Jan. 10, 1961 O. BRAUN ET AL 2,967,497

BUTTON FEED CONTROL FOR SEWING MACHINES

Filed Nov. 14, 1958 3 Sheets-Sheet 1

Fig. 1

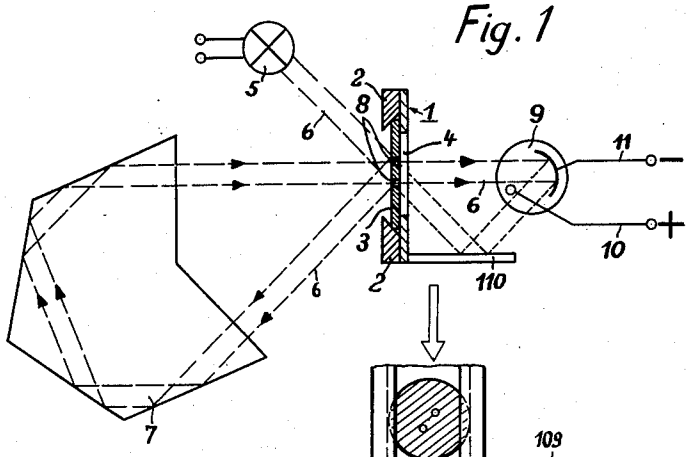
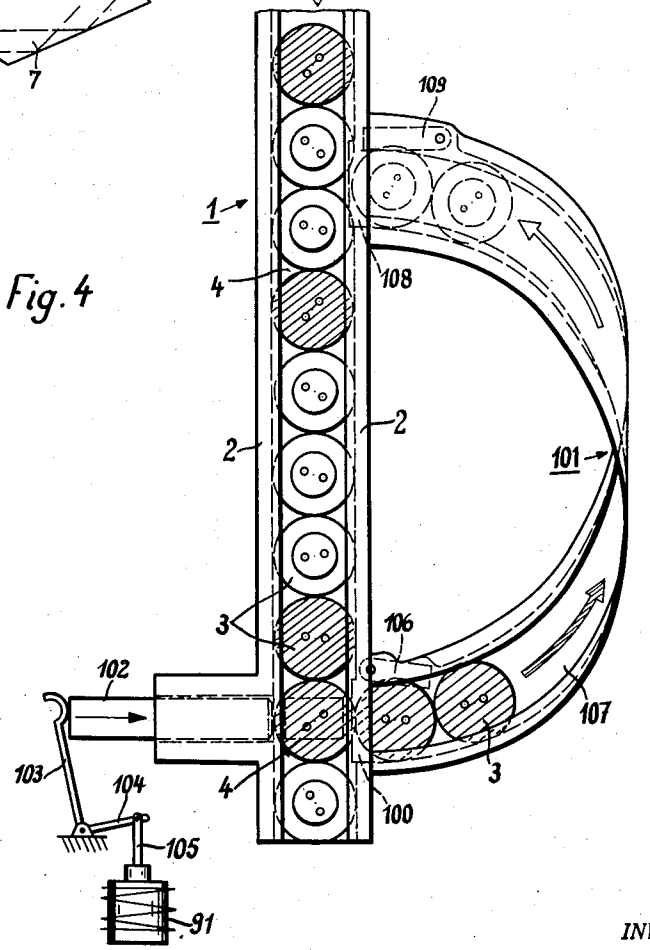


Fig. 4



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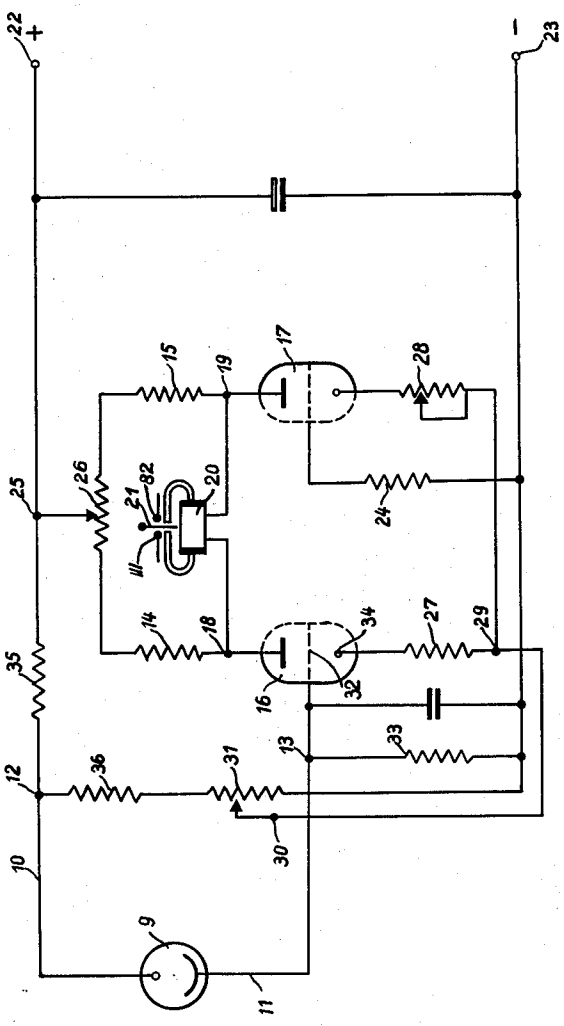


Fig. 2

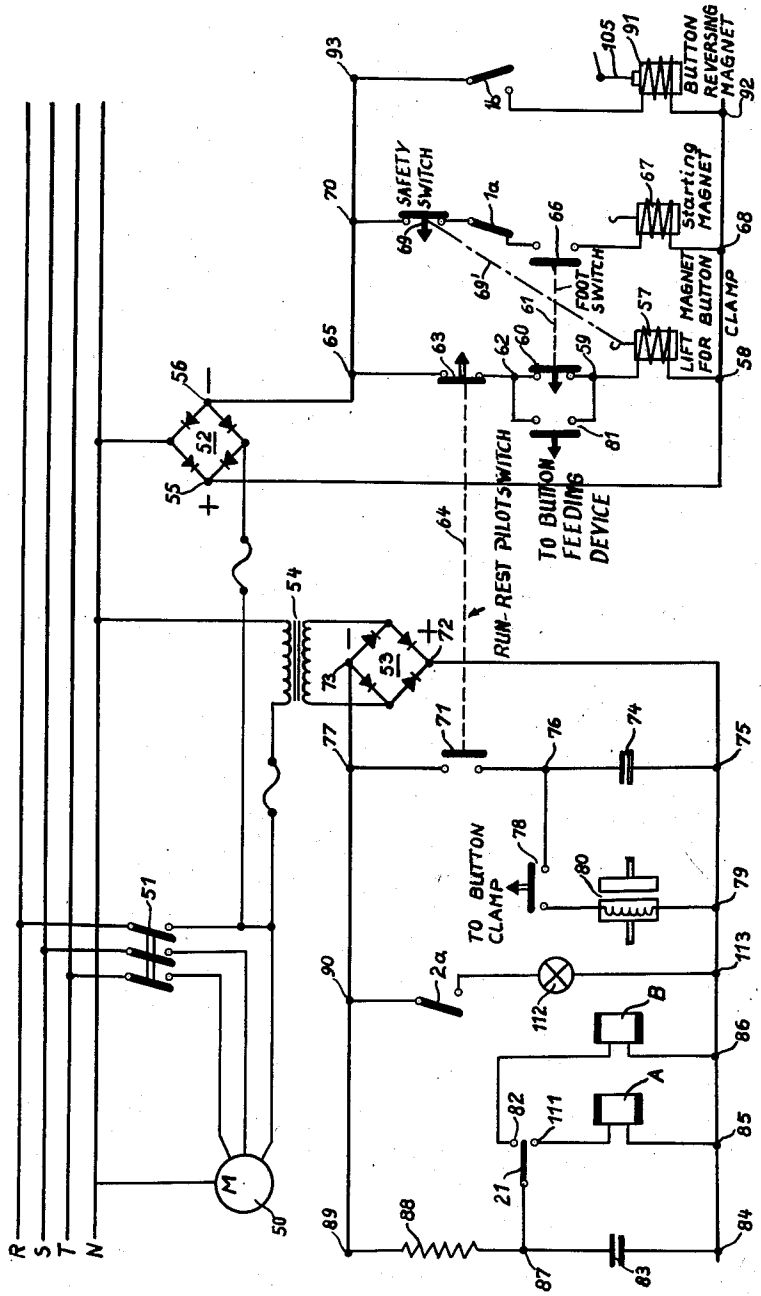
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BUTTON FEED CONTROL FOR SEWING MACHINES

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Fig. 3



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BUTTON FEED CONTROL FOR SEWING MACHINES

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6 Claims. (Cl. 112—113)

The present invention relates to button feeding mechanism for button sewing machines of the type comprising a feeding channel for passing or transporting an array of buttons for insertion into the button clamp of the work presser foot of a sewing machine, prior to the initiation of a button sewing operation.

It has already become known to provide button feeding mechanism for button sewing machines, wherein the buttons are introduced into a feeding channel from a storage bin or hopper through a rotary conveyor or the like and advanced or fed intermittently into the button clamp of the machine. In devices of this type, checking and/or control means are required in order to cause the buttons to be fed or inserted into the button clamp with a predetermined orientation, that is, with the correct side of the buttons facing in a desired (upward) direction. Button feeding mechanism of this type is disclosed and described, for instance, by U.S. Patent No. 2,505,468, entitled Button Feed Mechanism.

Such button checking mechanism has heretofore been designed primarily for use with buttons of the type having one flat or plane surface and an opposite curved or vaulted surface, whereby to enable the use of a feeler or the like mechanical scanning element for effecting a checking and/or aligning of the buttons, in such a manner as to cause all the buttons introduced or fed into the button clamp of the sewing machine to be properly aligned or to face in the proper or desired direction. While mechanical button checking and aligning devices of this type have been employed successfully in the past, their practical usefulness has been limited to one-sided or vaulted buttons and such devices would not, for instance, be suitable for the checking and/or alignment of buttons having parallel plane surfaces, such as the well known mother of pearl and the like buttons used in considerable quantities by the industry.

Accordingly, an important object of the present invention is the provision of a photoelectric checking or testing device for use in connection with automatic button feed mechanism for button sewing machines, being especially designed or suitable for use with buttons having plane upper and lower surfaces and exhibiting different surface characteristics or light reflectivity, in particular, buttons having a glossy upper surface of relatively high lustre and a more or less dull or mat lower surface, such as the well known mother of pearl or buttons consisting of a like material.

A more specific object of the invention is the provision of a photoelectric button checking or testing device of the above type, capable of discriminating between different optical surface characteristics of the upper and lower surfaces of the buttons being tested, especially, though not limitively, for use with buttons of the type having plane parallel surfaces.

Another object of the invention is the provision of a button checking or testing device of this type embodying improved means for automatically reversing the buttons

introduced in the wrong position into the button feeding channel connecting a storage container with the button clamp of a sewing machine, in such a manner as to automatically align the buttons in said channel to have a selected (glossy) surface facing in a desired (upper) direction.

Yet another object of the invention is the provision of improved means for use in connection with an automatic button checking and aligning device of the above type, to suspend the operativeness of the sewing machine in the absence of any buttons passing or being fed through the feeding channel of the device.

Another object of the invention is the provision of automatic button checking and reversing mechanism of the above type capable of preventing defective buttons having no or an insufficient number of holes or perforations from being fed or inserted into the button clamp of the sewing machine.

Still another object of the invention is the provision of automatic button checking and/or reversing mechanism for a button sewing machine which is both simple in design, as well as efficient in operation, and which can be used in conjunction with conventional button sewing machines.

The invention, as to its ancillary objects as well as novel aspects and advantages, will be better understood from the following detailed description, taken in reference to the accompanying drawings forming part of this specification and in which:

Fig. 1 is a schematic view of the optical scanning or testing device constructed in accordance with the principles of the invention, being operatively associated with a button feeding device, to produce varying electric control energy for properly and improperly oriented buttons, respectively, passing through said device;

Fig. 2 is a diagram of the photoelectric control circuit and polarized electrical relay as a control device, to produce different control functions by buttons of undesired orientation, on the one hand, and by defective buttons having no or an insufficient number of perforations, on the other hand;

Fig. 3 shows, by way of example, a complete circuit diagram for a button sewing machine equipped with automatic button feeding and reversing mechanism and including safety means and ancillary control devices in accordance with the invention; and

Fig. 4 is a schematic plan view showing the construction of the button reversing mechanism controlled by the output of the photoelectric checking device or button testing circuit in accordance with the invention.

Like reference characters denote like parts in the different views of the drawings.

With the foregoing objects in view, the invention, according to one of its aspects, involves generally the provision of a photoelectric scanning or button checking device arranged in cooperative relation to the button feeding mechanism or channel of a button sewing machine and serving to test or check the buttons being fed successively or intermittently to the button clamp of the machine, to produce varying electric output or control energy in dependence upon the varying characteristics or light reflectivity of the upper and lower surfaces, respectively, of the buttons being tested by said device. As an example, the invention is especially suitable for the checking of the well known mother of pearl or the like buttons having an upper plane surface of relatively higher luster or light reflectivity and having a lower plane and mat surface parallel to said first surface of relatively low light reflectivity, whereby to result in a substantial differential of the output currents of said photoelectric device.

The output of the photoelectric device or circuit may

serve to operate a warning signal or indicator, or preferably, to control a button ejecting or reversing device, in such a manner as to automatically align the buttons fed into the button clamp of the sewing machine with their correct (glossy) side pointing in a desired (upper) direction, as will become further apparent as the following description proceeds.

The button reversing device according to the invention may comprise essentially an auxiliary or reversing channel, being in the form of a relatively flat strip and shunting or by-passing a portion of the main button feeding channel connecting the storage device with the button clamp of the sewing machine. A suitable button ejecting device or mechanism being controlled by the output of the photoelectric device acts to insert an improperly oriented button into said auxiliary channel at a point proximal to the sewing machine or button clamp, in such a manner that the improperly oriented buttons will be passed through said auxiliary channel in the reverse direction and reinserted into said main channel at a point distal to or remote from the button clamp of the sewing machine. In order to effect a reversal of the buttons passed through the auxiliary channel and to re-insert the same into the main channel in proper alignment or orientation, the auxiliary channel is bent or twisted by a complete 180° angle, in the manner more clearly shown by the drawing and understood from the following description.

In order to discriminate between both improperly oriented buttons, on the one hand, as well as defective buttons having no or an insufficient number of holes or perforations, the reflected light or equivalent radiant energy scanning beam, after multiple deflection, such as by means of a reversing prism or the like, is passed in a direction axially of and through the perforations of the buttons, acting as scanning apertures, and impinged upon the light sensitive surface of a photoelectric cell or the like device sensitive to the radiant energy and arranged upon the side of the buttons opposite to the side being scanned or tested by said beam. In this manner, both the buttons facing the scanning source in the wrong position, as well as defective buttons will be ejected or by-passed through the auxiliary channel, whereby to prevent their insertion into the button or work clamp of the sewing machine.

Finally, the photoelectric device may be utilized as a safety means, to suspend the operativeness of and to prevent damage to the sewing machine in the absence of any buttons passed through the button feeding channel. For this purpose, the entire scanning beam, in the absence of a button being positioned in the aperture of the scanning device, is impinged upon the photoelectric device by the provision of suitable reflecting means, to produce a varying output current serving to operate a stop-motion or equivalent safety device of the sewing machine, as will be further described in the following.

Referring more particularly to Figs. 1 and 4 of the drawings, the numeral 1 indicates the rear wall of a button feeding channel further comprising a pair of bevelled guides 2, one of which may be displaceable relative to the other end between which are passed or fed a number of buttons 3 in a continuous chain or array from a suitable storage container to the button clamp of a sewing machine, as indicated by the vertical arrow in Fig. 4. In Fig. 1, the button 3 next to the lower or first button of Fig. 4 ready for insertion into the button clamp of the sewing machine, is shown in section and overlying a scanning aperture 4 arranged in the rear wall 1. A light beam 6 produced by a suitable light source 5 is impinged upon one face of the button 3, said beam forming an angle with the surface of the button, while the reflected beam is passed through a suitable optical reversing device, preferably a reversing prism 7 as shown in the drawing, in such a manner that the beam, upon multiple reflection by the prism, is passed in a direction substantially parallel to the axis of the buttons, to cause a fractional portion thereof to be transmitted through the holes or perforations 8 of the buttons and unto the light sensitive surface of a photoelectric device 9, shown in the form of a photoelectric discharge tube of the type well known in the art.

The output leads 10 and 11 of the photoelectric tube 9 are connected to a suitable biasing or operating voltage source, as indicated by terminals 22 and 23, Fig. 2. Furthermore, the leads 10 and 11 are connected to the terminals 12 and 13 of a Wheatstone bridge circuit being comprised of a pair of fixed resistors 14 and 15 and a pair of triode or the like amplifying tubes or devices 16 and 17. Connected between one pair of diagonal points 18 and 19 of the bridge circuit is a polarized relay 20 having a movable contact 21 (see also Fig. 3) operable to engage a pair of stationary contacts 82 and 111, upon unbalance of the bridge circuit in either sense or direction, respectively, from the normal or balanced position shown in the drawing.

In other words, the fixed resistors 14 and 15 and the amplifying tubes 16 and 17 constitute the branches of a conventional bridge circuit, wherein the relay 20 replaces the conventional galvanometer connected in one of the diagonal bridge circuits. Connected in the coordinated diagonal bridge circuit, that is, between terminals 22 and 23 is a suitable direct current operating source indicated by the plus and minus signs in the drawing, such as a battery, stabilized rectifier power supply or the like. The photoelectric tube 9 is connected in a known manner to displace the operating point or grid biasing voltage of the tube 16, to vary the internal impedance of the tube, whereas the internal impedance of the tube 17 is maintained constant by the provision of a fixed grid return resistor 24.

More specifically, a displacement of the operating point of the tube 16 and, in turn, of the internal impedance of the tube results in unbalance of the bridge circuit, in such a manner as to cause excitation of the relay 20 in either sense and closing of the contacts 82 and 111, respectively, depending upon the sense or direction of the unbalance current, in a manner readily understood. More specifically, the bridge circuit is energized by the direct current source 22, 23 through a circuit being traced as follows:

(I) Positive terminal 22, terminal 25, differential balancing resistor 26, branch circuits (*a*) including fixed resistor 14, tube 16, fixed resistor 27 and (*b*) including fixed resistor 15, tube 17, adjustable resistor 28, common terminal 29, terminal 30, balancing resistor 31 and back to the minus terminal 23 of the direct current source.

Resistors 27 and 28 are cathode biasing resistors determining the grid bias of the tubes 16 and 17, the bias of the former being fixed by the resistor 27 and the bias of tube 17 being adjustable by the variable resistor 28, for adjusting or balancing the bridge circuit in conjunction with the potentiometer resistor 31 and the differential adjusting resistor 26, in the manner to be described presently.

The variable potentiometer resistor 31 is connected to the source 22, 23 in series with a pair of fixed voltage divider resistors 35 and 36 and serves to apply a varying cathode voltage to the tube 16, in a manner readily understood. In this manner, it is possible to balance the bridge circuit, first by a relatively coarse adjustment by means of resistors 28 and 31 and subsequently by a fine control or adjustment by means of the differential resistor 26, to normally cause the armature 21 of the polarized relay 20 to be in its neutral or rest position, as shown in the drawing, for a predetermined intensity of the illumination or amount of radiant energy being impinged upon the photoelectric tube 9.

More specifically, the grid 32 of the tube 16 is normally biased to a definite potential determined, on the one hand, by the internal impedance of the phototube 9 and the fixed voltage divider resistors 33 and 35 connected in series therewith and energized by the source 22, 23. This results in a positive bias upon the grid 32 varying with the intensity of the illumination and increas-

ing in proportion to an increase of the illumination of the photoelectric tube.

In addition to the varying positive bias of the grid **32** provided by the phototube **9**, a negative grid bias is applied by the cathode biasing resistor **27**, said negative bias exceeding the positive bias produced by the phototube, to normally cause the tube to operate within its negative grid bias region. As a result, if the illumination of the phototube **9** is increased or the internal impedance of the tube decreased, the grid bias will become more positive, resulting in a reduction of the negative bias by the resistor **27** and, in turn, in a decrease of the internal impedance of the tube **16**. In the same manner, a decrease of the illumination causes an increase of the impedance of the tube **16**. As a result, the bridge circuit being adjusted or balanced for a predetermined or normal intensity or illumination of the phototube **9** becomes unbalanced in either direction from the balance condition, upon an increase or decrease of the illumination from its normal value, thus causing a response of the polarized relay **20** in either direction or closing of contacts **82** or **111**, respectively.

Fig. 3 illustrates a complete operating circuit of a button checking and control system for a button sewing machine embodying the principles of the invention. Item **50** indicates a three-phase driving motor being fed from a three-phase power line R, S, T having a neutral conductor N, through a main or power control switch **51**. Simultaneously with the closing of the switch **51**, a first rectifier **52** is connected directly and a second rectifier **53** is connected indirectly by way of a step-down transformer **54** to one phase of the power network. While the rectifiers **52** and **53** are shown in the drawings in the form of contact bridge rectifiers, they may be of any other suitable type known in the art, we will be understood. As a result, a D.C. voltage appearing at the output terminals **55**, **56** of the rectifier **52** causes the energization of a lift magnet or solenoid **57** of known construction which serves to operate the button clamp of the sewing machine from its normally lowered or work engaging position to a raised position, against the action of a return spring, in a manner well known to those skilled in the art. The exciting circuit for the clamp lift magnet or solenoid **57** is traced as follows:

(II) Positive terminal **55** of rectifier **52**, terminal **58**, lift magnet winding **57**, terminal **59**, movable contact of a foot switch **61**, terminal **62**, movable contact of a pilot switch **64**, terminal **65** and back to the negative terminal **56** of rectifier **52**.

Energization of the lift magnet **57** results in a raising of the button clamp of the button sewing machine against the action of the clamp return spring, in a manner well known and pointed out. After insertion of a work piece into the sewing machine, the foot switch **61** or the like is depressed or operated, resulting in an opening of the Circuit II and closing of the exciting circuit of a starting magnet or solenoid **67** of known construction, said circuit being traced as follows:

(III) Positive terminal **55** of rectifier **52**, terminal **58**, terminal **68**, starting magnet winding **67**, movable contact **66** of foot switch **61**, contact **1***a* of a relay A, safety switch **69**, terminal **70**, terminal **65**, and back to the negative terminal **56** of rectifier **52**.

The safety switch **69** is mechanically coupled with the clamp lifting magnet **57**, as indicated by the dot-dash line **69'** in the drawing, in such a manner that it will be opened during the raised position of the button clamp and closed in the normal or lowered position of the clamp, as shown in the drawing.

As a result of the operations described, the sewing machine is started by the operation of a suitable coupling device by the magnet or solenoid **67**, to establish driving connection between the machine and the continuously running driving motor **50**, in a manner well known and understood. The sewing machine automatically performs a button sewing operation or program. Immediately upon starting of the machine, the contact **63** of the pilot switch **64** is opened, said switch being connected in a known manner to an operative organ of the sewing machine (not shown). As an example, the switch **64** which may be connected with the coupling mechanism or any other operative parts of the machine, assuming the position shown in the drawing during the inoperative or rest condition of the sewing machine and being automatically operated to an open position to interrupt contact **63** and to close a further contact **71**, to be described presently. After the operation of the machine has been started, the foot switch **61** is released, whereby to interrupt the Circuit III, while maintaining open the Circuit II due to the interruption of the contact **63**.

Simultaneously with the opening of the contact **63** by the pilot switch **64**, the contact **71** closes a charging circuit of a capacitor **74** being connected to the output terminals of the rectifier **53** and traced as follows:

(IV) Positive terminal **72** of the rectifier **53**, terminal **75**, capacitor **74**, terminal **76**, switch contact **71**, terminal **77** and back to the negative terminal **73** of rectifier **53**.

As a result, the capacitor **74** is charged by the rectifier **53** during a button sewing operation of the machine. Upon completion of the button sewing operation, the machine is automatically stopped in a manner well known, resulting in an opening of the charging circuit **4** by opening of the contact **71** by the pilot switch **64**. At the same time the contact **63** of the switch **64** is again closed, whereby to re-energize the button lift magnet **57** through Circuit II and to result in a renewed lifting or raising of the button clamp of the machine. Upon completion of this operation, a further switch **78** being mechanically coupled with the button clamp is closed to result in a discharge of the capacitor **74** through a circuit traced as follows:

(V) Positive terminal of capacitor **74**, terminal **75**, terminal **79**, coupling magnet **80**, switch contact **78** and back to the negative terminal of the capacitor **74**.

The coupling magnet **80** or equivalent electrically operated actuating device serves to operate in a known manner the button feed mechanism, whereby to advance the buttons in the feeding channel and to introduce a new button into the button clamp of the sewing machine. During this operation of the button feeding device, a locking or safety switch **81** shunting the foot switch terminals **59** and **62** in the Circuit II is closed to short-circuit said terminals, thereby to prevent the operation of the foot switch **61** and, in turn, starting of the sewing machine, as well as to cause the button clamp to remain in its raised position during the button feed operation until the beginning of a new button sewing cycle.

After a new button has been introduced into the button clamp, the safety switch 81 is again opened by the button feeding mechanism having returned to its rest or inoperative position. As a result, a renewed operation or depression of the foot switch **61** causes the initiation of a new operating cycle as described hereinbefore.

The buttons **3** within the button feeding channel **1** are advanced by the button feeding mechanism by a distance equal to the diameter of one button, after the button at the extreme end of the channel has been fed or introduced into the button clamp, whereby the next following button is moved to a position overlying the scanning aperture **4**, Fig. 4, for testing or checking by the photoelectric device, in the manner described. If the light beam **6** impinges upon the upper or glossy side of the button **3** positioned in the scanning aperture, that is, if the button being scanned passes through the feeding channel **1** in the desired or proper orientation, the light beam upon reversal by the prism and passage through the perforation of the buttons will result in an illumination of the phototube **9** maintaining the bridge circuit in a balanced condition, as described, whereby, in turn, to cause the armature **21** of

the relay 20 to assume a neutral position between the contacts 82 and 111, a shown in the drawing.

On the other hand, if a button 3 during scanning by the light beam 6 is in the wroing or upside down position, the intensity of the reflected light beam will be weakened due to the reduced light reflectively of the button surface, in such a manner as to result in a reduction of the negative bias of the grid 32 of the amplifier tube 16, is the manner described hereinbefore, thus, resulting in a disturbance of the balance or equilibrium of the bridge circuit and, in turn, in a response of the relay 20. As an example, the connections and adjustment of the circuit may be such that in the case of a button being in the wrong position, that is, with the illumination of the phototube 9 being reduced, the relay 20 will respond to close its contact 82, Fig. 3, whereby to energize and operate a further relay B by a previously charged capacitor 83 through a circuit traced as follows:

(VI) Capacitor 83, terminal 84, terminal 85, terminal 86, relay winding B, contact 82, contact arm 21, terminal 87 and back to the capacitor 83.

The capacitor 83 is normally charged, that is, while the relay contact 21 is in its neutral position through a charging circuit traced as follows:

(VII) Positive terminal 72 of rectifier 53, terminal 75, terminal 79, terminal 86, terminal 85, terminal 84, capacitor 83, terminal 87, charging resistor 88, terminal 89, terminal 90, terminal 77 and back to the negative terminal 73 of the rectifier 53.

As a result, energization of relay B closes its contact 1*b*, whereby to establish an exciting circuit for a button reversing magnet or solenoid 91, being traced as follows:

(VIII) Positive terminal 55 of the rectifier 52, terminal 58, terminal 68, terminal 92, reversing magnet winding 91, contact 1*b*, terminal 93, terminal 70, terminal 65 and back to the negative terminal 56 of rectifier 52.

The solenoid 91 forms part of the button reversing mechanism shown in Fig. 4. Referring to the latter, the main feeding channel 1 is provided with an ingress opening 100 adjacent to one side of the scanning aperture 4 upon the opposite side of which is arranged a sliding member 102 connected with the armature of the magnet 91 through a suitable linkage or the like coupling mechanism 103, 104, 105. As a result, energization of the magnet or solenoid 91 will result in a displacement of the slide 102 in the direction shown by the arrow, whereby to eject and introduce a button 3 under test into the reversing device 101. The latter consists essentially of a strip-like auxiliary feeding channel 107 having its input connected to the opening 100 located proximal to the button clamp of the sewing machine and having its output connected to a further opening 108 of the main feeding channel 1 at a point distal to or remote from the button clamp of the machine. A resiliently mounted blocking lever 106 which is briefly deflected during the inserting operation of a button into the auxiliary channel 107, serves to engage and hold the inserted button in the position adjoining the opening 100, in the manner of a click-stop or the like arresting device.

As pointed out, the button reversing device is comprised essentially of a semi-circular guide or auxiliary channel 107 having its output connected to the opening 108 of the main feeding channel 1. Disposed adjacent to the latter opening is a further retaining lever 109 serving to arrest or fix the position of the button next to the opening 108, in a manner similar to the function of the lever 106. The guide or channel 107 is bent or twisted by a full 180° angle, whereby to result in a reversal of the buttons passed therethrough and being re-inserted into the main feeding channel after the auxiliary channel has been filled with a complete array of buttons, as will be understood. As a result, buttons having been originally introduced into the main channel in the wrong orientation will be automatically reversed, in such a manner as to cause buttons of a desired position or orientation only to be fed into the button clamp of the sewing machine.

More specifically, energization of the reversing solenoid 91 connected in the Circuit VIII will result in an improperly oriented button being ejected and inserted into the reversing channel by the slide 102 or equivalent ejecting mechanism, whereby to cause the next following button to be advanced to a position overlying the scanning aperture 4. If this button has a proper orientation, the balance of the bridge circuit will be maintained and the slide 102 remain in its rest or inoperative position. It is furthermore possible, according to an improved feature of the invention, to determine whether the buttons 3 introduced into the channel 1 are defective in having an improper number of perforations 8. Thus, if, in the case of a defective button, one of the perforations should be missing, this will result in a decrease of the amount of light impinged upon the photoelectric cell 9, whereby to initiate the same control operation by ejecting the defective buttons by the slide 102 or the like ejecting mechanism. The same would apply to defective buttons having no perforations.

Referring again to Fig. 1, there is further shown a mirror or reflector 110 arranged on the side of the channel 1 opposite to the light source 5, whereby in the absence of buttons passing through the feeding channel, the beam 6 traverses the aperture 4 in full strength and will be reflected by the mirror 110 unto the sensitive surface of the photoelectric cell 9. Since this results in an increase of the illumination of the photoelectric cell in respect to the normal or balance condition of the bridge circuit, the polarized relay 20 now closes its contact 111, Fig. 3, thus in turn closing the exciting circuit of a further relay A traced in the following:

(IX) Capacitor 83, terminal 84, terminal 85, relay A, contact 111, contact 21, terminal 87 and back to the capacitor 83.

Energization of the relay A results in the opening of the relay contact 1*a*, whereby to open the Circuit III and to prevent energization of the starting solenoid 67 by operation of the foot switch 61. The operativeness of the sewing machine is thereby suspended, as long as no buttons are fed through the channel 1. At the same time, a further contact 2*a* of the relay A closes the circuit of a pilot or indicator lamp 112 connected in a circuit traced as follows:

(X) Positive terminal 72 of rectifier 53, terminal 75, terminal 79, terminal 113, lamp 112, contact 2*a*, terminal 90, terminal 77 and back to the negative terminal 73 of the rectifier 53.

The relay A is so designed as to remain energized after the full discharge of the capacitor 83 through a holding circuit traced as follows:

(XI) Positive terminal 72 of rectifier 53, terminal 75, terminal 79, terminal 113, terminal 86, terminal 85, relay A, contact 111, contact 21, terminal 87, resistance 88, terminal 89, terminal 90, terminal 77 and back to the negative terminal 73 of rectifier 53.

As soon as renewed feeding of buttons is commenced, the beam 6 becomes again weakened, whereby the relays A and 20 are released, resulting in the re-establishment of the operativeness of the sewing machine and control device. This condition is indicated by the extinction of the lamp 112 by interruption of the contact 2*a* in the Circuit X.

The relay B is so designed as to be unable to maintain its excitation through resistance 83 during closing of the contact 82, after the capacitor 83 has been fully discharged. As a result, the reversing magnet 91 is energized during a short period or pulse only, in such a manner as to eject a single button only and to allow the remaining buttons to be advanced to the next following position by a distance equal to the diameter of the buttons, before initiating a renewed button testing operation.

In the foregoing, the invention has been described with reference to a specific illustrative device and circuit. It will be evident, however, that numerous modifications and variations, as well as the substitution of equivalent devices or circuits for those shown and described herein for illustration, may be made without departing from the broader scope and spirit of the invention as set forth in the appended claims. The specification and drawings are accordingly to be regarded in an illustrative rather than in a limiting sense.

We claim:

1. In button feeding mechanism for sewing machines including a feeding channel and means for feeding a consecutive series of perforated buttons having opposite faces of relatively high and relatively low reflectivity to said machine, a control system comprising a source arranged at one side of said channel to direct a radiant energy scanning beam upon and at an angle with the surface of said buttons, means to deflect said beam upon reflection by said buttons, to cause the deflected beam to pass substantially axially of and through the perforations of said buttons, and radiant energy sensitive means arranged at the opposite side of said channel to be impinged by said beam, to produce an output current having a predetermined value for buttons oriented with their surface of high reflectivity facing said source and having perforations passing a predetermined fraction of said beam and decreasing for buttons being oriented with their surface of low reflectivity facing said source and/or having perforations passing a fraction of said beam less than said predetermined fraction.

2. In button feeding mechanism for sewing machines including a feeding channel and means for feeding a consecutive series of perforated buttons having opposite faces of relatively high and relatively low light reflectivity to said machine, a control system comprising a light source arranged at one side of said channel with means to project a scanning light beam upon and at an angle with the surface of said buttons, means to deflect said beam upon reflection by said buttons, to cause the deflected beam to pass substantially axially of and through the perforations of said buttons, and a photoelectric device arranged at the opposite side of said channel to be impinged by said beam, to produce an output current having a predetermined value for buttons oriented with their surface of high reflectivity facing said source and having a predetermined number of perforations and decreasing for buttons being oriented with their surface of low reflectivity facing said source and/or having perforations less than said predetermined number.

3. A button feed control system as claimed in claim 2 including button reversing means comprised of an auxiliary channel having inlet means connected to said feeding channel at a point adjacent to the buttons being scanned by said source and having outlet means connected to said feeding channel at a point distal to said first point in respect to said machine, said auxiliary channel being bent by an angle of 180°, to effect a reversal of the buttons passing therethrough, and actuating means for said inlet means controlled by said current, to introduce buttons of predetermined orientation into said auxiliary channel.

4. A button feed control system as claimed in claim 3 including further reflecting means arranged at the side of said feeding channel opposite from said source, to directly impinge said beam upon said device in the absence of a button in said feeding channel, differential translating means connected to said photoelectric device being normally balanced for buttons passing through said feeding channel with their surface of high reflectivity facing said source and adapted to produce first and second output currents upon unbalance in different directions in the absence of a button in said feeding channel, on the one hand, and upon passage of a button through said channel with its surface of low reflectivity thereof facing said source and/or having insufficient perforations, on the other hand, a button reversing channel by-passing said feeding channel and having inlet means adjacent to the button in said feeding channel being scanned by said source, means to effect the stoppage of said machine, and further means to actuate said last means and said inlet means by said first and second output currents, respectively.

5. In button feeding mechanism for sewing machines having a feeding channel and means for intermittently feeding a consecutive series of perforated buttons having opposite faces of relatively high and relatively low reflectivity to said machine, a control system comprising a light source arranged at one side of said channel with means to project a scanning light beam upon and at an angle with the surface of said buttons at a predetermined point of said channel, a multiple reflecting device to deflect said beam upon reflection by said buttons, to cause the deflected beam to pass substantially axially of and through the perforations of said buttons, a photoelectric device arranged at the opposite side of said channel to be impinged by said beam, to produce an output current having a predetermined value for buttons having a first orientation with their surface of high reflectivity facing said source and having a predetermined number of perforations and decreasing for buttons having a second orientation with their surface of low reflectivity facing said source and/or having perforations less than said predetermined number, and a button reversing auxiliary channel having inlet means connected to said feeding channel at a point adjacent to said first point and having outlet means connected to said feeding channel at a point distal to said first point in respect to said machine, and actuating means for said inlet means controlled by said current, to introduce buttons of said second orientation into said reversing channel.

6. A button feed control system as claimed in claim 5 including further reflecting means arranged at the side of said feeding channel opposite from said source, to directly impinge said beam upon said device in the absence of a button in said feeding channel, to increase said output current beyond said predetermined value, a polarized relay connected to said device being balanced to a neutral position by said predetermined output current and including means to establish a first and a second control current, respectively, by an unbalance in one direction by the absence of a button in said feeding channel, on the one hand, and by an unbalance in the opposite direction by a button oriented according to said second orientation and/or a button with insufficient perforations, on the other hand, motion stoppage means for said machine, and further means to operate said last means and said actuating means by said first and second control currents, respectively.

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