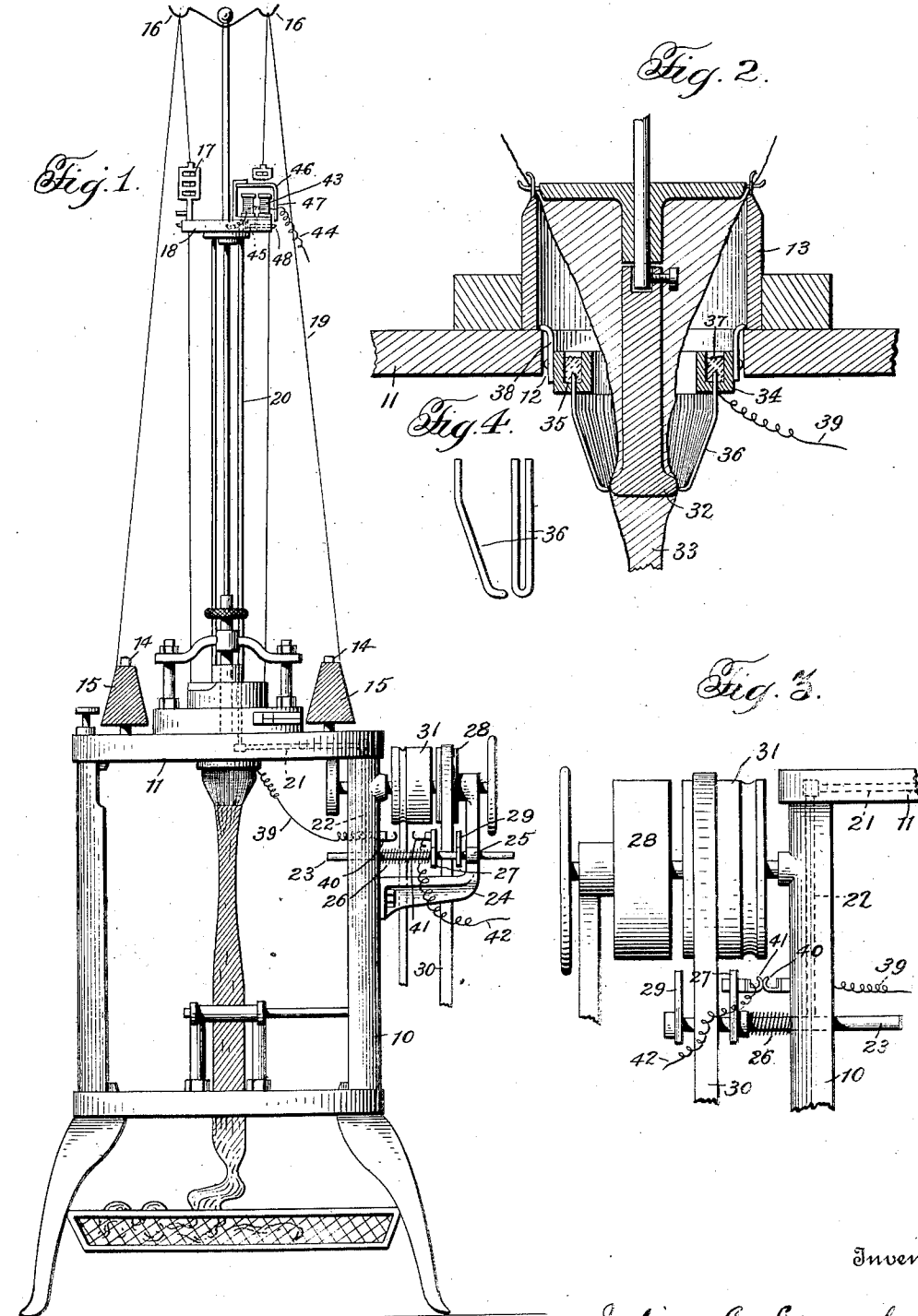


J. A. CRUMLEY.
HOLE DETECTOR FOR KNITTING MACHINES.
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1,368,489.

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JULIUS A. CRUMLEY, OF ROSSVILLE, GEORGIA.

HOLE-DETECTOR FOR KNITTING-MACHINES.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JULIUS A. CRUMLEY, a citizen of the United States and residing at Rossville, county of Walker, State of Georgia, have invented certain new and useful Improvements in Hole-Detectors for Knitting-Machines, of which the following is a specification.

This invention relates to hole detectors and is designed particularly for use on hosiery ribbing machines, but is applicable to other machines making tubular knitted fabrics. It operates electrically and not only detects any hole which may appear in the fabric being knitted, but upon the appearance of such releases a stop motion and permits it to at once stop the knitting machine. The invention is especially designed to be applied to and used on knitting machines already equipped with a stop motion operated by the breaking of the thread but it is, of course, useful in new machines as well. It is in the nature of an attachment which may be applied to those existing machines, and may be so connected as to release the stop motion already on the machine, without changing that stop motion or its method of operation. The novel features will be apparent from the following description taken in connection with the drawings. In the drawings—

Figure 1 is a side elevation of a machine having my hole detector applied thereto.

Fig. 2 is a vertical section through the hole detector itself; and

Fig. 3 is an enlarged fragmentary detail view showing the belt shifter mechanism for stopping the machine.

In the drawings I have shown a knitting machine of the well known type which is provided with a stop motion which is set in operation and works mechanically to shift the driving belt of the machine to a loose pulley upon the breaking of the thread, but it will, of course, be understood that my invention is not limited to use on a machine where the stop motion is altogether mechanical.

The knitting machine embodies the usual frame 10 carrying the table section 11 at its top. This table 11 has a circular opening 12 in it and the knitting ring 13 surrounds that opening and projects above the table. Supports 14 on the table carry the cones of yarn 15 and the yarn passes over those cones up to the guides 16 and down through the

feeler fingers 17 mounted on the platform 18, and from that point passes down to the knitting ring 13. I have marked the yarn 19. As will be understood by those skilled in the art when a thread of yarn breaks, the feeler finger 17 through which it passes will fall by gravity and release a chain of operating mechanism which will in turn cause a shifting of the belt driving the machine to the idle pulley. Since the means for transmitting motion from the trip operated by the feeler finger down to the release for the belt shifting mechanism is well known in the art, it is not shown in detail but diagrammatically. It includes the vertical rod 20 which rotates when released, and which extends down through the table 11 behind the knitting ring when looking at the machine from the viewpoint of Fig. 1. It in turn operates the transverse shaft 21 arranged under the table and that transverse shaft by suitable connections operates the vertical shaft 22. The operation of the vertical shaft 22 serves to release the horizontal sliding rod 23, which has a bearing in the upright side of the frame 10 and in the bracket 24 at 25. Coiled spring 26 surrounds the rod 23 bearing at one end against the frame 10 and at the other end against an arm 27 fixed on the rod, whereby the rod under the tension of the spring tends to keep the position shown in Fig. 1 on the idle pulley 28. A second arm 29 is also on the rod 23 on the opposite side of the belt 30, so that when the rod 23 is pulled to the left as shown in Fig. 1, the belt is moved over from loose pulley 28 to the fast or operating pulley 31. The above noted features are known to those skilled in the prior art, and constitute no part of my present invention, except as my invention may cooperate with them.

According to my invention I place a metal spreader 32 within the tubular fabric 33, as it leaves the knitting ring 13 and this spreader thus extends below the table 11. It is secured to the dial head as shown, and is preferably made at its lower end of larger diameter or mushroom shape. Surrounding this spreader and the tubular fabric, I place a ring 34 preferably made of fiber which is of nonconducting material, and this ring has in its upper surface extending nearly to the bottom a groove 35. Spring metal fingers 36 are passed through openings in the lower surface of the ring into the groove

and slightly below the lower surface of the ring they are bent inward, as shown in Fig. 2, so that at their lower ends they tend under their spring action to make contact with the enlarged end of the spreader 32. These spring fingers are preferably made of a piece of wire bent back on itself, as shown in Fig. 4, leaving a rounded contact point at the bottom and there are a sufficient number of fingers to practically contact at all points around the spreader. The groove or slot in the top of the ring 34 is filled with solder or similar material up to the line 37, and this solder serves to hold the fingers in place and also connects them electrically. The ring 34 is supported from the table 11 by clamps 38, which are preferably made of flat metal secured by screws to the ring and having outwardly bent portions at their tops to rest on the ledge of the table within the knitting ring. It is, of course, to be understood that any suitable means may be used for supporting the ring 34 below the knitting ring, and that it will vary with different machines. An insulated wire 39 passes through the ring 34 and makes electrical connection with the solder in the groove, and it is connected at its other end to a fixed contact 40. There is a movable contact 41 carried by the arm 27 on the rod 23, and there is an insulated wire 42 connected to this second contact and leading to a source of electric energy. The contacts 40 and 41 are insulated from the machine, and it will be observed that they are in contact with each other, only when the rod 23 is shifted to the left, as shown in Fig. 1, to bring the belt in position on the active pulley 31 and the circuit through the wires 39 and 42 is broken when the belt is shifted to the idle pulley 28.

On the platform 18 electromagnets 43 are mounted and an insulated wire 44 leads to the same source of electric energy as wire 42, that source not being shown since it will be understood. An insulated wire 45 is connected to the other end of the coils in these magnets and to the frame of the machine at the platform 18 and it will be understood that the circuit is then made through the machine down to the spreader 32. When the belt is on the active pulley and the contacts 40 and 41 are connected, there is thus a complete circuit with the exception of the break due to the fabric 33 between the spreader 32 and the fingers 36. In other words, the fabric traveling down from the knitting ring goes between the fingers 36 and the spreader 32 and keeps them out of electrical contact unless and until a hole appears in the fabric. When such hole does appear, the spring fingers drop into it and make contact, thus completing the circuit through the electromagnet 43. When those magnets are energized, they operate

to pull down the armature 46 which is flexible and has a dependent end 47 which will make contact with the trip arm 48. The operation of that trip arm will release the rod 20, which as heretofore indicated, will have the effect of transmitting power down through the rods 21 and 22 releasing the catch which holds the belt shifter rod 23 in operative position, thus permitting the spring 26 to move the rod to the right, Fig. 1, shifting the belt to the idle pulley and stopping the machine.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. An electric hole detector for machines knitting tubular fabric comprising a spreader formed of conducting material beyond the knitting ring and over and in contact with which the tubular fabric passes after leaving the ring, a ring composed of conducting material contained in a casing of non-conducting material surrounding said tubular fabric and spreader, a series of spring fingers of conducting material secured to said casing at one end and making contact with said ring of conducting material and at the free end having bearing points closely adjacent around said spreader tending to make contact with said spreader, an electric circuit and a source of electric energy therein, the said spreader being connected to one pole of said circuit and said ring of conducting material being connected to the other pole.

2. In a stop motion for knitting machines the combination with means for stopping the operation of the machine, of means for causing said stopping means to operate to stop the machine including an electric circuit and a hole detector comprising a central spreader of conducting material extending down on the inner side of the knitted fabric below the knitting ring and a series of conducting fingers at close intervals around said spreader resiliently pressing the fabric against said spreader and tending to make electric contact therewith, the said fingers and spreader being connected in said circuit one to one pole of the source of electric energy and one to the other pole, and means operated by the current when the circuit is closed by the contact of the fingers with the spreader for setting in operation said stopping means.

3. In a stop motion for knitting machines the combination with means for stopping the operation of the knitting machine, of electrical means for causing said stopping means to operate to stop the machine when a hole appears in the fabric, said electrical means including an electric conductor extending through the knitting ring of said machine and having a smooth outer surface over and in contact with which all portions

of the fabric pass after being knitted and a series of fingers of conducting material arranged with their ends closely adjacent on a line transversely of the travel of the fabric, each finger being so mounted as to yieldingly press the passing fabric against the electric conductor, said fingers being connected to one pole of a source of electric energy and said electric conductor being connected to the other pole whereby when a finger strikes a hole in the fabric it makes contact with the electric conductor completing the circuit and setting in operation the stop mechanism.

4. An attachment for tubular knitting machines of the type provided with automatic means for stopping the machine upon the breaking of a thread of yarn comprising a spreader of conducting material around and over which the tubular fabric passes after leaving the knitting ring, of a ring surrounding said fabric carrying a series of spring fingers of conducting material bearing inwardly on said fabric at their ends and tending to make electrical contact or connection with said spreader and being prevented only by the interposed fabric, an electric circuit, one pole of which is connected to said spreader and the other pole of which is connected to said fingers, and

means operated by the closing of the circuit through said spreader and fingers for setting in operation said stopping means.

5. An attachment for tubular knitting machines of the type provided with a knitting ring and a support on which it rests and through which the knitted fabric passes and with automatic means for stopping the machine, of a spreader composed of conducting material extending down within the tubular fabric below said knitting ring and support an insulated ring of conducting material secured to and supported by said support, spring fingers secured to and projecting inwardly and downwardly from said insulated ring and tending at their free ends to make contact with said spreader at closely adjacent points around its circumference, an electric circuit including a source of electric energy and connected at one end to said spreader and at the other end to said fingers through said insulated ring, and means operated by the electric current in said circuit when the fingers by reason of a hole in the fabric complete the circuit by contact with the spreader for setting in operation said stopping means.

In testimony whereof I affix my signature.

JULIUS A. CRUMLEY.