Nov. 11, 1947. V. F. SEPAVICH 2,430,829

ELECTRIC WEFT DETECTOR FOR LOOMS

Filed Nov. 2, 1946 2 Sheets-Sheet 1

FIG. 1

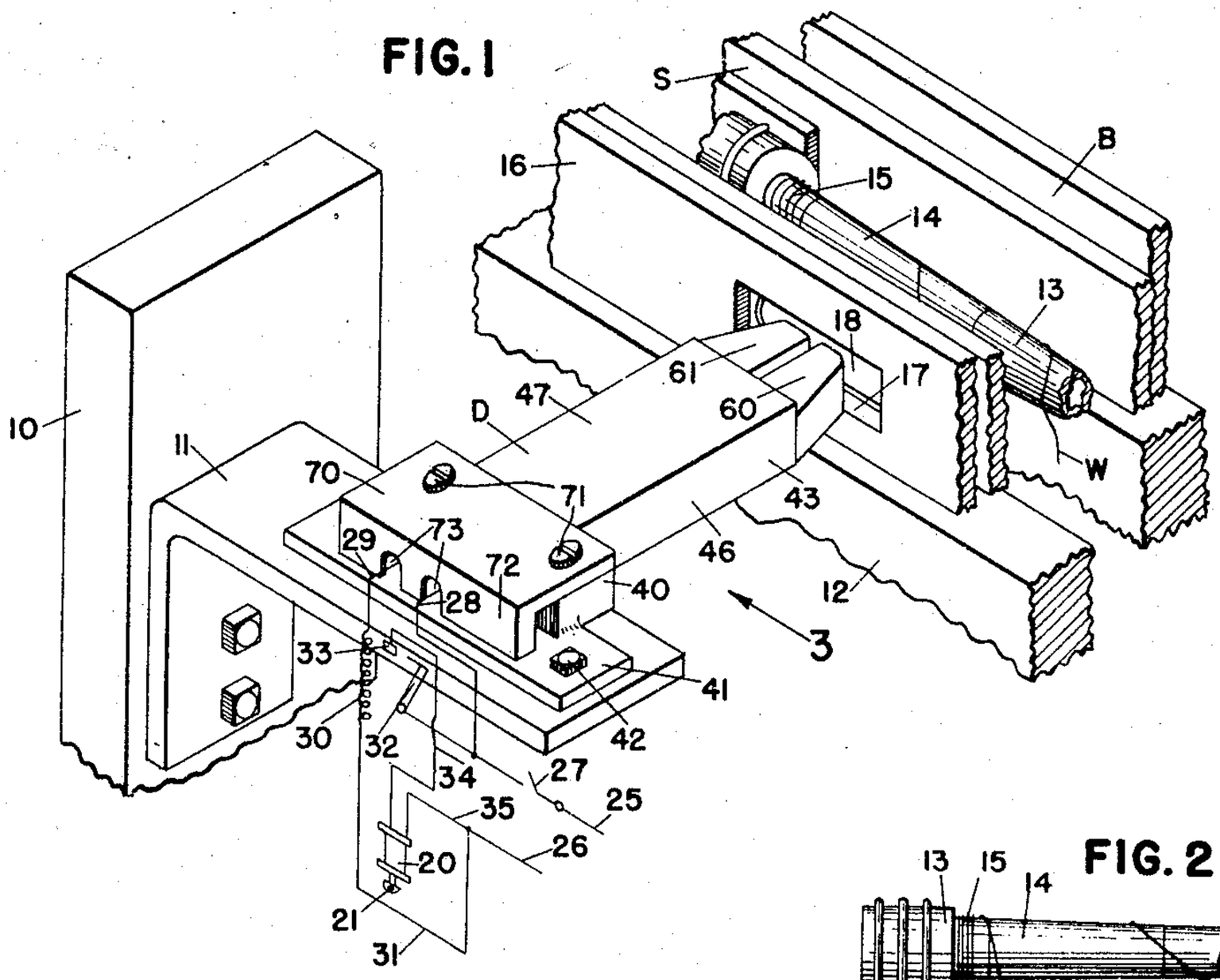

FIG. 2

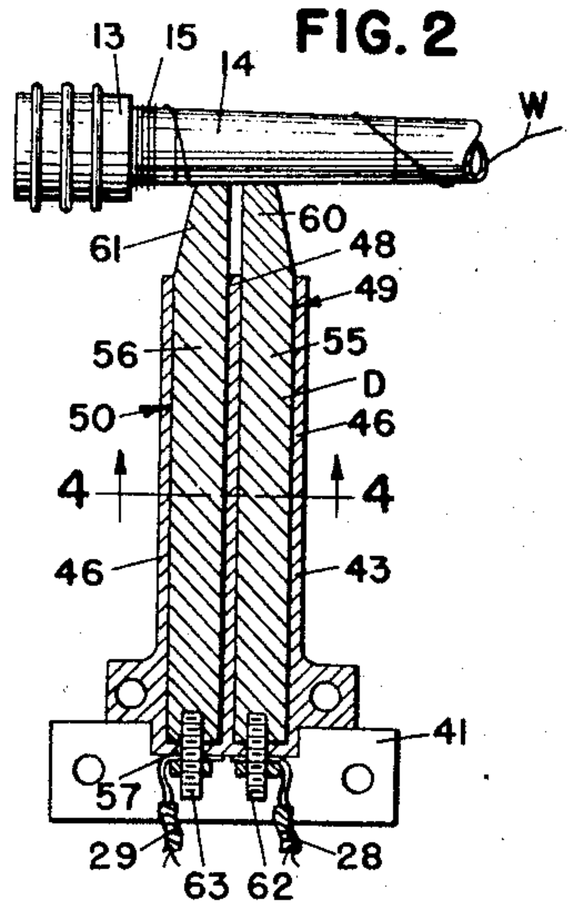

FIG. 3

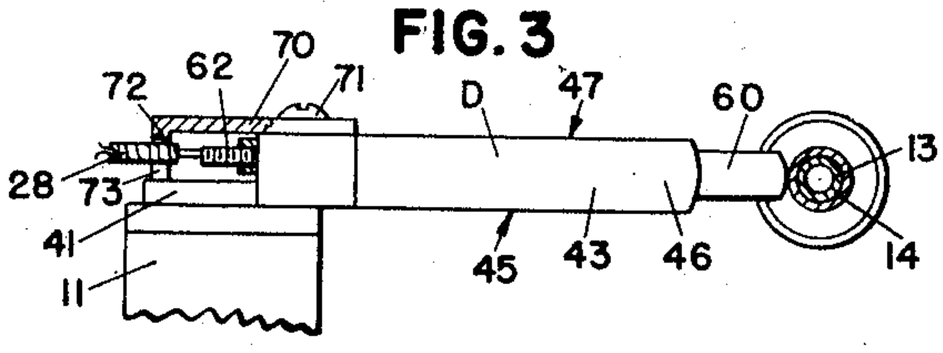

FIG. 4

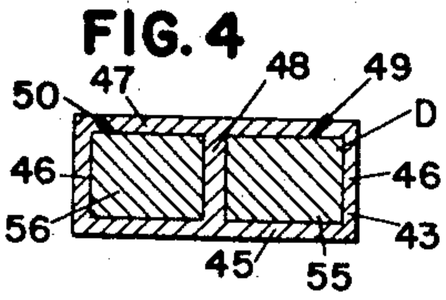

FIG. 5

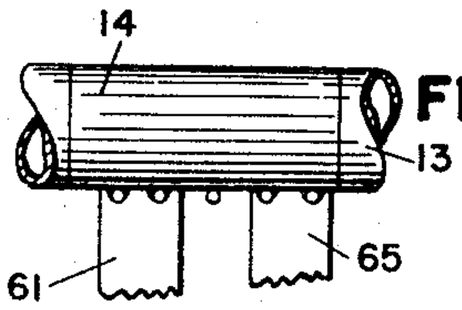

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FIG. 6

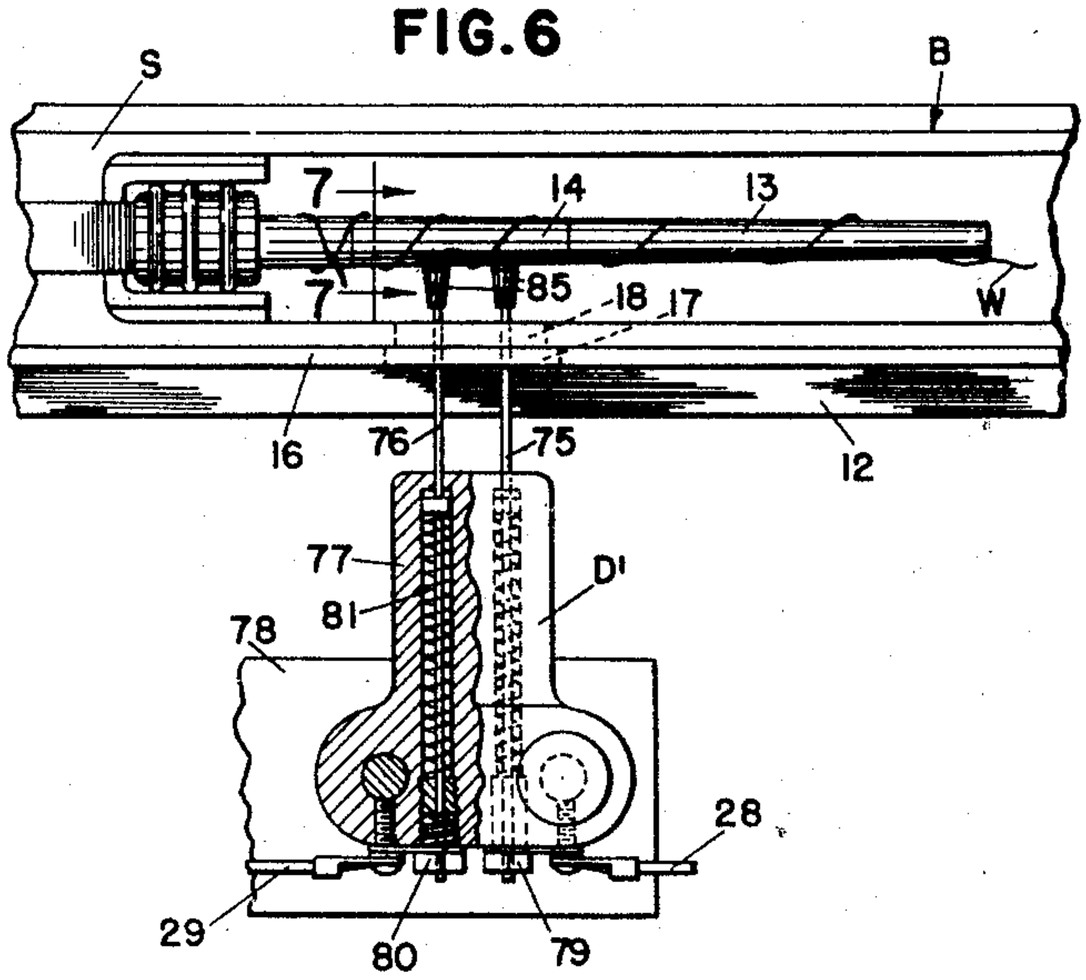


FIG. 7

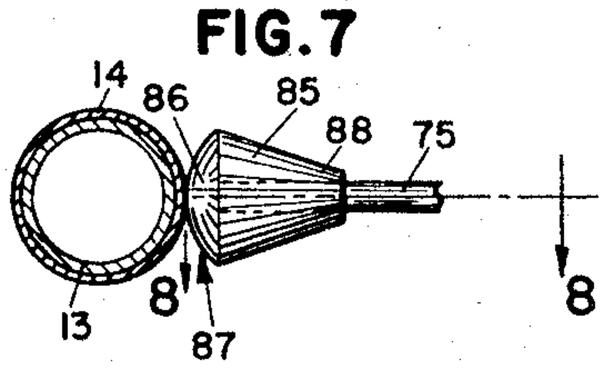


FIG. 8

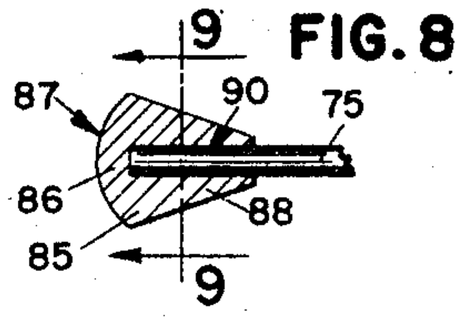


FIG. 9

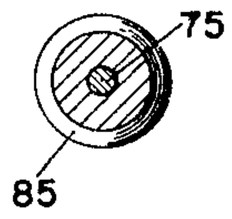
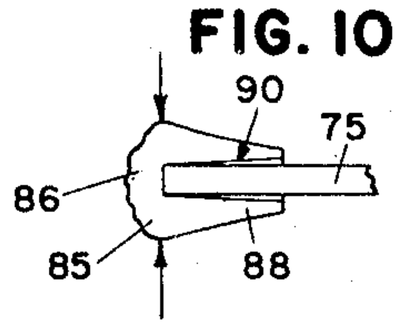


FIG. 10



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2,430,829

ELECTRIC WEFT DETECTOR FOR LOOMS

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Application November 2, 1946, Serial No. 707,420

13 Claims. (Cl. 139—273)

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This is a continuation in part of my copending application Serial No. 586,753, filed April 5, 1945.

This invention relates to improvements in weft detectors for looms and it is the general object of the invention to provide a detector having inherently resilient tips so formed as to eliminate damage to fine wefts during the detecting operation.

Weft replenishing looms ordinarily employ a weft detector or feeler for determining when the weft in a shuttle is exhausted. Electric weft detectors have a sensitivity not possessed by mechanical detectors, but usually employ metallic tips which force the weft against a metallic ferrule on the bobbin in such a manner as to cause cutting or abrasion of the weft.

It is an important object of the present invention to provide an electric weft detector having weft engaging tips made of an electric current conducting material which is inherently resilient and preferably softer than the yarn being detected. Electric current conducting soft rubber is a suitable material for this purpose.

It is customary to wind bobbins used in weft replenishing looms with a bunch of reserve weft so that the shuttle can remain active for two or more picks after the detector indicates substantial exhaustion of weft. These bunches usually represent a waste of yarn and always require an additional operation at the beginning of the winding of a bobbin. When a weft detector having soft resilient tips is used the few winds of weft remaining on the bobbin ferrule immediately before complete exhaustion occurs become embedded in the feeler tips and permit the latter to engage the ferrule between the warps or coils of the weft. Because of this feature of the invention it is not always necessary to wind bunches of reserve weft on the bobbins.

Two types of weft detectors embodying the invention are set forth hereinafter, one of them comprising blocks of electric current conducting soft rubber secured at their forward ends to a supporting structure which will normally be stationary, and the other comprising small weft engaging tips on the rear ends of detector wires or elements such as are customarily used in electric weft detectors. Both of these types of detectors possess the advantages already mentioned hereinbefore, but the second type employing the

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small tips possesses the additional advantage that the resiliences of a sleeve or neck integral with the tip can be relied upon to hold the tip on its supporting detector wire or element. Furthermore, in this latter form of the invention the sleeve can be deformed slightly to permit the escape of air which might otherwise form a pocket to interfere with close current conducting contact between the end of the supporting wire and the feeler tip.

With these and other objects in view which will appear as the description proceeds, my invention resides in the combination and arrangement of parts hereinafter described and set forth.

In the accompanying drawings, wherein two forms of the invention are set forth,

Fig. 1 is a perspective view partly in section showing the preferred form of weft detector with its mounting and parts of a shuttle being detected in its shuttle box, an electric circuit for controlling loom operation being shown diagrammatically,

Fig. 2 is a horizontal section through the detector shown in Fig. 1,

Fig. 3 is a side elevation of the detector looking in the direction of arrow 3, Fig. 1, part of the supporting structure for the detector being in section,

Fig. 4 is an enlarged vertical section on line 4—4 of Fig. 2,

Fig. 5 illustrates the manner in which strands of weft remaining on a bobbin become embedded in the soft rubber detector tips of the preferred form,

Fig. 6 is a plan view of a modified form of detector partly in section and showing the detector tips in engagement with the ferrule of a bobbin depleted of weft,

Fig. 7 is an enlarged vertical section on line 7—7 of Fig. 6,

Fig. 8 is a horizontal section on line 8—8 of Fig. 7 through the detector tip,

Fig. 9 is a vertical section on line 9—9 of Fig. 8, and

Fig. 10 is a diagrammatic view illustrating how a bobbin tip made according to the modified form of the invention can be deformed temporarily to permit escape of air from the socket of the feeler tip which receives the supporting detector wire or element.

Referring particularly to Fig. 1, there is shown part of a loom frame 10 supporting a stand 11 on which is mounted the preferred form of the detector designated generally at D. The loom lay 12 is provided with a shuttle box B to receive a shuttle S carrying a bobbin 13 having an electric current conducting zone provided in the present instances by a metallic ferrule 14. The weft W is wrapped around the barrel and ferrule in the usual manner and unwinds during flight of the shuttle. When a sufficient weft supply for continued weaving is present the ferrule will be covered with weft during the detecting operation, but as weaving proceeds the ferrule is uncovered so that part of it will be exposed between the coils or wraps of weft remaining thereon.

It has been stated hereinbefore that the detector can be used without a reserve bunch, but it is obvious that the detector can also be used with such a bunch, and in order to illustrate the usual mode of operation a bunch 15 is indicated in Fig. 2.

The shuttle box may be provided with a binder 16 having a slot 17 registering with a slot 18 in the front wall of the shuttle when the latter is boxed and in position for a weft detecting operation. During loom operation the lay 12 reciprocates, moving forwardly toward the detector as the lay beats up toward its front center position, and moving rearwardly away from the detector as the lay moves toward its back center position.

As shown diagrammatically in Fig. 1 the loom is provided with a controlling solenoid 20 having a core 21 operatively connected by means not shown to some part of the loom to be controlled. When the solenoid is energized it attracts its core and initiates a change in loom operation, such as replenishment of the shuttle, by mechanism not set forth herein but well understood.

Two electric feed wires or lines 25 and 26 supply the electric power for operating the solenoid when the detector D indicates exhaustion of weft in the shuttle. A switch 27 in wire 25 may be controlled by the loom in such manner as to be closed only during loom operation. The wires 28 and 29 lead from the detector and are ordinarily disconnected electrically but will be connected when the detector indicates weft exhaustion.

While the detector tips forming the subject matter of the present invention conduct electricity they are not as good conductors as metal, and the amount of current which can pass through them at permissible voltages may require the use of a relay. In Fig. 1 a relay 30 is indicated having one side connected to wire 29 and having the other side connected by wire 31 to power wire 26. Wire 28 is connected to power wire 25, and when wires 28 and 29 are electrically connected by the detector and ferrule the relay 30 is energized, provided switch 27 is closed. The relay thereupon attracts its contact armature 32, moving it into engagement with a stationary contact 33. Electric current then flows from wire 25 through the contact armature 32, contact 33, wire 34, solenoid 20, and wire 35 to power wire 26.

It is to be understood that I am not limited in the use of the weft detector set forth in detail hereinafter to the type of detector circuit indicated diagrammatically in Fig. 1. A variety of weft detecting circuits are known and if desired the detector D can be used in connection with an electronic weft detecting system such as that shown for instance in copending application Serial No. 606,600, filed July 23, 1945.

In carrying the preferred form of the invention into effect there is provided a support 40 having feet 41 secured as at 42 to the stand 11. Extending rearwardly from the support 40 and preferably integral therewith is an elongated hollow casing 43 having a floor 45, side walls 46, a top 47 and a central longitudinal vertical partition 48 located substantially midway between the side wall 46 and attached to the floor and top, all as set forth more particularly in Fig. 4. The partition 48 divides the interior of the casing 43 into right and left compartments 49 and 50, respectively, as viewed in Figs. 2 and 4. The support 40 and casing 43 are made of insulating material.

Each of the compartments 49 and 50 has located therein a mass of soft elastic deformable electric current conducting rubber or the like forming an electrode the rear end of which projects beyond the casing 43 to engage the bobbin 13. The electrodes for compartments 49 and 50 are designated at 55 and 56, respectively, Figs. 2 and 4. The electrodes are held against forward displacement in the casing 43 by a front wall 57 shown for instance in Fig. 2. The electrodes are preferably held frictionally in their respective compartments by their own resilience. The rear ends of the electrodes 55 and 56 are preferably tapered to form bobbin engaging tips 60 and 61, respectively. These tips are spaced slightly by an amount determined by the thickness of the partition 48, and do not ordinarily engage each other either normally or during weft detecting operations.

A binding screw or post 62 is threaded through the front wall 57 and is embedded in rubber electrode 55, while a similar binding post 63 is embedded in electrode 56, as shown more particularly in Fig. 2. The binding posts 62 and 63 are connected, respectively, to wires 28 and 29 already described.

If the voltage of the power wires 25 and 26 is somewhat above that customarily employed in electric weft detectors it may be desirable to use a shield for the posts 62 and 63. To accomplish this purpose the shield or guard 70 made of insulating material may be fastened as at 71 to the support 40 and extend forwardly and then downwardly to form a front wall 72 slotted as at 73 for the wires 28 and 29. This shield or guard can be applied as shown in Figs. 1 and 3 after the electric connections have been made between wires 28 and 29 and their respective binding posts.

The electrodes 55 and 56 are held in stationary position and as the lay beats up during a detecting operation the bobbin will engage the tips 60 and 61 in a manner customary with weft detectors. If sufficient yarn remains on the ferrule 14 the electrodes will not be electrically connected and the circuit shown in Fig. 1 will remain idle, but if the weft is substantially exhausted part at least of the ferrule 14 will be uncovered and move into engagement with the tips 60 and 61 during the detecting operation. When this engagement occurs the solenoid 20 will be energized as already described. During the detecting operation the few coils of weft remaining on the ferrule may become embedded into the tips as shown in Fig. 5. If such embedment is not relied upon, indication will be given by engagement of the tips with the uncovered ferrule, as in Fig. 2.

In the modified form of the invention shown in Fig. 6 the greater part of the detector D' is of usual construction including right and left electrodes or detector fingers 75 and 76 slidably mounted in an insulated base 77 mounted on the

usual support 78. The fingers or detector elements 75 and 76 are metallic and have sliding contact with electrodes 79 and 80, respectively, which may be connected to the previously described wires 28 and 29. The electrodes or detector fingers are urged rearwardly by compression springs 81 which yield to permit forward movement of the fingers during the detecting operation.

The rear end of each detector finger or electrode is provided with a small bobbin engaging tip 85 made of the same material as are the electrodes 55 and 56, that is, of soft electric current conducting rubber or the like. Each tip has a relatively broad rear body 86 having preferably a convex surface 87 for presentation to the bobbin. A sleeve or neck 88 extends forwardly from the body 86 and is proportioned to fit snugly around the supporting finger.

When applying a tip 85 to its finger it is found that an air pocket is likely to form within the socket or bore 90 of the sleeve or neck between body 86 and the rear end of the finger. This trapped air can escape if the neck is pinched slightly as indicated in Fig. 10, thereby allowing the rear end of the finger to seat firmly against the body of the tip 85. By this arrangement the electric current is required to travel only a short distance through the thickness of the body 86 from the ferrule 14 to the electrode.

From the foregoing it will be seen that the weft detector described herein has electrodes the tips of which are formed of soft electric current conducting material, such as rubber, and that the tips thus formed are deformable during the detecting operation to establish a good contact with the ferrule 14. A detector provided with such tips can be used with the finest of wefts without danger of abrasion. The embedment of the wefts within the deformable rubber tips is illustrated in connection with the preferred form of the invention, as in Fig. 5, but it should be understood that a similar condition could exist with the modified form of tips 85. When such deformation does occur the detector tips can engage the ferrule 14 between adjacent coils of weft on the bobbin when the latter is almost depleted, and for this reason a reserve bunch of weft will not always be necessary. It will also be understood that the detector can be adapted for use on the usual multicolor weft replenishing loom, in which case the detector support can be arranged for forward movement at the time of transfer. In the modified form of the invention it is desirable that the springs 81 which normally hold the electrodes 75 and 76 rearwardly be of such strength as to cause at least a moderate amount of deformation of the tips 85 before the springs yield.

Having thus described my invention it will be seen that changes and modifications may be made therein by those skilled in the art without departing from the spirit and scope of the invention and I do not wish to be limited to the details herein disclosed, but what I claim is:

1. A feeler tip for a loom electric weft detector comprising a body of soft electric current conducting rubber.

2. A feeler tip for the electric weft detector of a loom operating with a bobbin having an electric current conducting zone, said tip comprising a body of soft eelctric current conducting rubber for engagement with said zone.

3. In an electric weft detector for a loom having a bobbin provided with a metallic ferrule which is uncovered when the weft of the bobbin

is exhausted, a pair of electrodes insulated from each other and having bobbin ferrule tip engaging parts formed of a soft elastic electric current conducting rubber.

4. In an electric weft detector for a loom having a bobbin provided with a metallic ferrule normally wound with weft of a given hardness less than the hardness of the ferrule, the weft when depleted uncovering said ferrule, and a pair of bobbin engaging electric weft detecting members insulated from each other and each having a detecting tip formed of an electric current conducting elastic rubber softer than the weft.

5. In an electric weft detector for a loom provided with a bobbin which when depleted of weft can conduct an electric current, a support formed of electric insulating material, a pair of electrodes secured to said support in position for contact with said bobbin, each electrode being formed of electric current conducting soft elastic rubber, and a lead electrically connected to each electrode for connection to an external circuit.

6. In an electric weft detector for a loom provided with a bobbin which when depleted of weft can conduct an electric current, a support formed of electric insulating material, a pair of electrodes secured to said support in position for contact with said bobbin, each electrode being formed of electric current conducting soft elastic rubber, and a lead member partly embedded in each electrode and extending beyond the electrode for connection to a loom controlling circuit.

7. In an electrical weft detecting system for a loom operating with a bobbin having an electric current conducting zone which is uncovered at substantial weft exhaustion, means constituting a normally open electric circuit including a source of electric power and an electromagnetic member which is energized when the circuit is closed and initiating a change in loom operation, a pair of weft detector electrodes each connected to said circuit and comprising electric current conducting soft elastic rubber, and support means holding said electrodes insulated from each other and in position to be engaged and electrically connected by said zone of the bobbin when said zone is uncovered to close said circuit.

8. In an electric weft detector for a loom operating with a bobbin having an electric current conducting zone, a metallic wire finger, and a feeler tip of soft electric current conducting rubber held by the finger in position to engage said zone during a detecting operation and provided with a socket surrounding part of the finger and acting due to the resilience thereof to hold the tip on the finger.

9. In an electric weft detector for a loom operating with a bobbin having an electric current conducting zone, a current conducting finger, and a feeler tip made of soft electric current conducting rubber held by the resilience thereof on said finger and supported by the latter in position for engagement with said zone.

10. An electric weft detector finger for a loom, said finger comprising an elongated metallic wire, and a feeler tip made of soft electric current conducting rubber held by the resilience thereof on one end of said finger.

11. An electric weft detector finger for a loom, said finger comprising an elongated metallic wire, and a feeler tip made of soft electric current conducting rubber and having an integral hollow neck surrounding one end of the finger and held on the latter by the resilience of the neck.

12. An electric weft detector finger for a loom,

said finger comprising an elongated metallic wire, and a feeler tip made of soft electric current conducting rubber having a socket therein receiving and due to the resilience thereof gripping one end of said finger.

13. An electric weft detector finger for a loom comprising an elongated electric current conducting element to one end of which is secured a feeler tip made of soft electric current conducting rubber.

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