Aug. 3, 1954 M. VISCONTI 2,685,664

AUTOMATIC CONTROL SENSING MEANS RESPONSIVE TO A PLURALITY OF CONDITIONS

Filed June 29, 1953 4 Sheets-Sheet 1

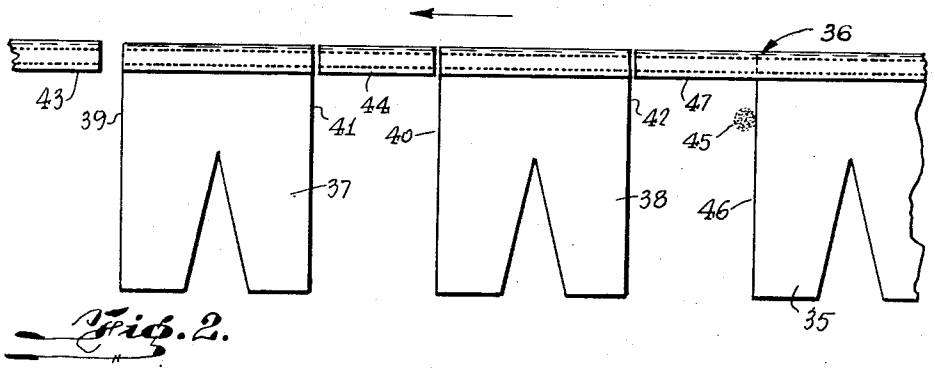


Fig. 2.

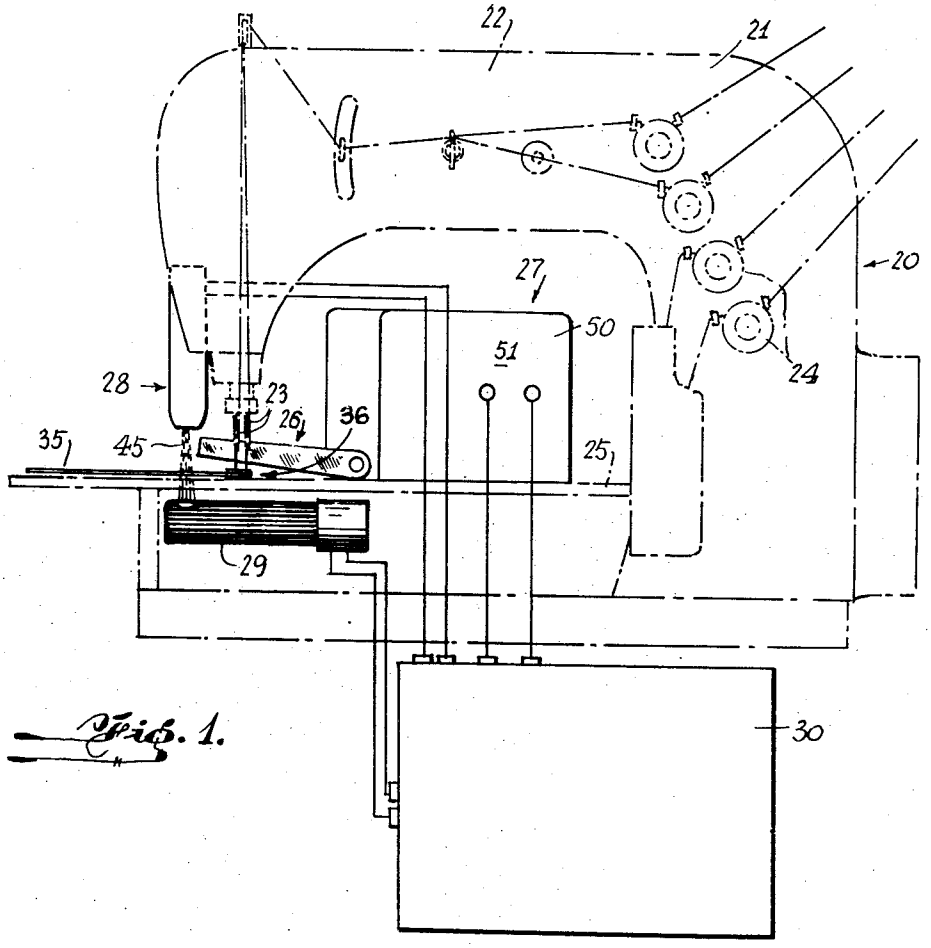


Fig. 1.

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Fig. 3.

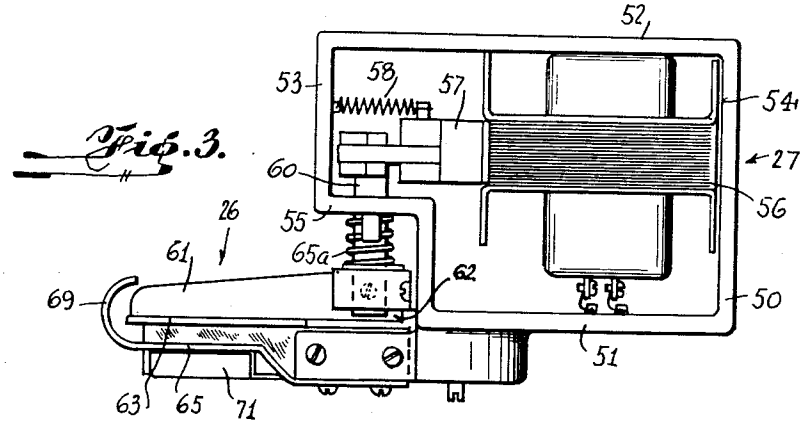
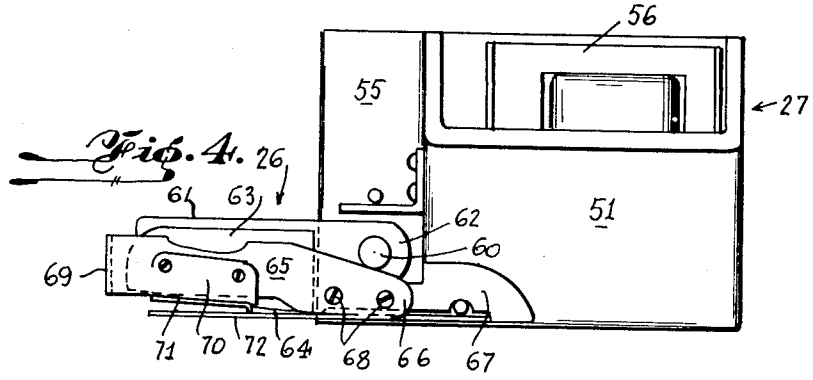


Fig. 4.



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AUTOMATIC CONTROL SENSING MEANS RESPONSIVE TO A PLURALITY OF CONDITIONS

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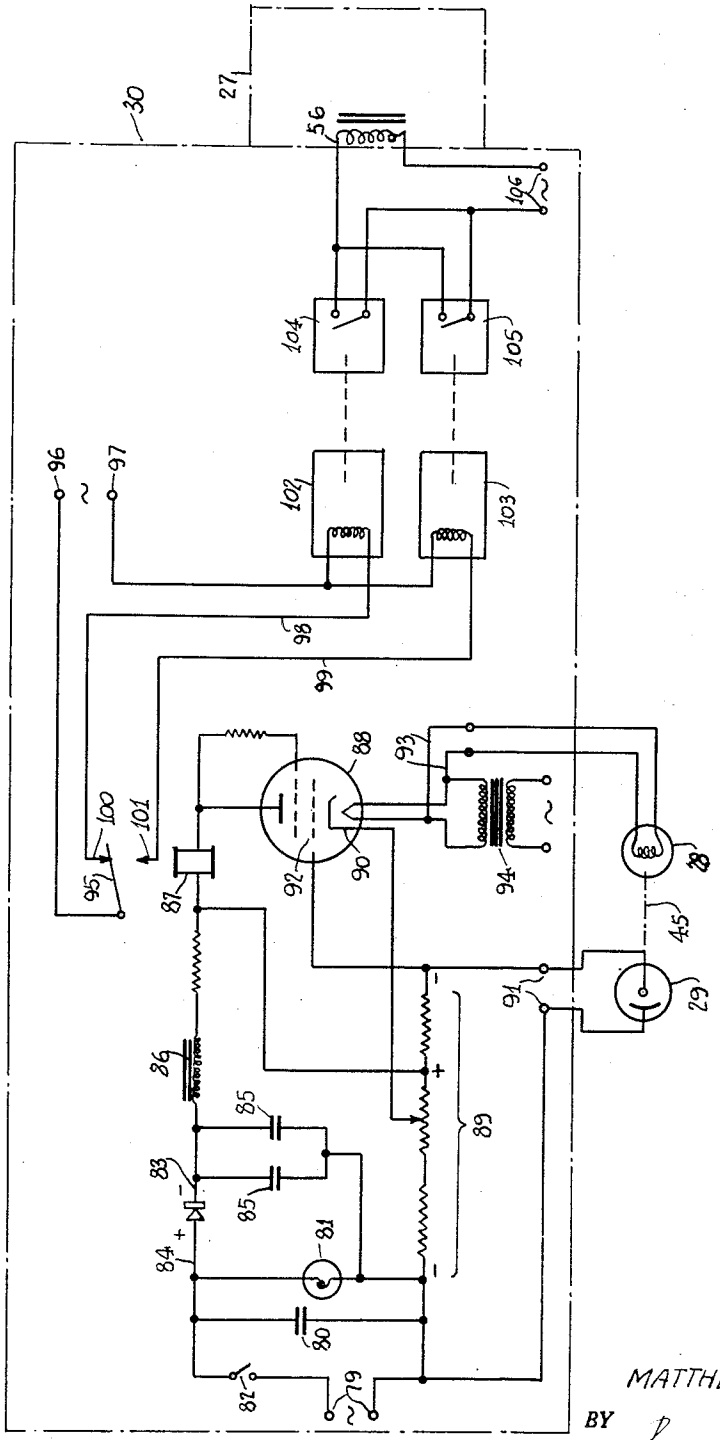


Fig. 5.

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AUTOMATIC CONTROL SENSING MEANS RESPONSIVE TO A PLURALITY OF CONDITIONS

Filed June 29, 1953 4 Sheets-Sheet 4

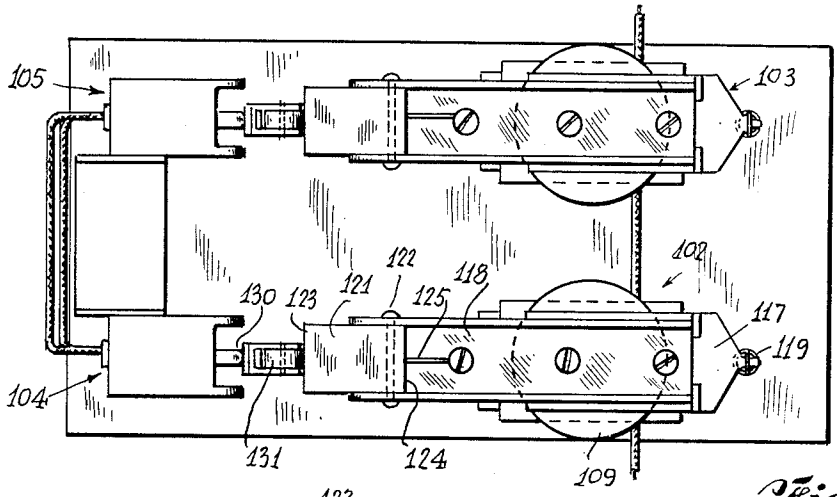


Fig. 7.

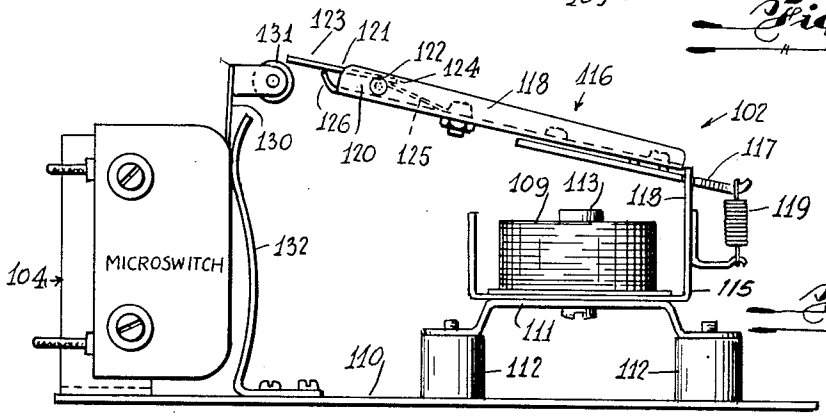


Fig. 6.

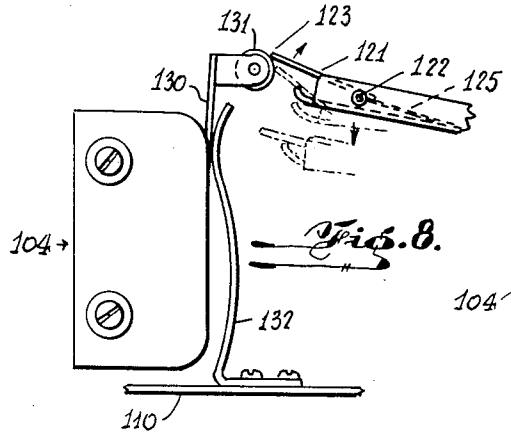


Fig. 8.

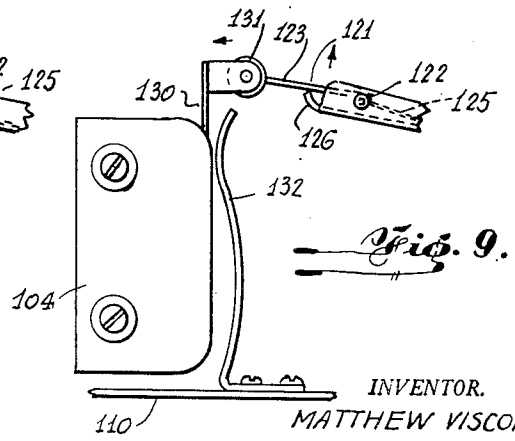


Fig. 9.

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Patented Aug. 3, 1954

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UNITED STATES PATENT OFFICE

2,685,664

AUTOMATIC CONTROL SENSING MEANS RESPONSIVE TO A PLURALITY OF CONDITIONS

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Application June 29, 1953, Serial No. 364,584

8 Claims. (Cl. 317—130)

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The present invention relates generally to accessories or attachments for sewing machines, and is particularly directed to sewing machine accessories for severing material passing through the machine.

As is well known to those versed in the garment manufacturing art, a frequent and important operation is that of binding; that is, the sewing of a binding strip along the edge of a garment. The binding strip and garment are fed simultaneously through the sewing machine and there secured together, after which it is necessary to sever the binding strip so as to be flush with the garment edges.

While prior devices have been employed to accomplish this end, such devices have been extremely complicated in construction and unreliable in operation. For example, it has heretofore been necessary to provide separate controls for each cutting operation, that is, one control mechanism for cutting the leading garment edge and another for cutting the trailing garment edge.

Accordingly, it is a principal object of the present invention to provide a completely automatic cutting attachment or accessory for a sewing machine, which is simple and durable in construction, and efficient in operation.

It is another object of the present invention to provide a novel control means in which a single sensing element is adapted to actuate a mechanism in response to a variety of conditions. A more particular object is to provide a sewing machine accessory in which a single sensing element is adapted to actuate cutting operations at both the leading and trailing garment edges.

Still another object of the present invention resides in the provision of a cutting accessory for a sewing machine which is completely automatic, and sufficiently quick-acting to permit the continuous feeding of material to the machine, even during the cutting operation.

Yet another object of the present invention is to provide a sewing machine attachment having the characteristics mentioned in the foregoing paragraphs, which will achieve substantial savings in time and labor, and which can be manufactured and sold at a reasonable cost.

Other objects of the present invention will become apparent upon reading the following specification and referring to the accompanying drawings, which form a material part of this disclosure.

The invention accordingly consists in the features of construction, combinations of elements, and arrangements of parts, which will be exemplified in the construction hereinafter described, and of which the scope will be indicated by the appended claims.

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In the drawings:

Fig. 1 is a front elevational view showing a device constructed in accordance with the present invention in operative relation with respect to a sewing machine, the latter being illustrated in dot-and-dash lines.

Fig. 2 is a diagrammatic representation of a plurality of garments passing through the sewing machine employing the attachment of the present invention.

Fig. 3 is a top plan view showing the cutter and cutter operating means of the present invention.

Fig. 4 is a front elevational view of the device shown in Fig. 3.

Fig. 5 is a schematic representation of the electrical control circuit employed in the present invention.

Fig. 6 is a front elevational view showing a physical embodiment of a portion of the control circuit of Fig. 5.

Fig. 7 is a top plan view of the elements shown in Fig. 6.

Fig. 8 is a fragmentary elevational view of the elements shown in Fig. 6, various positions of movement being shown in dot-and-dash lines.

Fig. 9 is a view similar to Fig. 8 showing still another postion of movement.

Referring now more particularly to the drawings, and specifically to Fig. 1 thereof, the embodiment of the invention illustrated therein comprises a sewing machine, generally designated **20**, having an operating head **21**, an arm **22**, reciprocatory needles **23**, and thread feeding means **24**. While the drawing illustrates a double needle machine, it will soon become apparent that the invention may be employed with sewing machines of any number of needles. For reasons of simplicity and clarity of understanding, certain conventional sewing machine elements have been omitted from the drawing, notably the presser foot and material feeding means. A work surface or table **25** is shown in conventional position.

Just rearwardly of the needles **23** is shown a cutter **26** which is connected to the cutter-operating means **27** mounted on the table **25**. Adjacent to the cutter **26** is mounted a light source or lamp **28** projecting downwardly through the table **25** for reception by a photo-electric cell

29. The photo-electric cell is responsive to light emanating from the light source 28 and actuates the cutter control means 30 which is connected to the cutter operating means 27.

A garment 35 is shown being operated on by the needles 23, a binding strip 36 being sewn along one edge of the garment. The operational result of the invention is shown in Fig. 2, where the garments 37 and 38 have passed through the sewing machine 20 and have been severed by the cutter 26 at the leading edges 39 and 40 and at the trailing edges 41 and 42. Thus, the binding portions 43 and 44 intermediate the adjacent garments are completely disassociated therefrom so that no further severing operations are required. The light projecting from the light source 28 is indicated at 45 just prior to being interrupted by the leading edge 46 of the garment 35, at which time the cutter 26 will sever the strip portion 47 from the garment 35.

In Figs. 3 and 4 are shown more detailed views of the cutter 26 and cutter-operating means 27. The latter includes a housing 50 adapted to be fixed on the sewing machine table 25 including front and rear walls 51 and 52 and side walls 53 and 54. The side wall 53 is offset by a transverse wall portion 55. Disposed within the housing 50 adjacent to the side wall 54 is a solenoid 56 which carries a bar 57 reciprocable from right to left and resiliently biased toward the left by a relatively light spring 58. A rotatable shaft 60 extends forwardly through the transverse wall portion 59 and has its inner end connected to the solenoid bar 57 for rotative movement upon actuation of the solenoid.

A solid cutter member or bar 61 has one end fixed, as at 62 to the forward end of the shaft 60 for rotation therewith. The cutter bar carries a blade 63 having a knife edge formed on its lower edge 64. A relatively stiff helical spring 65*a* is circumposed about the forwardly projecting portion of the shaft 60 and fixedly secured to the shaft and the housing 50 to strongly urge the shaft and cutter bar 61 in a clockwise direction, as seen in Fig. 4. Arranged in front of the cutter blade 63 is a guard 65 which has one end 66 secured to a boss 67 on the housing front wall 51, as by bolts 68. The other end 69 of the guard 65 curves rearwardly in spaced relation about the cutter bar 61 and blade 63 to keep foreign objects away from the latter. A guide 70 is secured to the forward face of the guard 65 and is formed with a forwardly projecting flange 71 for guiding the garments into the space between the cutter blade and a fixed shearing element 72.

In operation, the garment will pass just below the guide 70 under the cutting blade 63, and, upon energization of the solenoid 56, the bar 57 will shift to the right to rotate the cutter bar 61 and blade 63 down into the path of the garments for severing the same. As the solenoid is energized only momentarily, which will be more fully described hereinafter, the relatively strong helical spring 65 serves to effect forcible clockwise rotation of the cutter blade 63 to quickly retract the latter from the path of the garments passing through the sewing machine. This substantially instantaneous cutter operation will permit continuous feeding of garments through the sewing machine without bunching or other impediment.

Included in the cutter control means 30 is a circuit amplifying the output of the photo-electric cell 29, which circuit is shown in Fig. 5. A source of voltage (not shown) is connected via terminals 79 across the condenser 80 and lamp 81, upon closure of the on-off switch 82. A rectifier 83 is connected in the line 84 and the rectifier output is smoothed by the filter comprising condensers 85 and choke 86. In series with the line 84 is a relay winding 87 which is in the plate circuit of an amplifier tube 88. A voltage divider 89 is tapped by the tube cathode 90 and the photo-electric cell 29 is connected to the terminals 91 to control the bias on the tube grid 92. Variations in the conductivity of the photoelectric cell are thus employed to control the current in the tube plate circuit to energize and de-energize the relay winding 87. A filament transformer 94 may be employed, and the secondary thereof may be tapped by lines 93 for operating the photo-electric cell light source 28. While the above described circuit has been found satisfactory, any suitable amplifying means may be employed.

The relay winding 87 is operatively associated with an armature actuated double throw switch 95 which is connected to one side of a source of voltage via the terminal 96. A pair of contacts 100 and 101 are operatively associated with switch 95 and connected, respectively, through line 98 and a relay 102 and line 99 and a relay 103 to terminal 97 and the other side of the source of voltage. When winding 87 is de-energized the switch 95 is arranged to engage contact 100 thus energizing the winding of relay 102. When winding 87 is energized it attracts switch 95 causing it to leave contact 100 and engage contact 101. This de-energizes the winding of relay 102 and energizes the winding of relay 103. Subsequent de-energization of winding 87 changes the connections again to re-energize the winding of relay 102 and to de-energize the winding of relay 103. Relays 102 and 103 are specially constructed as will be explained hereinafter with reference to Figs. 6 to 9 to momentarily actuate on-off switches 104 and 105, respectively, when the associated relay, as indicated in Fig. 5, is de-energized. The on-off switches or micro-switches 104 and 105 are each connected in series with a voltage source 106 and the cutter operating solenoid 56 which was described above. Thus, upon shifting the double throw switch 95, the relays 102 and 103 will be actuated and in turn operate one of the micro-switches 104 and 105. In either case, the solenoid 56 will be energized by the voltage source 106 to operate the cutter 26.

To recapitulate the general operation of the invention, the sensing means or photo-electric cell 29 normally receives light from the light source 28. However, when a garment passes between the light source 28 and the photo-electric cell 29, the transmission of light to the latter is interrupted and the conductivity of the photo-electric cell is substantially reduced. The photo-electric cell controls the bias on the tube 88 so that the relay winding 87 is actuated to shift the double throw switch 95 in one direction when light is transmitted to the photo-electric cell and in the other direction when the transmission of light is interrupted, as by the movement of a garment. Therefore, in each condition of conductivity of the photo-electric cell, one of the relays 102 and 103 will be energized.

In order to effect the desired operation of the cutter 26, it is necessary to provide a current of momentary duration through the solenoid 56. In addition, to effect cutting action at the desired instant, the solenoid 56 must be actuated when the leading and trailing edges of a garment are below the cutting blade 63, so that the

binding strip 44 intermediate the garments will be severed therefrom.

To accomplish this end, the relays 102 and 103 and microswitches 104 and 105 are of a highly novel construction and arrangement, best seen in Figs. 6–9.

As the relays 102 and 103 are identical in construction, only one will be described. The relay 102 is illustrated in Fig. 6 and comprises a winding 109 mounted on a support 110 by a bracket 111, which is secured to mounting blocks 112. A permeable core 113 is disposed in the winding 109. An upright member 115 is fixed to the bracket 111 and mounts an armature, generally designated 116, for pivotal movement toward and away from the winding 109. More specifically, a bar 117 is pivoted intermediate its ends on the upright 115, and is provided with an upwardly facing channel member 118 secured to the bar for movement therewith. The relay armature 116 is resiliently urged away from the winding 109 by the tension spring 119.

On the distal end 120 of the channel member 118, a tongue 121 is pivoted intermediate its ends as at 122. One end 123 of the tongue 121 projects longitudinally outwardly beyond the distal end 120 of the channel member 118. The other tongue end 124 is adapted to be engaged on its undersurface by a spring wire 125 which urges the tongue counter-clockwise with respect to the armature 116, as seen in Fig. 6. An upstanding lug or stop 126 is formed on the channel member 118 to limit the counter-clockwise movement of the tongue 121, for a purpose which will soon become apparent.

The micro-switch 104 has a contact arm 130 movable between the open and closed positions of Figs. 8 and 9, respectively. On the upper end of the arm 130 and extending toward the relay armature 116 is mounted a roller 131. A leaf spring 132 engages the contact arm to resiliently limit its opening movement.

Upon energization of the winding 109, the relay armature 116 will be moved downwardly against the force of spring 119. The projecting end 123 of the tongue 110 will then yieldably engage the roller 131 and ride over the latter by depressing the spring wire 125. This action is shown in Fig. 8, the tongue moving relative to the armature 116, in the direction of the arrow. The armature may then be moved downwardly to its lowermost position, shown in dot-and-dash lines, without closing the micro-switch, that is, without moving the contact arm 130 to the left. Upon deenergization of the winding 109, the tension spring 119 will swing the armature 116 upwardly about the fulcrum of upright member 115. The distal end 123 of the tongue 121 will then rigidly engage the roller 131, the tongue being in abutment with the stop 126, as seen in Fig. 9. This will cause the contact arm 130 to move inwardly toward the left to close the cutter operating solenoid circuit. As the upward movement of armature 116 is continuous and relatively rapid, the micro-switch 104 will be closed only momentarily to effect a rapid cutting action and permit quick retraction of the cutter blade 63.

As described hereinbefore, upon energization of the relay 102, the relay 103 is deenergized and, conversely, upon energization of the relay 103, the relay 102 is deenergized. Therefore, upon each shifting of double throw switch 95 in response to the interruption and restoration of light received by the photoelectric cell 29, one of the relays 102 and 103 is deenergized to effect a momentary closing of one of the micro-switches 104 or 105, and thereby operate the cutter 26.

From the foregoing, it is seen that the present invention enables an operator to simultaneously and continuously feed a binding strip and a plurality of garments into the sewing machine, so that the garments are delivered from the machine completely severed in the proper manner.

While the invention has been described in detail with particular reference to sewing machines, it will now be understood that the invention is applicable to various other uses. That is, the invention may be applied wherever a particular operation is desired in response to a plurality of conditions.

In view of the foregoing detailed description, it will now be appreciated that the invention fully accomplishes its intended objects and is well adapted to meet practical conditions of use.

Although the present invention has been described in some detail by way of illustration and example for purposes of clarity of understanding, it is understood that certain changes and modifications may be made within the spirit of the invention and the scope of the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent, is:

1. In an automatic control, a single photo-electric cell responsive to two different conditions represented by two different levels in illumination, two separate identical control circuits each having an input and an output, said outputs being connected together in parallel for connection in common to a device to be controlled, switch means having two alternate positions and disposed in the inputs of said two control circuits for alternately causing said circuits to provide an output control effect at their respective outputs upon actuation of said switch means between its alternate positions, means connected to said photo-electric cell for actuating said switch means between said alternate positions in response to change between said two levels of illumination received by said photo-electric cell, each of said alternate switch positions corresponding to a different one of said levels of illumination, whereby said device will receive the same control effect in response to the occurrence of each of said two conditions.

2. The combination of claim 1, said control circuits each including a relay winding connected with said switch means for energization and de-energization from a source of power upon actuation of said switch means between said alternate positions and an armature operatively associated with said winding and movable in opposite directions when the associated winding is energized and de-energized by said switch means, said armature being coupled with its associated output in a manner such that it engenders said output control effect upon movement in the direction corresponding to de-energization of said associated winding.

3. The combination of claim 1, said control circuits each including a relay winding connected with said switch means for energization and de-energization from a source of power upon actuation of said switch means between said alternate positions and an armature operatively associated with said winding and movable in opposite directions when the associated winding is energized and de-energized by said switch means, and a microswitch operatively associated with each of said armatures and included in

the respective outputs of said control circuits, said micro-switches being electrically connected in parallel for independently effecting the same output control effect, each of said armatures including means for actuating the associated micro-switch for a predetermined interval of time upon movement in one direction but not in the other direction, whereby said control effect will be provided for said predetermined interval of time in response to the occurrence of said two conditions.

4. The apparatus according to claim 3, wherein said means included by each of said armatures each comprises a tongue extending toward the associated microswitch, said tongue being alternately yieldably and rigidly engageable with the associated microswitch upon movement of the associated armature in said other and said one directions, respectively, whereby said tongue is adapted to actuate the associated microswitch upon movement of the associated armature in said one direction.

5. The apparatus according to claim 3, wherein said means included by each of said armatures each comprises a tongue carried by said armature and mounted for movement relative to the associated armature, said tongue being engageable with the associated microswitch upon back and forth movement of said armature, resilient means urging said tongue in a first direction of its movement relative to the associated armature, and stop means on said armature limiting the relative movement of said tongue in said first direction, said tongue thus being alternately yieldably and rigidly engageable with said micro-switch, upon back and forth armature movement in said other and said one direction, respectively, whereby said microswitch is actuated upon movement of said armature in said one direction.

6. A device for automatically controlling the operation of a work-performing mechanism, said device comprising a light source on one side of the path of material passing through said mechanism, a photo-electric cell on the opposite side of said path, said photo-electric cell being aligned to receive light from said source in the absence of material passing betwen said source and said photo-electric cell, a pair of control circuits connected in parallel and each including means for independently operating said mechanism, switch means having two alternate positions and disposed in said pair of control circuits for alternately closing said circuits upon actuation of said switch means between its alternate positions, means connected to said photo-electric cell for actuating said switch means between said alternate positions sequentially in response to sequential interruption and restoration of light received by said photo-electric cell caused by passage of material between it and the light source, whereby said mechanism is operated adjacent to the leading and the trailing edges of a piece of material moving through said work-performing mechanism.

7. The apparatus according to claim 6, said mechanism-operating means each comprising a relay armature movable in opposite directions when the associated circuit is opened and closed by said switch means, a micro-switch operatively associated with each of said armatures and having means for electrically connecting it to said mechanism for actuating said mechanism, each of said armatures including means for actuating the associated micro-switch for a predetermined interval of time upon movement in one direction but not in the other direction, whereby said mechanism is operated for a predetermined interval of time after each successive interruption and restoration of light received by said photo-electric cell.

8. The apparatus according to claim 7 wherein said means included by each of said armatures each comprises a tongue extending toward the associated micro-switch, said tongue being alternately yieldably and rigidly engageable with the associated micro-switch upon movement of the associated armature in said other and said one direction, respectively, whereby said tongue is adapted to actuate the associated micro-switch upon movement of the associated armature in said one direction.

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