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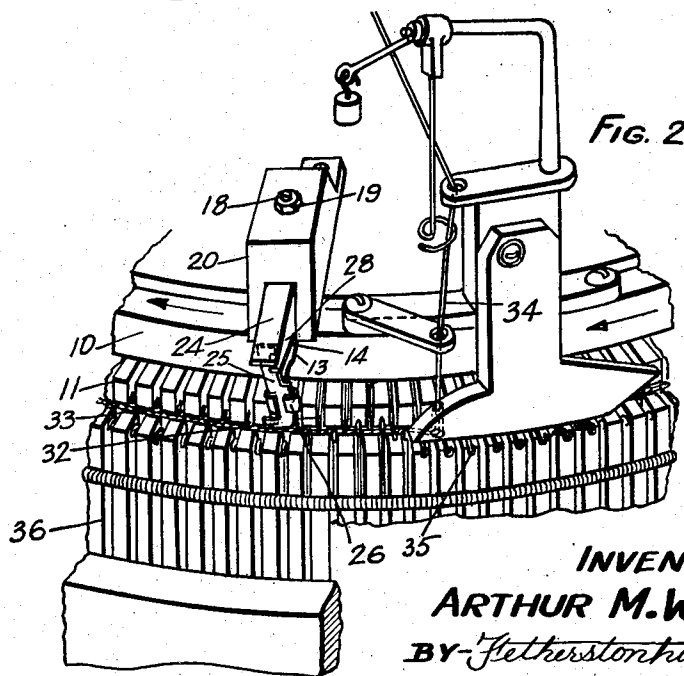
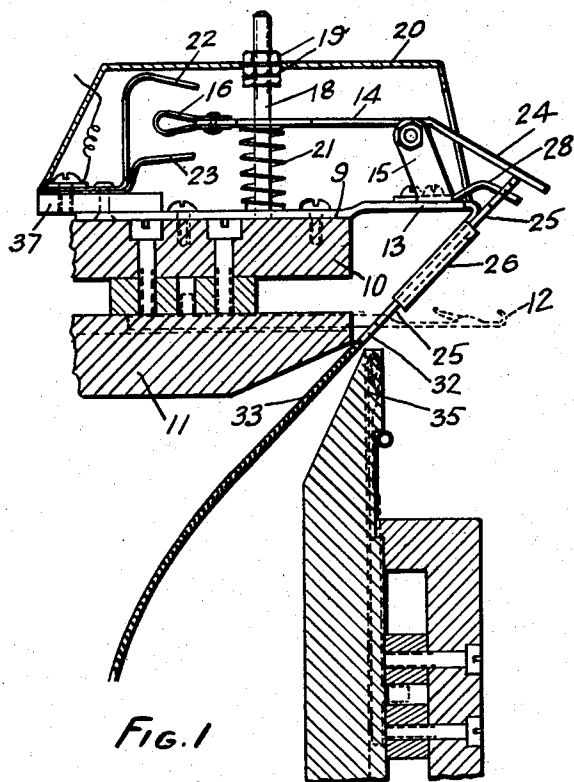
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GUARD APPARATUS FOR THE NEEDLES OF KNITTING MACHINES

Filed July 24, 1951

2 Sheets-Sheet 1



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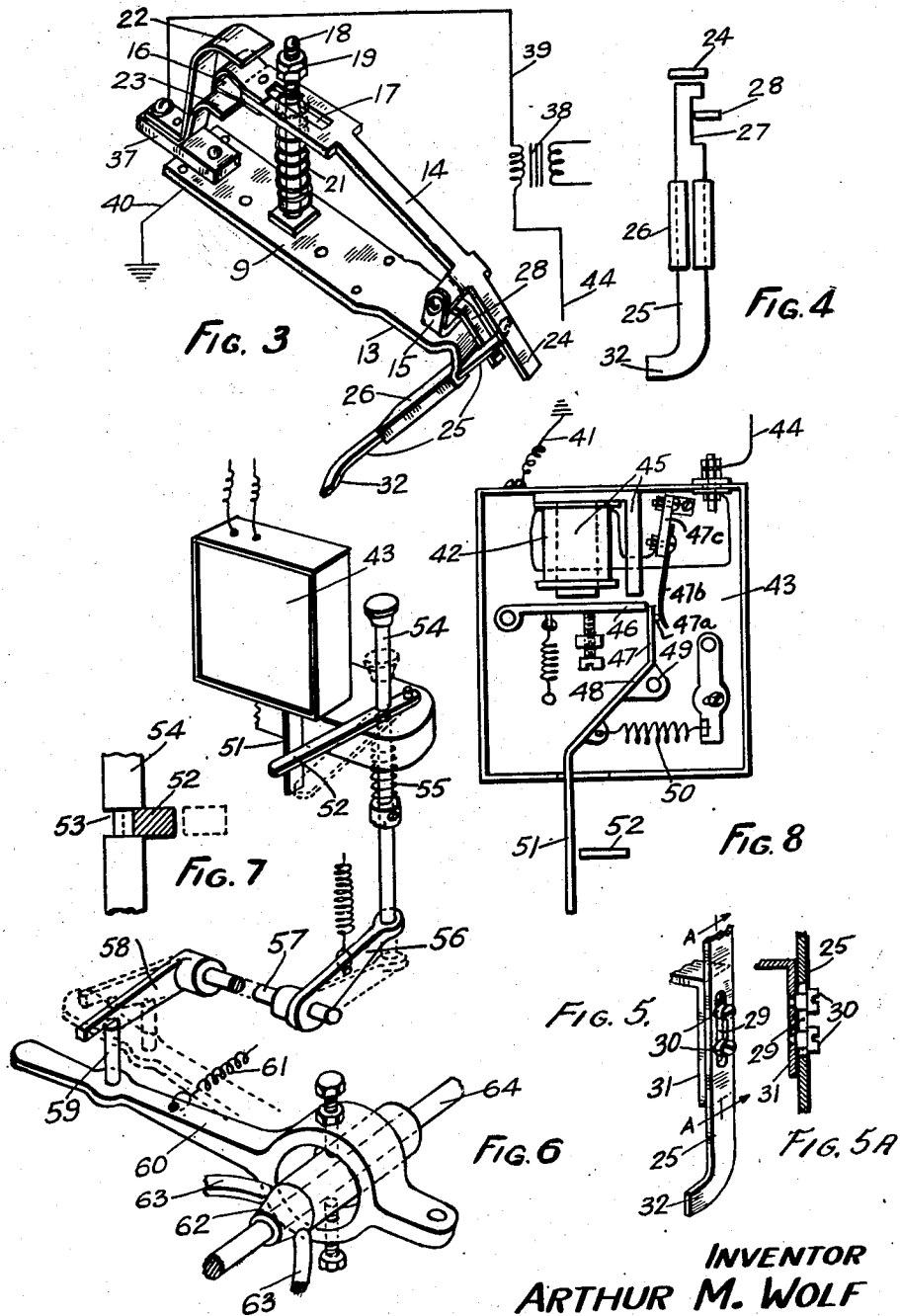
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GUARD APPARATUS FOR THE NEEDLES
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This invention relates to guard apparatus for the needles of knitting machines to prevent the fabric pressing-off the needles. The invention particularly refers to machines of the circular rib and jacquard types.

In knitting machines of the circular rib and jacquard types the fabric often presses-off the needles due to various causes, but most commonly due to fluff and the like obstructing a yarn guiding hole or the feeding hole in a yarn carrier, and also due to faulty wound yarn and the like. The above-mentioned occurrences will naturally stop a thread from feeding into the machine, and it is often beyond the control of the existing stop motions to stop a machine in time to prevent the press-off of the fabric. The other unobstructed threads will keep on feeding and lumping up yarn onto the needles often breaking the latter, until the needle detector stops the machine. The fabric must then be picked up onto the needles again. The above enumerated disabilities cause much loss of time, reduction in production, and also waste of yarn and needles. In the case of jacquard machines with bird's-eye back, the fabric does not always run-off the needles but is rendered defective in quality and becomes useless.

The present invention has been specially devised to provide simple and inexpensive guard apparatus whereby the above mentioned disabilities are eliminated, thereby saving yarn, needles, time and temper, with increase in production, and wherein the fabric has clean and even stitches. Also, the use of the invention enables the running speed of the machines to be increased by at least 10 per centum, as the general mechanical construction of most machines will permit of such an increase. Furthermore, the apparatus is safe from electric shock, and the circuit thereof foolproof.

According to this invention, the guard apparatus for the needles of knitting machines of the type hereinbefore mentioned consists broadly of an electro-mechanical device formed as a complete unit having a finger member slidably mounted from the said device in such a manner as to contact the fabric being knitted as it passes through the opening between the dial and cylinder of the machine, and the fabric exerts a pressure effect on the said finger member. The other end of the said finger member operatively connects with contact elements and associated elements of the device arranged to instantly interrupt or make an electric circuit of a relay controlling the operation of the machine. The

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arrangement is such that when a pressure effect is exerted on the finger member by the fabric in its normal movement from the knitting needles, the contact elements and associated elements of the device break the circuit, but immediately the pressure effect on the finger member relaxes, due to the fact that the fabric is no longer moving from the knitting needles, the circuit of the relay switch is made, and the machine immediately stopped. The resulting break in the fabric is only comparatively small, usually about four inches.

These knitting guards in the fitting may be screwed onto the dial-cam-boxes say by screws or attached in other manner. On some machines it may be desirable to screw the knitting guards onto the cylinder-cam-boxes, depending on the construction of a machine. The base plate is modified in such a case to suit the machine. The position of the finger member of each unit is immediately after the needles have passed a yarn carrier, that is, after the stitches have been formed and all the needles are well back in the dial and cylinder.

The electric circuit of the guard and the relay is a low voltage one, say from 4 to 12 volts, supplied from a battery or preferably a transformer is used to operate the relay switch for stopping the machine.

Any other stop motions, such as top stop motion, chain control and the like, may be connected to the circuit by simple contact switches.

With this invention the pin of the old needle detector is eliminated, although the lever of the relay switch may be used in connection with such needle detector or part thereof to effect the stopping of the machine.

In order to describe the invention more fully reference will now be made to the drawings accompanying and forming part of this complete specification wherein:

Figure 1 is a sectional elevation of portion of the dial and cylinder of a knitting machine and the present guard apparatus showing the latter mounted upon the said dial, and in which machine the cylinder and dial rotate in a clockwise direction.

Figure 2 is a perspective view of portion of the dial and cylinder in Figure 1 showing the guard apparatus in use in association with knitted fabric formed by the knitting machine.

Figure 3 is a perspective view of the guard apparatus with its cover removed.

Figure 4 is a face view of a form of the finger member in the apparatus.

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Figure 5 is an alternative form of the finger member illustrated by a perspective view.

Figure 5A is a vertical section taken along the line A—A in Figure 5.

Figure 6 is a perspective view of clutch releasing means and trip relay which is operated by the guard apparatus.

Figure 7 is a detail view in section of the trip lever which is operated by the trip relay for the purpose of stopping the knitting machine.

Figure 8 is an elevation of the trip relay casing with its cover removed to illustrate the various parts of the relay within.

The guard apparatus consists of a base 9 fixed as by screws to the dial-cam-box plate 10 situated above the knitting machine dial 11 in which the horizontally disposed knitting needles 12 are housed as seen in Figures 1 and 2. This base 9 overhangs the dial-cam-box 10 by its end 13, to which is fitted a rocking lever 14 pivotally mounted on a holder 15.

One end of the rocking lever 14 carries a contact 16 and inwardly of which there is formed a slot 17, through which there passes in a free manner a threaded rod 18 screwed into the base 9 and fitted at its upper end with lock nuts 19 to secure the shield or cover 20 in place. A coiled spring 21 is sleeved over the rod 18 under the rocking lever 14 and serves to normally elevate the contact end 16 of said lever 14, which when elevated or depressed makes contact at its contact end 16 alternatively with an upper and a lower spring contact element respectively numbered 22 and 23. These contact elements 22 and 23 are mounted upon an insulating block 37 affixed to the base 9.

Associated with the outer end 24 of the rocking lever 14 there is a finger member 25 which is slidably fitted in an angularly set guide 26 which is conveniently formed from a projection of the end 13 of the base plate 9. This finger member 25 is provided with a notch 27 to prevent its dislodgment from the guide 26 through the engagement of an arm 28 with the shoulders of such notch 27 as shown in Figure 4.

Alternatively this finger member 25 may be provided with a slot 29 (as seen in Figure 5) in which shouldered screws 30 are fitted to allow limited slidable movement of the said finger 25, such screws 30 being fitted into an angled extension 31 of the end 13 of the base 9.

The lower end of the slidable finger 25 is formed with a curved foot-like projection 32 which is adapted to ride upon the knitted fabric 33 formed by the needles of the knitting machine.

When the machine is working normally, the foot 32 rides upon the fabric 33 and maintains the arm 14 approximately midway between the contacts 22 and 23 as shown in Figure 1. When breakage of the feed thread 34 occurs, the fabric 33 loses its tension and allows the foot 32 to sink, thus causing the rocking lever 14 to drop at its end 24 elevating its contact 16 and causing same to make contact with the upper contact element 22. Should there be defective needles among the needles 12 in the dial 11 or the similar needles 35 in the cylinder 36 of the knitting machine, the foot 32 is forced upwardly thus causing the rocking arm 14 to make contact through its contact end 16 with the lower contact element 23.

The operation of the contact 16 on the rocking lever 14 contacting with either of the contact elements 22 or 23 closes an electric circuit from a transformer 38 which causes a low volt-

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age current to flow through the wire 39 then to either of the contacts 22 and 23 to the rocking lever 14 and through the base 9 to the earth connection 40 to the frame of the knitting machine (see Figure 3).

The electric circuit is then completed through the machine earth connection 41 (see Figure 8) and the electromagnet coil 42 of the trip relay 43 and finally to a wire 44 which leads to the transformer 38.

When the coil 42 is energized the magnet 45 attracts an armature 46 which releases the end 47 of a lever 48, which swings about a pivot 49 through the energy of a tension spring 50. This releasing movement of the end 47 of the lever 48 opens the circuit through the magnet coil 42 by means of a contact 47a which moves away from a contact spring 47b which is mounted upon an insulating block 47c.

The other end 51 of the lever 48 forces an arm 52 out of engagement with a notch 53 of a resetting rod 54 which moves downwardly through the energy of the spring 55 to depress an arm 56 on a shaft 57 to the other end of which a notched arm 58 is raised to release a pin 59 on a pivoted spring controlled resetting arm 60 as shown in Figures 6 and 7.

The arm 60 now moves by the energy of a spring 61 to draw the slidable cone 62 away from the fingers 63 which are part of an expanding clutch of which there are many well known types.

The shaft 64 carries a pulley at each end one of which is associated with the clutch and is driven by a motor or the like and the other pulley is adapted to drive the knitting machine.

It is to be understood that although one type of trip mechanism has been described and illustrated, there are many other known forms of trip mechanisms fitted to the various types of knitting machines, to which the present invention may be adapted, and its application is not limited to the above described example of relay and clutch releasing means.

This invention is also easily adapted to operate different known designs of trip mechanisms fitted to the various machines which employ a belt shifting device to move the driving belt from the fast to the loose pulley for stopping or starting the machine.

The number of devices used with each machine is governed by the number of feeds of the machine usually ranging from 4 to 12 feeds, and there is one of the devices for each feed.

The range of circular knitting machines in regard to their construction is very large, therefore the knitting guard described herein may have to be modified to suit the various machines. It has been found by experience that about three models for each direction of knitting, that is clockwise or anti-clockwise, should cover the total, that is full range of machines. Provision can be made to allow for the raising or lowering of the dial to alter the tension of the knitted fabric.

This knitting guard can be adapted also for use in open machines which do the knitting on a cylinder only. These machines are commonly known as jersey machines.

I claim:

1. An improved guard apparatus for the knitting needles of knitting machines of the circular rib and jacquard types having a dial housing horizontally disposed knitting needles, a dial-cam-box, a cylinder housing vertically disposed

needles, a shaft for driving said machine, and a clutch releasing mechanism operatively connected to said shaft, the horizontal and vertical needles being arranged to knit a fabric, the knit fabric passing through the opening of the dial and cylinder, said guard apparatus comprising an electro-mechanical device formed as a complete unit and including a finger member slidably mounted within the device with one end in contact with the fabric being knitted as it passes through said opening, whereby the fabric exerts a pressure effect on said finger member, a relay switch having a suitable electrical circuit for controlling the operation of said machine through said clutch releasing mechanism, and means for establishing contact between said finger member and the electrical circuit of said relay switch, said finger member being operatively connected to said contact means and said contact means being arranged to instantly interrupt or complete said electrical circuit, said electro-mechanical device being arranged so that the pressure effect exerted on said finger member by the fabric in its normal movement from the knitting needles holds the said contact means in a position which breaks the circuit of the relay switch, but when the pressure effect on the said finger member relaxes since the fabric is no longer moving from the knitting needles, the electrical circuit is completed and the machine immediately stopped through actuation of said relay switch which in turn actuates the clutch release mechanism operatively connected to the drive shaft of the machine.

2. A guard apparatus as defined in claim 1, in which the said electro-mechanical device includes a base securable to the dial-cam-box, and means at one end of said base for slidably mounting the finger member, and in which said contact means includes a lever arm rockably mounted on said base so that one of its ends rests against the upper end of the said finger member, a contact member carried at the other end of said rockable lever arm, said lever arm being in electrical connection with one side of said electric circuit, and a pair of spaced contacts, one being located on either side of said lever contact member so as to make contact with same on upward or downward movement thereof, said contacts being insulated from said base and being connected to the other side of the circuit of the said relay switch.

3. Improved guard apparatus according to claim 2, wherein the rockable lever arm has an extension at one end to contact the top of the finger member and is pivotally mounted to a bracket on the base inwardly of said extension, said base having an upwardly extending rod fixed thereto, and said lever arm having a longitudinally extending slot, said rod extending through said slot, a coiled spring being sleeved on said rod and bearing against said lever arm to normally elevate the end thereof carrying the contact thereon.

4. Improved guard apparatus according to claim 2, wherein the said spaced apart contacts extend from a common insulating block secured to the base, one contact overlying the contact member carried by the lever arm on the upper side and the other underlying said contact member.

5. Improved guard apparatus according to claim 2, wherein the finger member is of bar-like form having a foot at its lower end which is suitably shaped for riding upon the knitted fabric formed by the needles of the knitting machine, while its top end is suitably shaped for contacting the end of the rockable lever arm, and wherein said finger member is slidably mounted by a bracket fixed to said base.

6. Improved guard apparatus according to claim 5, wherein said bracket which slidably mounts the finger member is a guide which projects from the end of the base, in which a slot is formed in the side of said finger member adjacent its upper end, and in which a projection extending from the said base engages in said slot in a freely slidable manner to prevent the dislodgment of said member from said guide.

7. Improved guard apparatus according to claim 5, wherein the finger member is provided with a slot extending longitudinally therealong, and is slidably mounted on said bracket fixed to the base by at least one shouldered element having a shank which passes through said longitudinally extending slot and is secured in the said bracket.

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