

May 27, 1947.

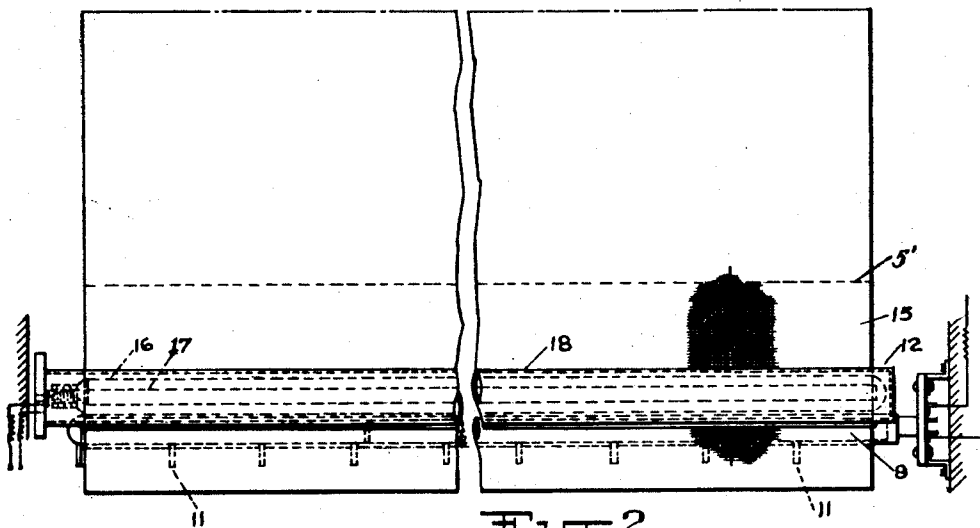
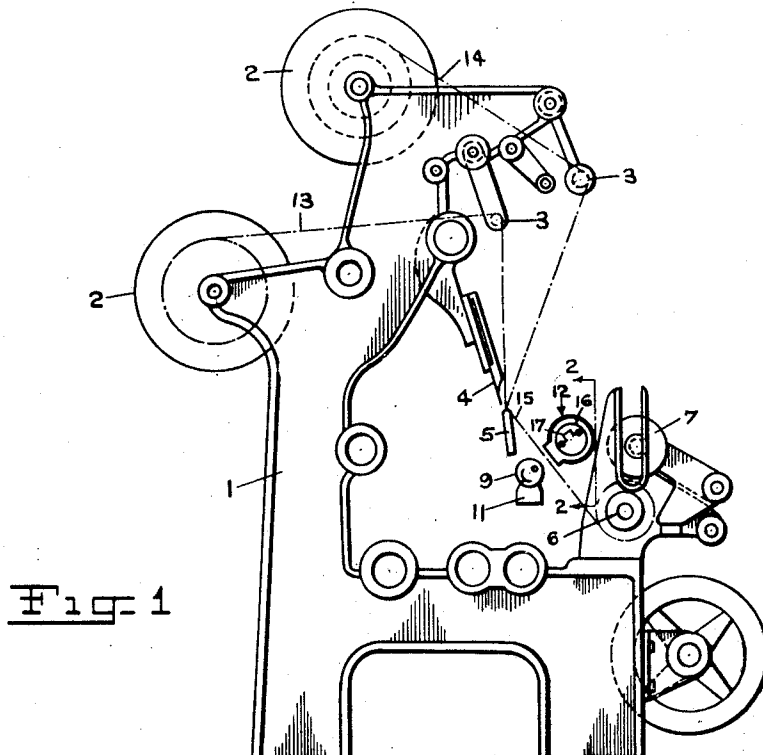
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2,421,092

STOP MOTION FOR KNITTING MACHINES AND THE LIKE

Filed Aug. 18, 1944

2 Sheets-Sheet 1



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2 Sheets-Sheet 2

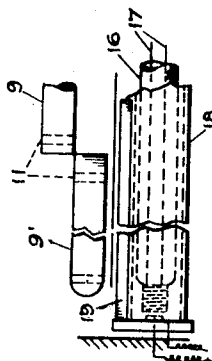


Fig. 3

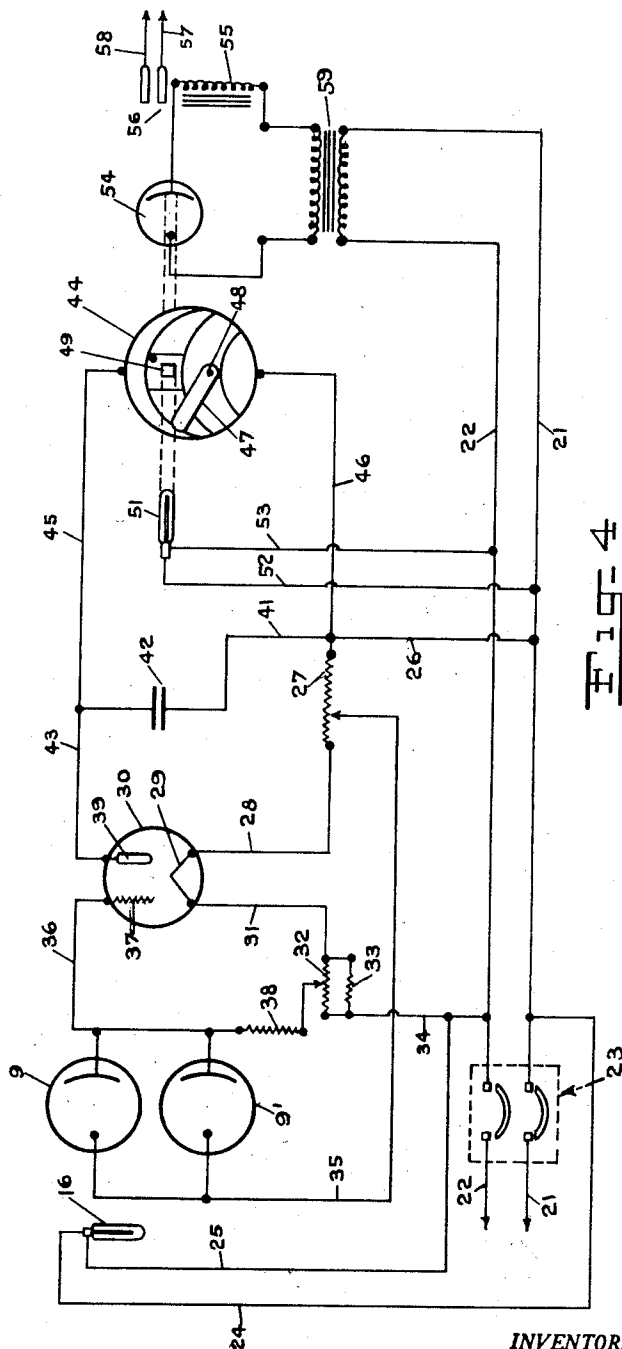


Fig. 4

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UNITED STATES PATENT OFFICE

2,421,092

STOP MOTION FOR KNITTING MACHINES
AND THE LIKEAllan Clair Thomas, Cumberland, Md., assignor
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6 Claims. (Cl. 66—166)

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This invention relates to stop motions for knitting machines, looms, inspection tables and the like, and relates more particularly to stop or detector motions for use on warp knitting machines.

An important object of this invention is the provision of improved means for automatically detecting broken threads or similar defects in the fabric being formed on warp knitting machines and causes stoppage of the machine or gives a warning in the event of a defect.

Another object of this invention is to provide a stop or detector motion which operates immediately upon the occurrence of a broken thread or other flaw in the fabric being formed.

A further object of this invention is to provide in a stop or detector motion for a knitting machine a photo-electric cell structure which is stationary with respect to the frame of said machine.

Other objects of this invention, together with certain details of construction and combination of parts, will appear from the following detailed description and claims.

In my Patent No. 2,346,240 I have described a stop or detector motion which scans the entire width or a substantial portion of the width of a fabric, formed on a warp knitting machine, at one time and is responsive to an overall change of transmitted light over the entire width of the fabric. This device was a substantial improvement over prior stop motions including the stop motion described in Patent No. 2,290,257 to Stanley and Edwards which employs a photo-electric cell and light source arranged to travel back and forth across the fabric and which examines a relatively small area of the fabric at a time. While the device of my prior patent was eminently satisfactory in use, it made use of a contact milliammeter switch the contact points of which often became dirty or burned out resulting in a failure of the switch to operate.

In accordance with my present invention, I construct a stop or detector motion for warp knitting machines, looms, fabric inspection tables and the like similar in all but one respect to the stop or detector motion described in my Patent No. 2,346,240. I have replaced the contact milliammeter by a light valve current meter which is free from the above-mentioned disadvantage attendant upon the use of a contact milliammeter. My present device includes a source of light adapted to act on a photo-electric cell in such a manner that the increase or decrease in light intensity, transmitted to the photo-electric cell by a missing yarn or a double yarn in the fabric, in-

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creases the plate current of an amplifier tube causing a vane in a light valve current meter to move and cover an aperture therein. Covering the aperture breaks the beam of a light source thus causing a change in the resistance of a photo-electric cell and effecting the operation of a switch controlling the main drive or to operate a visible or audible signal to attract the attention of the operative. The device of my invention does not, of course, prevent breaks in the fabric but it will keep the breaks to small size and confine the defect to a small area. The dropped stitches can be worked in by hand, preventing the production of a fabric of lower grade. The device also offers a considerable economy due to the larger number of machines that can be handled by a single operator.

An important advantage of this device is that it can be used on any type of fabric, including mesh fabrics, drop stitch fabrics, figured fabrics, ribbed fabrics, etc. The photoelectric cell of the stop motion has merely to be set to the amount of light coming through the particular fabric being manufactured or inspected, so that a slight additional amount of light, such as would be caused by a broken end in the fabric, will cause the stop motion to become operative.

Referring now to the drawings for a detailed description of this invention,

Fig. 1 is a somewhat diagrammatic view, in side elevation, of a warp knitting machine showing the relation thereto of the light and photo-electric cell,

Fig. 2 is an enlarged detail view taken on the line 2—2 of Fig. 1,

Fig. 3 is a detailed view of a modified form of photoelectric cell structure, and

Fig. 4 is a wiring diagram of the electric circuit. Like reference numerals indicate like parts throughout the several views of the drawings.

In Fig. 1 there is shown the frame 1 of a warp knitting machine on which may be supported one or a plurality of warp beams 2, guide rollers 3 for bringing the warps to the sinkers 4 and needles 5 (in Fig. 2 a bank of needles is represented by a broken line 5') and rollers 6 and 7 for taking up the finished fabric. Many parts of the machine have been eliminated from the drawings for the sake of clarity, and it is to be understood that the device of my invention may be applied to apparatus other than warp knitting machines. Fig. 1 shows the relation of the photo-electric cell 9, its supports or brackets 11 and source of light, generally indicated by reference numeral 12, to the fabric being formed. Thus, warps 13 and 14

are brought from warp beams 2 over guides 3 to the needles 5 where they are knitted into a fabric 15 that immediately passes between the source of light 12 and the photo-electric cell 9 to the fabric take-up rolls 6 and 7. The photo-electric cell 9 may be connected with the amplification and operating circuits, described below, by suitable connecting wires and these circuits may be conveniently located in a cabinet at one end of the machine. However, single stage amplifiers may be inserted in the circuit at various points across the width of the machine to compensate for current losses or line drop.

Fig. 2 shows, on an enlarged scale, the position of the stop-motion with respect to the fabric. In this view the warp yarns pass to the needles 5 where they are formed into a fabric 15 which passes between the source of light 12 and the photo-electric cell 9 supported by brackets 11. The source of light may be any suitable type of bulb, i. e. a fluorescent bulb or, as shown, a bulb 16 containing filaments 17. The bulb is covered by a reflector 18 having a slotted opening 19 directed toward the fabric. Where the fabric is not too wide a single photo-electric cell 9 may be employed. However, on wider fabrics a number of cells 9 and 9' placed end-to-end, or placed in a staggered relation, as shown in Fig. 3, may be employed. Whether the cells are placed end-to-end or staggered depends somewhat on the fineness of the yarns being knitted and on the particular type of electric connections employed on the cells. It is immaterial if the cells overlap as the whole bank of cells is set as one unit, as will appear from a description of Fig. 4.

Fig. 4 shows circuits for supplying current to the bulb and photo-electric cell in conjunction with means for intensifying the small variation of current occurring when the resistance of the photo-electric cell varies in response to a change in light intensity, so that it may be employed for stopping the machine or give the required signal. In this figure, reference numerals 21 and 22 indicate alternating current supply lines, say, from a 115-volt city line, which lead into a regular 25-ampere circuit breaker or fuse box generally indicated by reference numeral 23. Bulb 16 is connected to the output side of circuit breaker 23 by conductors 24 and 25.

A conductor 26 connects supply line 21 to one end of a variable resistance coil 27 and a conductor 28 connects the other end of coil 27 to the filament 29 of an amplifier tube 30. The other end of filament 29 is connected by means of conductor 31 to a variable resistor 32 and a constant resistor 33, which are connected in parallel to a conductor 34 leading back to the supply line 22. A conductor 35 joins the variable resistance coil 27 to the variable side of photo-electric cell 9. In this modification a plurality of photo-electric cells 9 and 9', which are connected in parallel between conductors 35 and 36, are shown. One end of the conductor 36 is connected to the grid 37 of the amplifier tube 30, and the other end thereof is connected to high resistance resistor 38 which in turn is connected to the variable side of the variable resistor 32. Plate 39 of the amplifier tube 30 is charged through a circuit comprising a conductor 41 leading to a condenser 42 which is connected to the plate by conductor 43.

A light valve current meter, generally indicated by reference numeral 44, is located in a circuit shunted by leads 45 and 46 around condenser 42. The current meter is provided with a vane 47 pivoted at 48 and adapted to be moved, when there

is an increase in plate current in vacuum tube 30 effected by a change in light intensity on photo-electric cells 9 and 9', over an aperture 49, a pin 50 limiting the movement of the vane. Covering the aperture 49 of the current meter breaks the beam of light coming from a suitable bulb 51, connected to supply lines 21 and 22 by leads 52 and 53, thus causing a change in resistance of a photo-electric cell 54 in the circuit including power relay or solenoid 55 the energization of which opens contacts 56 connected by conductors 57 and 58 to a signal or to a holding coil circuit of a switch (not shown). A transformer 59 may be employed to supply power to the circuit including photo-electric cell 54.

Obviously, any suitable voltage supply may be employed and the various resistors set at a variety of points to balance the set. To "tune" the set the light is passed through the most dense and then the most open part of a perfect fabric to get the limits of variation in the intensity of light acting upon the photo-electric cell and then adjusting the various elements so that any greater or lesser surge of current beyond the ascertained limits will cause the operation of the power relays controlling the contacts 56.

It is to be understood that the foregoing detailed description is given merely by way of illustration and that many variations may be made therein without departing from the spirit of my invention.

Having described my invention what I desire to secure by Letters Patent is:

1. A stop or detector motion for a knitting machine and the like for detecting faults in a fabric, comprising a photo-electric cell positioned on one side of said fabric and extending substantially the full width of said fabric, a source of light co-extensive with said photo-electric cell and positioned on the opposite side of said fabric so as to direct light on to said fabric, a current meter operative by a change in light intensity on said photo-electric cell caused by faulty fabric passing between said photo-electric cell and said source of light and means, including a second source of light and a second photo-electric cell, under control of said current meter, for stopping the machine or giving a warning signal.

2. A stop or detector motion for a knitting machine and the like for detecting faults in a fabric, comprising a photo-electric cell positioned on one side of said fabric and extending substantially the full width of said fabric, a source of light co-extensive with said photo-electric cell and positioned on the opposite side of said fabric so as to direct light on to said fabric, a current meter operative by a change in light intensity on said photo-electric cell and said source of light and means, including a second source of light on one side of said current meter and a second photo-electric cell, on the opposite side of said current meter, under control of said current meter, for stopping the machine or giving a warning signal.

3. A stop or detector motion for a knitting machine and the like for detecting faults in a fabric, comprising a photo-electric cell positioned on one side of said fabric and extending substantially the full width of said fabric, a source of light co-extensive with said photo-electric cell and positioned on the opposite side of said fabric so as to direct light on to said fabric, a current meter, having an aperture therein, operative by a change in light intensity on said photo-electric cell caused by faulty fabric passing between said

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photo-electric cell and said source of light and means, including a second source of light on one side of said current meter and a second photo-electric cell on the opposite side of said current meter, for stopping the machine or giving a warning signal upon change in intensity on second photo-electric cell in the light passing through the aperture in said current meter.

4. A stop or detector motion for a knitting machine and the like for detecting faults in a fabric, comprising a photo-electric cell positioned on one side of said fabric and extending substantially the full width of said fabric, a source of light co-extensive with said photo-electric cell and positioned on the opposite side of said fabric so as to direct light on to said fabric, a current meter, having an aperture therein and a vane adapted to pass across said aperture, operative by a change in light intensity on said photo-electric cell caused by faulty fabric passing between said photo-electric cell and said source of light and means, including a second source of light on one side of said current meter and a second photo-electric cell on the opposite side of said current meter, for stopping the machine or giving a warning signal when said vane closes said aperture.

5. A stop or detector motion for a knitting machine and the like for detecting faults in a fabric, comprising a photo-electric cell positioned on one side of said fabric and extending substantially the full width of said fabric, a source of light co-extensive with said photo-electric cell and positioned on the opposite side of said fabric so as to direct light on to said fabric, a current meter having an aperture therein, a vane pivotally mounted in said current meter and adapted to be put in operation by a change in light intensity on said photo-electric cell, caused by faulty fabric passing between said photo-electric cell

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and said source of light, so as to cause said vane to pass across said aperture and means, including a second source of light on one side of said current meter and a second photo-electric cell on the opposite side of said current meter, for stopping the machine or giving a warning signal when said vane closes said aperture.

6. A stop or detector motion for a knitting machine and the like for detecting faults in a fabric, comprising a photo-electric cell positioned on one side of said fabric and extending substantially the full width of said fabric, a source of light co-extensive with said photo-electric cell and positioned on the opposite side of said fabric so as to direct light on to said fabric, an amplifier tube in the photo-electric cell circuit, a current meter having an aperture therein, a vane pivotally mounted in said current meter and adapted to be put in operation by a change in light intensity on said photo-electric cell, caused by faulty fabric passing between said photo-electric cell and said source of light, so as to cause said vane to pass across said aperture and means, including a second source of light on one side of said current meter and a second photo-electric cell on the opposite side of said current meter, for stopping the machine or giving a warning signal when said vane closes said aperture.

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