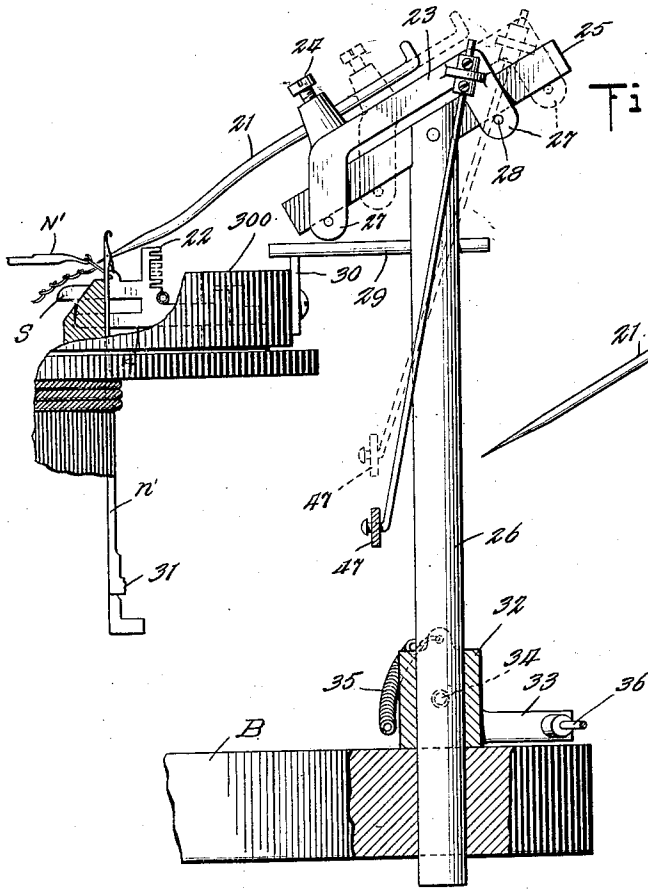


Fig. 3.

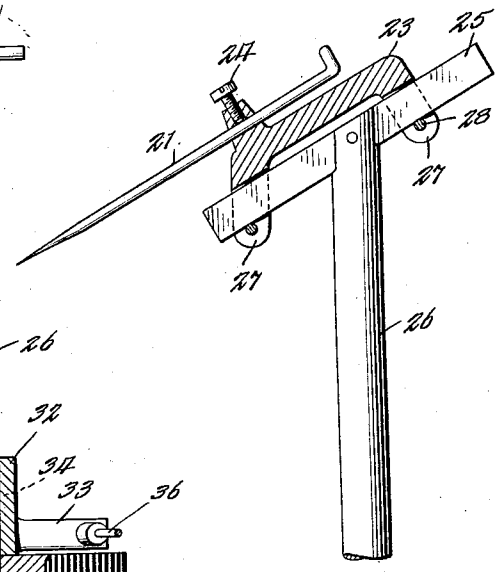


Fig. 4.

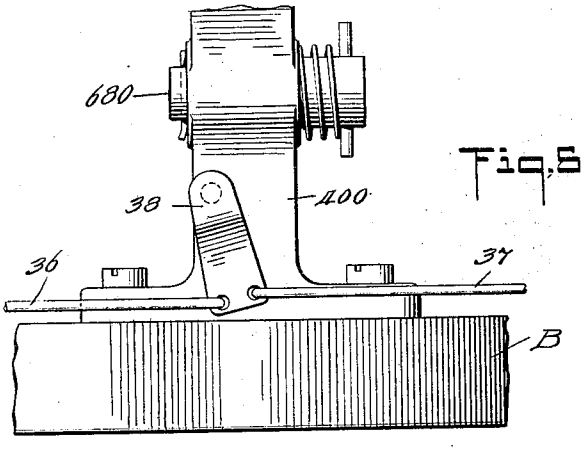


Fig. 5.

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UNITED STATES PATENT OFFICE

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CIRCULAR-KNITTING MACHINE

Application filed June 17, 1929. Serial No. 371,522.

This invention relates to needle protectors for knitting machines, and more particularly to means for detecting broken needles and "load-ups" on circular knitting machines. One object of the invention is to provide a mechanism which functions without interfering with the sinkers and which is also capable of detecting a load-up in the knitting of rib fabric.

In the drawings the invention is shown embodied in the well known Scott & Williams rib knitting machine shown in the patent to Robert W. Scott, 1,641,101, dated August 30, 1927.

Fig. 1 is an elevation of the right side of a Scott & Williams rib-knitting machine showing the new protector embodied therein.

Fig. 2 is a plan view of the parts shown in Fig. 1, the sinker cam cap being partly broken away;

Fig. 3 is an elevation on a larger scale of the needle detector member, its carriage and slide and their relation to the rest of the machine, the dotted position showing the detector raised to inoperative position.

Fig. 4 is a vertical section through the detector, its carriage and slide;

Fig. 5 is an elevational detail of a mounting of the trip wire connections; and

Fig. 6 is a detailed elevation of a connection between the pattern drum and the carriage.

The ordinary parts of the machine set forth in the abovementioned patent to Robert W. Scott, 1,641,101, will first be described. The head of the machine is supported by the usual bedplate B, the needle cylinder 260 revolving therein. In the needle cylinder there is the usual circle of needles N interspersed with sinkers S whose exact construction will be described at another point in the specification. The radial movement of these sinkers is caused as usual by a sinker cam cap 300 which is permitted limited circumferential movement to give the necessary adjustment of the cams during reciprocatory knitting. As shown in Fig. 2 the machine is driven from a set of pulleys 42, 43, 47 and there is a stop motion to throw the belt to the loose pulley 43 when the stop motion is tripped. This stop motion includes a bell crank lever 11 with a notch therein adapted to hold a stop finger 9 out of engaging position with the adjacent pulley until said bell crank lever is turned. The machine has the usual main pattern drum 120 racked around on the shaft 76 under the control of the usual pattern chain and main rack wheel of the well known Scott & Williams machine shown and described in the patent to Robert W. Scott, 1,150,850, dated September 7, 1915. The details of the clutch are shown and described in the patent to Robert W. Scott, 1,270,063, dated June 18, 1918.

The sinkers of a modern circular knitting machine sometimes have portions which extend above the neb of the sinker, and in the drawings we have shown a sinker of the general type in which there is an upward extension having butts thereon to give selective movement of the sinkers. This upward extension being taller than the neb interferes with a needle detector such as shown in the patent to A. Z. Hall and W. A. Hughes, 1,434,950, dated Nov. 7, 1922, in that the detector element would strike against these butts and stop the machine. According to the present invention this difficulty is overcome by mounting a needle detector member 21 at an angle which permits the member to reach over the top of this upward extension 22 on the sinker and down to the proper position above the neb. In order that this detector member 21 may be moved from operative position during reciprocatory knitting, and at other times when it is not desired, the member is mounted in a carriage 23 by means of a set screw 24, the carriage 23 riding on an inclined plate 25 acting as a slide. This plate is mounted on one edge and points downwardly toward the center of the needle circle. It is carried by a support 26 which is shown in the form of a vertical post revolubly mounted in the bedplate B. The carriage 23 has legs 27 at both its front and rear ends which straddle the slide 25, the carriage being held on the slide by pins 28 passing underneath the slide between the legs. The downward movement of the carriage, i. e. the movement which carries the detector member 21 into operative position is limited in its down-

ward movement by a horizontal pin 29 passing through the upright support 26 and lying in the path of the lower pair of the legs 27 of the carriage. This pin in turn is supported at its radially inward end by a plate 30 screwed on the outside of the sinker cam cap 300. This plate 30 is of sufficient length to insure that some portion of its upper edge will be in contact with this pin 29 no matter what the circumferential position of the sinker cam cap 300 may be. By mounting the needle detector member in the manner which has just been described, which permits a movement of that member simultaneously upward and radially away from the needles, it is possible not only to detect needles which have broken butts 31 (Fig. 3) no matter what the shape of the sinker, but it is also possible to detect a "load-up" in rib fabric. The position of the needle detector member with relation to the abovementioned cylinder needles N and the dial needles N' and the ribbed stitches between them, is shown in Fig. 3. If there are no dial instrumentalities the detector member need have no kink as shown in Fig. 3, but may be straight as in Fig. 4.

The movement of the needle detector member when it meets a broken needle or a fabric load-up is of course a pivotal movement about the axis of its post or support 26 and that pivotal movement is transmitted to the stop motion by the following parts. On the post 26 just above the bedplate B is a collar 32 with an arm 33 extending therefrom, the collar being held tightly on the support by means of a set screw 34. Opposing revolution of the post 26 in the direction which it would turn if a broken needle were to meet the needle detector member, is a coiled spring 35 tending to hold the detector member from revolving out of its operative relation with the needles and fabric. The connection from the arm 33 of the collar 32 to the bell crank lever 11 of the stop motion consists of wires 36 and 37 connected by a swinging link 38 carried on the post 400 which supports the widening picker 680.

The mechanism by which the needle detector member is lowered into and raised out of operative position at the appropriate times will now be described. The control can be obtained from the main pattern drum 120 by means of a pivoted lever 39 whose lower end rides against cams on the surface of the pattern drum 120, the lever being held in contact by a tension spring 40 connecting the upper part of the lever and the bedplate B. The normal function of this lever is to operate two special raising and lowering cams 20 and 8 respectively, which act on the butts of the needles. These special cams are for the purpose of clearing all the needles after the knitting of a welt and to depress the needles below their normal path, when that is necessary in connection with the knitting of a stocking having both ribbed and plain portions. The cams on the main pattern drum 120 which actuate the lever 39 must therefore be of at least two heights and the lever has at least three positions. As can be seen most clearly in Fig. 2 the depressing cam 8 is carried by a lever 41 pivoting at 42 on the bedplate of the machine, and the cam 20 is mounted on a bell crank lever 43 having an arm engaging with the arm 41 of the cam 8 in such manner that when the bell crank lever is turned in one direction the cam 20 will be inserted, and when it is turned in the other direction cam 8 will be inserted as is shown in Fig. 2. In the neutral position of the lever 43 neither cam is inserted.

If desired the entrance of the cams 8 and 20 into operative position can each be carried out in two stages by having two extra heights of cams on the main pattern drum 120, (Fig. 1), the first or partial insertion of each cam being to a position where it will contact with the long butt needles. This insertion occurs while the short butt needles are passing the cam. After the long butt needles have come into contact with the cam the remainder of the insertion of the cam takes place and thereafter the short butts also will be acted on. The bell crank lever 43 is connected to the pattern drum lever 39 by a rod 44 pivotally connected to an arm 45 of the lever 43.

For the purpose of removing the needle detector member 21 from operative position and permitting its return thereto, the carriage 23 is operatively associated with the pattern drum lever 39 and the rod 44 by the following mechanism. On the bedplate B is a vertical post 46 which supports a long rocking lever 47. One end of this rocking lever is pivoted to a wire passing freely through a lug 49 on the upper end of the carriage 23. This wire is restrained with relation to this lug 49 by means of two collars 50 mounted on the wire on either side of the lug. The rocking lever 47 is carried by the post 46 at such an angle that the end which is pivotally connected to the wire 48 is radially nearer the center of the needle cylinder than that portion of the wire which passes through the lug 49 of the carriage, and as a result the wire leans outwardly and upwardly in the same general manner as the needle detector member 21. In the drawings, however, the angle of this wire 48 from the vertical is shown as less than the angle of the detector member 21. An examination of Fig. 3 will show that if the end of the rocking lever 47 fastened to the wire 48 is raised, the wire will push the carriage vertically and radially to the position shown in dotted lines in this figure. In this position the detector member will, of course, be withdrawn out of the area occupied by the needles, fabric and sinkers. In order that the detector member may normally tend to re-

main in operative position, there is a coiled tension spring 51 attached between the outer or rear end of the rocking lever 47 and an arm of the post 46 on which the rocking lever is mounted.

In order to transmit the necessary movement of the bar 44 to the needle detector member there is an adjustable horizontal pin 52 on the rod 44. This adjustable pin coacts with a bent pin 53 adjustably mounted at the opposite end of the rocking lever 47 from the wire 48 connecting with the carriage 23. The bent end 54 of this pin 53 extends in a substantially horizontal plane when the carriage 23 is in its operative position. This bent end 54 is long enough to just reach the near edge of the adjustable pin 52 when the pattern drum lever 39 is on its highest cam, i. e. in its extreme left position. The bent end 54 is preferably slightly below the center of the adjustable pin 52 and opposite a rounded edge thereon so that when that pin 52 is pushed to the right by the lever 39 the bent end 54 will ride under the adjustable pin 52 as shown in Fig. 6. This, of course, rocks the lever 47 and tends to raise the carriage 23 and the needle detector member 21. Of course the position of the adjustable pin 52 can be varied as desired to vary the correlation of the positions of the cams 8 and 20 with the operative and inoperative positions of the detector member 21, but in the drawings we have shown the pin 52 adjusted to allow the detector member to slide downwardly into operative position when the cam 8 is inserted, i. e. when the lever goes to its extreme left position.

It will be observed that by means of this connection between the pattern drum lever 39 and the detector member 21, it is possible to operate the detector member by the series of cams which control the knitting cams 8 and 20.

This invention provides a detector which is adapted to function with the minimum of interference with the other parts of the machine, and not only can be used to detect broken needles no matter what the shape of the sinker, but it can also detect a load-up on a rib-knitting machine.

I claim:

1. A needle detector for a knitting machine comprising a detector member, and a carriage supporting said member, in combination with a slide permitting said member to move simultaneously vertically and radially away from the needles, and means adapted to move said carriage on said slide.

2. A needle detector for a circular knitting machine having a stop motion, comprising a detector member, and a carriage supporting said member, in combination with a slide permitting said carriage to move upward and radially away from the needles, a support for said slide permitting said member to give way upon contact with a needle, and means actuating said stop motion when said member contacts with a needle.

3. A circular knitting machine having a stop motion, a series of sinkers having projections above the nebs, a needle detector member passing above the projections on the sinkers, a carriage supporting said member and a slide permitting said detector member to have a movement upward and radially away from the needles, in combination with cam-operated means to cause such movement, and means operatively connecting said stop motion to said detector member.

4. A circular knitting machine having a stop motion, a needle detector member, a carriage supporting said member and a slide permitting said detector member to move simultaneously upward and radially away from the needles, in combination with a horizontally moving member and means controlled by said latter member adapted to move said carriage when said member moves horizontally.

5. A circular knitting machine having a stop motion, a needle detector member, a carriage supporting said member and a slide permitting said detector member an upward and radially outward movement, in combination with a cam-controlled lever and means moving said detector member into and out of operative position adapted to be actuated by one movement of said cam-controlled lever but not to be affected by another.

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

FRANK LEONARD ELLIOTT.