July 10, 1962 H. W. SCHNEIDER ETAL 3,043,991

STOP MOTION DEVICE AND CONTROL CIRCUIT THEREFOR

Filed July 10, 1959

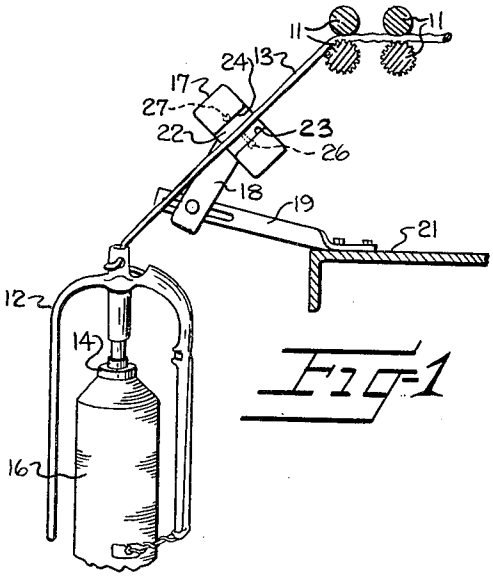

Fig-1

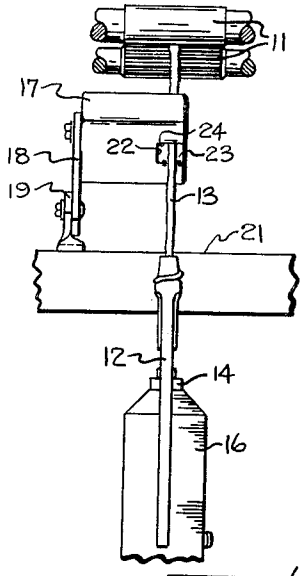

Fig-2

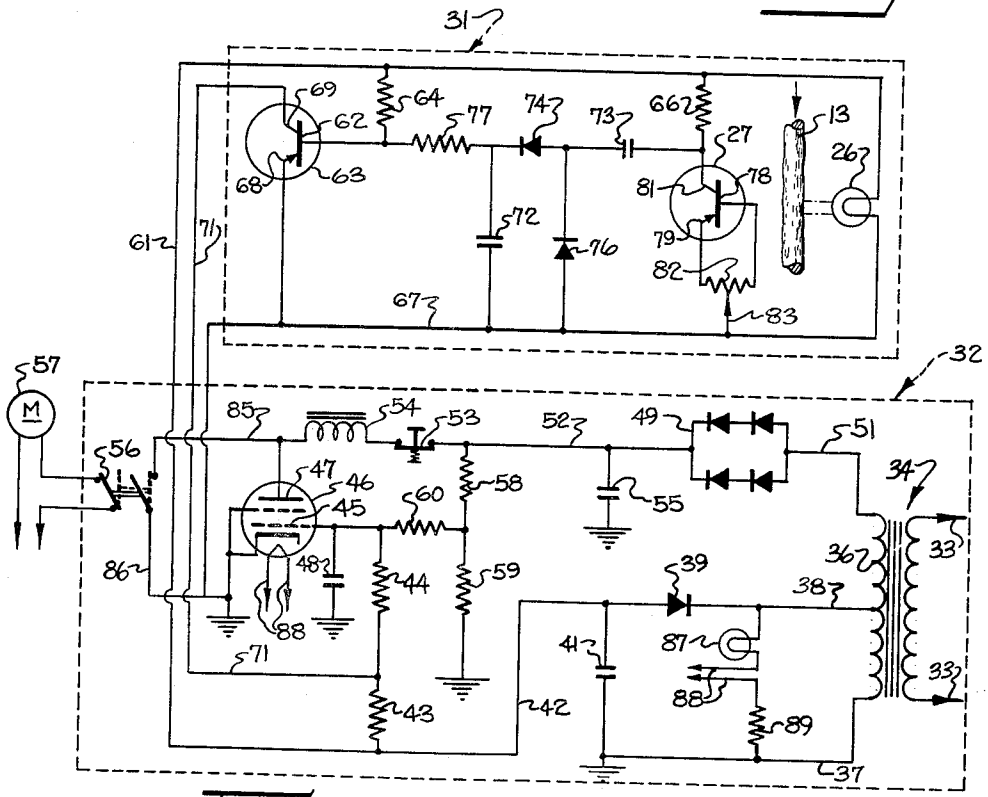

Fig-3

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STOP MOTION DEVICE AND CONTROL CIRCUIT THEREFOR

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This invention relates to textile apparatus and more particularly to a photoelectrically operated stop motion device and control circuit for detecting broken or slack strands of textile material in textile machinery such as roving frames, spinning frames, and the like.

In the production of textile material such as yarn and the like, many operations are required for the processing of textile fibers such as cotton, wool and the like into yarn. In many of these operations, the fibrous textile material is processed while in the form of a continuous strand utilizing various textile apparatus such as drafting frames, roving frames, spinning frames, and the like. These continuous strands of fibers processed in such apparatus are generally relatively thin, delicate, and easily broken. For instance, in the roving operation carried out on roving frames, a plurality of individual strands or sliver, each of which are composed of a loose assembly of textile fibers are drawn to a smaller diameter and twisted into roving so that alignment of the fibers is obtained and the strands are reduced to a diameter more suitable for subsequent operations such as spinning.

As is well known, textile machines such as roving frames are arranged to process a plurality of such strands simultaneously and in order to more economically utilize space, the strand processing stations or "spindles" are arranged in closely spaced relationship on each frame. For instance, it is not uncommon to provide for simultaneously processing up to 150 strands and more on a single roving frame depending, of course, on the type and size of the frame employed.

As a result of its thin, delicate state, the roving often breaks during the roving operation and if the roving frame is not stopped immediately, many difficulties are presented. One effect of a break in a strand of roving is the winding or "lapping" of a broken end of roving about one of the upper drafting rolls and thereby produce an increase in the spacing of the drafting rolls. This increase in roll spacing is generally carried over to adjacent rolls which are interconnected thereto so that the diameter of the adjacent strands of roving quickly increases. Subsequently, unless the frame is immediately stopped, the adjacent strands of roving become entangled with resultant damage to the rolls, flyer, and frame from the jamming of the roving frame and its associated parts due to the heavy accumulated mass of textile material. In another situation, the broken end of the roving is flipped about across adjacent strands of roving so that considerable damage to the frame will result as discussed above unless the roving frame is stopped immediately. This entanglement between roving strands on a frame may also occur when an end becomes excessively slack and therefore whips about to catch and becomes entangled with the adjacent strands of roving.

Various mechanisms have been proposed for detecting a break in strands of textile material such as roving and for shutting down the textile frame by deenergizing the frame drive means or motor when such a break is detected. These mechanisms are generally referred to as "stop motion devices" and are generally of the mechanical type in that they depend on contact with the strand being monitored in order to function. This rubbing contact with the strand or textile material common to the mechanical type of stop motion device is preferably avoided and the need has been long present for a suitable stop motion device which avoids such contact.

For instance, in one type of mechanical stop motion device, the roving advances through an eye in continuous contact therewith and as a result of its fragile nature, the roving is not unaffected by this rubbing contact. The likelihood of damage or alteration to the roving is even more pronounced in roving formed from synthetic material than in roving formed from natural fibers. Synthetic fibers readily slip relative to each other and therefore are easily disturbed by such contact with the eye of the stop motion device. In addition, the roving must be rethreaded through this eye after each break.

Furthermore, all moving mechanical devices are subject to wear through use and maintenance is always a problem. Even with proper maintenance, however, mechanically operated devices are always subject to malfuctioning and in an installation such as a textile mill or the like, the excessive dust and lint which accumulates on such mechanical stop motion devices materially increases the likelihood of malfunctioning and the need for more frequent maintenance.

Accordingly, a primary object of this invention is to provide a new and novel stop motion device and control circuit for textile machinery arranged to process strands of textile material which responds instantly and without fail to initiate a shutdown of the machine upon the breaking or slackening of a strand.

A further object of the invention is to provide a new and novel stop motion device and control circuit for textile apparatus which utilizes a photoelectric strand scanning or monitoring arrangement for detecting and signaling broken or slack strands of textile material and which eliminates rubbing contact with the strand.

Another object of the invention is to provide a new and novel stop motion device and control circuit for initiating an interruption in the advance of a strand of textile material such as roving upon the breaking or slackening of the roving and which is provided with timing means for delaying the initiating action until the lapse of a predetermined interval of time.

Still another object of the invention is to provide a new and novel stop motion device for textile apparatus which is inexpensive to manufacture, small and compact so as to permit easy installation adjacent a strand of textile material on presently existing textile frames, which is capable of highly reliable, prolonged use without breakdown and which results in increased production with an attendant reduction in manufacturing costs.

A still further object of the invention is to provide a new and novel control circuit for a stop motion device employed on textile apparatus which utilizes a minimum number of readily available electrical components of the type which do not require critical adjustment and in which the components may be readily miniaturized so as to permit compact assembly.

Still another object of the invention is to provide a new and novel control circuit for an electrically operated stop motion device which quickly deenergizes the driving means in a textile frame used to process a plurality of strands of textile material upon the occurrence of a break or slack in any one of the strands.

Another object of the invention is to provide a new and novel method of detecting a broken or slackened condition in advancing strands of textile material and instantly interrupting the advance of such strands.

Briefly, the objects of the invention and other related objects are accomplished by providing a housing in which is located a portion of the control circuit of the invention. The housing is small and compact so as to be readily mounted on a textile frame adjacent a strand

of textile material such as roving and is provided with a slot through which the textile material is continuously advanced by any suitable means on the textile frame. Photoelectric control means are associated with the slot which scans the strand of textile material to signal the absence of the strand from a predetermined zone in the slot resulting from a break or a slackened condition in the strand and to interrupt the advance of the strand. In order to interrupt the advance of the strand, the control circuit of the invention contains a relay device for performing a control function such as the deenergizing of the drive motor of the textile frame. Means are provided in the circuit for producing a control voltage which inoperatively conditions the relay device. The circuit also includes an electron discharge which when conductive operatively conditions the relay device so that the control function is performed. The photoelectric control means are included in the circuit and cut-off the electron discharge device during normal advance of the strand in the slot zone. When the strand or roving is absent from the zone in the slot, the photoelectric control means permits the electron discharge device to conduct and the control voltage is increased sufficiently to permit the relay device to be operatively conditioned and the advance of the broken strand is interrupted.

Some of the objects of the invention having been stated, other objects will appear as the description proceeds when taken in connection with the accompanying drawings, in which—

FIGURE 1 is a side view of a portion of a textile frame illustrating the mounting of a stop motion device constructed in accordance with the invention;

FIGURE 2 is a front view of the apparatus of FIGURE 1; and

FIGURE 3 is a schematic wiring diagram of a control circuit in accordance with the invention utilized in the stop motion device of FIGURES 1, 2 and illustrating by means of dotted lines the division of the control circuit into two portions.

Referring to the drawings and to FIGURE 1 in particular, there is shown a portion of a textile apparatus with which a stop motion device constructed in accordance with the invention is incorporated. The particular textile apparatus with which this invention is incorporated is a roving frame of any well known type which is arranged to process a plurality of strands or ends of sliver into roving.

As is well known, a roving frame is provided with two or more pairs of drafting rolls 11 between which a strand of textile fibers such as a sliver is drawn for fiber alignment and reduction in strand diameter. This strand of textile material emerging from the front pair of rolls 11 advances into a rotating flyer 12 which twists the drafted strand into roving 13 and winds the roving onto a holder or bobbin 14 to form a roving package 16.

As has been explained above, the roving 13 is still an elongated bundle of relatively short textile fibers with relatively little twist and frequently breaks or goes slack at some point between the drafting rolls 11 and flyer 12. This breaking or slackening disrupts the roving operation and produces doubling with adjacent ends of roving to cause damage to the rolls, flyers and frame unless the frame is quickly stopped as explained above. Means have been provided therefore with this invention for electrically monitoring or scanning each strand of roving 13 without contacting the roving to immediately shutdown the frame such as by deenergizing its drive motor when a break or slackened condition in the roving occurs.

More specifically, the stop motion device of the invention comprises a housing 17 adjustably positioned in any suitable manner such as by brackets 18, 19 on a rigid member 21 of a roving frame. The housing 17 is arranged to contain a portion of the control circuit of the invention (FIGURE 3) and may be adjustably positioned so that it may properly monitor a single strand of roving 13 as it is advanced.

The housing 17 is provided with a recess or slot 22, preferably substantially U-shaped which extends across the housing at one end so as to accommodate the roving 13 as shown in FIGURES 1, 2. Although the housing 17 may be mounted in any suitable position, it is preferably mounted, as shown, in a position wherein the slot 22 opens laterally across the path of the advancing roving 13. In this position of the housing, the substantially parallel side walls 23, 24 of the slot 22 prevent the roving from being moved out of the slot by the oscillations of the roving which occur in a substantially vertical direction as the roving advances toward the flyer 12.

In order to sense the presence of yarn in the slot 22, photoelectric control means are associated with the slot 22 for determining the presence of the roving 13 within a predetermined zone in the slot. More specifically, the slot side wall 23 contains a light source or lamp 26 and slot side wall 24, a photoelectric control device or light sensitive cell 27 which is responsive to the light beam emanating from the light source 26. The light source 26 therefore projects a light beam which defines a predetermined strand control zone within the slot 22 so that if the roving breaks or goes slack, the control circuit acts to perform a control function such as deenergizing the drive motor of the roving frame as will be explained hereinafter.

Referring now to FIGURE 3, there is shown a control circuit constructed in accordance with the invention which is incorporated within the stop motion device of the invention. The circuit of FIGURE 3 has been divided into two portions each shown enclosed within dotted lines and designated broadly by the numerals 31, 32.

The portion of the circuit which will hereinafter be referred to as the "detector unit" and which is identified by the numeral 31 is that portion of the circuit which is preferably positioned within the housing 17 and includes the light source 26 and the photoelectric control device 27. The portion of the circuit hereinafter referred to as the "power and relay unit" and which is shown within the dotted lines 32 is preferably connected to a plurality of the detector units 31. One detector unit 31 is used for each strand of roving 13 being processed on the frame and therefore a plurality of such detecting units 31 are arranged in parallel for connection to a single power and relay unit 32.

The power and relay unit 32 is connected to the suitable source of power (not shown) by means of conductors 33 connected to the primary winding of a transformer designated generally by the numeral 34. The transformer 34 contains a secondary winding 36 grounded at one end by means of conductor 37 and having a tap 38 associated therewith for producing a control voltage.

This control voltage is produced by rectifying the A.C. voltage obtained from the transformer secondary tap 38 in a rectifier 39 having a filter capacitor 41 associated therewith. This control voltage is then applied by means of conductor 42 and serially connected resistors 43, 44 to a control electrode or grid 45 of an electron discharge device 46 employed as a relay device for initiating the performance of a control function. In the specific embodiment illustrated the relay device 46 comprises a gas-filled electron tube or thyratron having an anode or plate 47. A capacitor 48 one side of which is grounded is preferably connected also to the control electrode 45.

In practice, it has been found that a control voltage of approximately —8 volts D.C. is satisfactory. For a purpose to be explained hereinafter, this D.C. control voltage will contain a small A.C. component or ripple due to the presence of hum and a filter choke was therefore left out purposely.

In order to provide a source of power for the thyratron 46, a rectifier 49 is connected by means of conductor 51 to the other end of the transformer secondary coil 36. The rectifier 49 therefore provides a source of positive

D.C. voltage and has its load side connected by means of conductor 52 through a manual push button switch 53 and a relay coil 54 to the thyratron plate 47. A filter capacitor 55 is preferably also connected to the load side of the rectifier 49 for reducing the ripple in voltage. A switch 56 is associated with the relay coil 54 and is arranged to be moved thereby between the solid and dotted line positions of FIGURE 3.

It can be seen that in the solid line position of FIGURE 3, switch 56 is arranged to connect a source of power (not shown) to a drive motor 57 employed as the driving means for the roving frame.

The negative D.C. control voltage from rectifier 39 which is applied to the thyratron grid 45 is of a value to normally maintain the thyratron 46 non-conductive as the drop in the control voltage across resistors 43, 44 is negligible due to the small current flow. If desired, a positive bias voltage is also applied to the thyratron grid 45 through a voltage divider network comprising resistors 58, 59, 60 which is overcome by the negative control voltage when the thyratron is cut-off.

In order to interconnect the power and relay unit 32 with the detector units 31, conductor 61 is connected to the junction of conductor 42 and resistor 43 and applies the negative control voltage to the base 62 of an electron discharge device or transistor 63 through a resistor 64. The conductor 61 is also connected to one side of a resistor 66 and to one side of the light source 26, the other side of which is grounded by means of ground conductor 67.

The transistor 63 contains an emitter 68 connected to the ground conductor 67 and a collector 69 connected by means of conductor 71 to the junction of resistors 43, 44. The transistor 63 is of the type which will conduct when its base 62 has a negative voltage applied thereto and conversely will be cut-off when the negative base voltage is removed or reduced to a predetermined level.

The photoelectric control means of the circuit is arranged to control the actuation of the transistor 63 and consequently the value of the control voltage applied to the base 62 of transistor 63. More specifically, the other side of resistor 66 is connected to one side of the photoelectric control device 27 which in the specific embodiment illustrated comprises a phototransistor and to the base 62 of transistor 63 through a voltage doubling circuit comprising a pair of capacitors 72, 73 and a pair of rectifiers or diodes 74, 76 and a resistor 77. The voltage doubling circuit is arranged in the conventional manner, as shown, with one side of capacitor 72 and diode 76 connected to the ground conductor 67. This voltage doubling circuit will, of course, not pass the D.C. component of the control voltage but rectifies any A.C. voltage fed thereto as well as increasing its magnitude and reversing its polarity so that a positive D.C. voltage will be applied to the transistor base 62. As will be explained hereinafter, this A.C. voltage applied to the voltage doubling circuit may be either the A.C. component of the negative D.C. control voltage or it may be derived from fluctuations in the current flowing through the phototransistor 27.

In the specific embodiment illustrated, the phototransistor 27 is provided with a base 78, an emitter 79 and a collector 81 which is connected to the junction of capacitor 73 and resistor 66. A potentiometer 82 is connected across the base 78 and emitter 79 of the phototransistor and is provided with a movable tap 83 connected to the ground conductor 67. It should be understood that the sensitivity of the phototransistor can be adjusted by means of the movable tap 83 associated with potentiometer 82. The phototransistor 27 is of the type which is cut-off in the absence of light on its base 78 i.e. when a strand of textile material is present between the light source 26 and the phototransistor base 78 in a predetermined zone in the housing slot 22 so as to interrupt the light beam emanating from the light source 26.

In the operation of the control circuit of the invention, the presence of a strand in the predetermined zone in the housing slot 22 (FIGURE 1) interrupts the light beam emanating from the light source 26 and the phototransistor base 78 is substantially dark so that the phototransistor does not conduct to any appreciable degree.

In most instances, the irregularities in the diameter of the strand and/or the oscillations of the strand as it advances produces a small varying current flow through the phototransistor 27 which is sufficient to feed an A.C. voltage into the voltage doubling circuit which is rectified and magnified as explained above. Even if the strand is very even and moves along a fixed path without oscillations, the high resistance of the phototransistor permits the A.C. component of the D.C. control voltage to be applied to the voltage doubling circuit in the detector unit 31. Thus, when the strand is advancing properly a positive D.C. voltage is always applied to the base 62 of transistor 63 in opposition to the negative voltage being simultaneously applied to the transistor base 62 through resistor 64. The values of the electrical components and of the applied voltages have been selected so that when the negative control voltage is reduced to a predetermined level or eliminated by the positive voltage produced by the voltage doubling circuit, the transistor 63 is cut-off and no current flows in conductor 71. The control voltage applied to the thyratron grid 45 through resistors 43, 44 is thus of sufficient magnitude to prevent the thyratron from igniting as explained above.

When the strand of roving leaves the predetermined zone in the housing slot 22 as a result of a break or slackened condition in the strand, the light beam from light source 26 falls on the phototransistor base 78 and the phototransistor conducts. When the phototransistor 27 conducts a large current flows through the resistor 66 and the phototransistor so that an A.C. voltage is no longer applied to the voltage doubling circuit and the base 62 of transistor 63 has applied thereto only the negative D.C. control voltage through the resistor 64.

When its base goes negative, transistor 63 conducts and a large current flows through conductor 71. As a result of this current flow, a substantial voltage drop occurs across the resistor 43 in the power and relay unit 32 to thereby increase the voltage of the thyratron grid 45 to a level whereat the thyratron 46 will conduct. It has been found in practice, that where a D.C. control voltage of −8 volts has been employed and resistor 43 has a value of approximately 4700 ohms, a voltage drop of approximately four (4) volts across resistor 43 is sufficient to ignite the thyratron. The voltage divider circuit comprising resistors 58, 59 and 60 applies a small positive voltage continuously to the thyratron grid 45 as has been explained above to insure that ignition of the thyratron will take place when the voltage applied to the thyratron grid is increased.

It is thus seen that, when light of sufficient intensity impinges upon phototransistor 27 to cause transistor 63 to conduct, the control voltage on grid 45 is increased so that grid 45 is less negative and sufficiently increases the flow of current between the cathode and the plate 47 to cause the thyratron 46 to conduct. The relay coil 54 is then energized and actuated so that, under its attractive force, the switch or contactor 56 is moved from the solid line to the dotted line position of FIGURE 3, opening the circuit to the drive motor 57 of the roving frame and halting the advance of the roving. As can be seen, when the contactor 56 moves to the dotted line position of FIGURE 3, one side of the coil 54 is connected to ground through conductors 85, 86 so as to keep the coil 54 energized even though the thyratron 46 may be extinguished.

In order to deenergize the thyratron 46 and permit the contactor 56 to return to the solid line position of FIGURE 3 wherein the roving frame drive motor 57 is energized, the push button switch 53 is depressed to open

the circuit from the rectifier 49 and thereby remove the voltage from the thyratron plate 47. When the push button 53 returns to its normally closed position, the above described strand monitoring operation of the stop motion device is resumed.

A signal light 87 as shown in FIGURE 3 is preferably employed for indicating the connection of the stop motion device to a source of power. In the circuit of FIGURE 3, the signal light 87 is connected at one side to conductor 38 and at its other side through the thyratron filament conductors 88 and a resistor 89 to the ground conductor 37.

The time constant for circuit operation i.e. the rate at which the positive D.C. voltage produced by the voltage doubling circuit drops or falls off after the phototransistor conducts, is determined by the values of condenser 72 and resistors 64, 77. The delay therefore between the detection of a break or slack condition in the roving and the conducting of transistor 63 to initiate interruption of the roving advance may therefore be readily determined by the selection of appropriate values for these three components. It has been found in practice that a delay of approximately three seconds gives satisfactory operation and such delay is preferably not reduced substantially below this three second time interval.

It can be seen that there has been provided with this invention an electrically operated stop motion device for textile machinery such as a roving frame in which a strand of textile material or roving may be advanced while being monitored or scanned completely free from contact with any mechanical device. By the use of a photoelectric strand scanning device, a break or slack condition in the roving may be immediately detected and through the novel control circuit employed with the stop motion device the roving frame is instantly shut down to halt the advance of the roving and prevent damage to the roving frame. The stop motion device of the invention may be employed on any type of textile machinery and will monitor any size strand of textile material within a wide range. The problems heretofore encountered with the use of mechanical type of stop motion device such as mechanical failure, the need for periodic maintenance and replacement of parts, and the relatively short life of the working parts are no longer of any concern and the device of the invention may be manufactured inexpensively using readily available components.

Another outstanding feature of the invention is the ease with which the stop motion device may be installed on conventional textile machinery in a minimum of space so that presently existing units may be readily adapted for use with the stop motion device of the invention.

In the drawings and specification there has been set forth a preferred embodiment of the invention and, although specific terms are employed, they are used in a generic and descriptive sense only and not for purposes of limitation, the scope of the invention being defined in the claims.

We claim:

1. An electrical control circuit for a stop motion device comprising, in combination, a gas filled electron tube having a control electrode for initating an interruption in the advance of a strand of textile material, means for producing a control voltage, means for applying said control voltage to said control electrode and preventing ignition of said electron tube, an electron discharge device arranged to conduct and raise the control voltage applied to said control electrode whereby said electron tube is ignited, means for applying said control voltage to said electron discharge device and biasing said electron discharge device non-conductive, photoelectric control means in said control circuit responsive to the presence of an advancing strand of textile material in a predetermined zone for developing a voltage opposing the control voltage applied to said electron discharge device and thereby reducing the voltage in said electrode to prevent ignition of said electron tube, said photoelectric control means being arranged so that the absence of said strand from said predetermined zone causes said photoelectric control means to conduct and thereby eliminate said opposing voltage to permit said electron discharge device to conduct under the biasing of said control voltage and thereby to ignite said tube.

2. An electrical control circuit for a stop motion device in accordance with claim 1 wherein said control voltage is applied to said control electrode through an impedance and wherein said electron discharge device is connected between said impedance and said control electrode to increase the voltage drop across said impedance when said electron discharge device conducts.

3. An electrical control circuit for a stop motion device comprising, in combination, a gas filled electron tube having a control electrode, means connected to said electron tube for initiating an interruption in the advance of a strand of textile material when said electron tube is conductive, means for producing a control voltage having an A.C. component, means including an impedance for applying said control voltage to said control electrode for preventing ignition of said electron tube, a transistor having its collector connected between said impedance and said control electrode whereby a current flow in said transistor produces a voltage drop in said control voltage across said impedance and permits said electron tube to ignite, means for applying said control voltage to the base of said transistor to produce a current flow in said transistor, means for rectifying the A.C. component of said control voltage to produce an opposing voltage of opposite polarity from the control voltage applied to said transistor base and combined therewith to maintain said transistor in a non-conductive condition, a phototransistor, a light source operatively associated with said phototransistor for defining a strand control zone, said phototransistor being arranged to produce a second A.C. voltage from the fluctuations in the current flow through said phototransistor produced by the irregularities in the strand diameter and oscillations of said strand advancing through said strand control zone, said second A.C. voltage being also rectified by said rectifying means together with said control voltage A.C. component and applied to said transistor base, said phototransistor being arranged to conduct in the absence of said strand from said strand control zone and eliminate said A.C. voltage to permit said transistor to conduct and produce ignition of said gas filled electron tube.

4. An electrical control circuit for a stop motion device comprising, in combination, an electrically operated relay device for performing a control function, an electron discharge device for controlling the actuation of said relay device and arranged to cause actuation of said relay device when conductive, means for producing a control voltage for inoperatively conditioning said relay device and for operatively conditioning said electron discharge device, means including photoelectric control means in said control circuit responsive to the presence of an advancing strand of textile material in a predetermined zone for producing a voltage in opposition to the control voltage applied to said electron discharge device to render it non-conductive, said photoelectric control means being arranged to respond to the absence of said strand from said predetermined zone to bypass said opposing voltage and permit said control voltage to operatively condition said electron discharge device and cause it to conduct, and means responsive to the flow of current in said electron discharge device for changing said control voltage applied to said relay device whereby said relay device is actuated to perform said control function.

5. An electrical control circuit in accordance with claim 4 including time delay means comprising an R.C. circuit associated with said photoelectric control means for providing a timed interval between the response of said

photoelectric control means to the absence of said advancing strand of textile material and the operative conditioning of said electron discharge device by said control voltage.

6. An electrical control circuit for a stop motion device comprising, in combination, an electrically operated relay device for performing a control function, an electron discharge device for controlling the actuation of said relay device, means for producing a predetermined control voltage for operatively conditioning said electron discharge device and said relay device, and means including photoelectric control means in said control circuit and being responsive to the presence of an advancing strand of textile material in a predetermined zone, said photoelectric control means including means for providing a source of A.C. voltage during the presence of said strand in said predetermined zone and means for rectifying said A.C. voltage to provide a D.C. voltage of opposite polarity from said control voltage for opposing the control voltage applied to said electron discharge device for sufficiently reducing the control voltage applied to said electron discharge device to render said relay device inactive whereby absence of said strand from said predetermined zone permits an increase in said control voltage to thereby operatively condition said electron discharge device and actuate said relay device to thereby perform said control function.

7. An electrical control circuit for a stop motion device in accordance with claim 6 wherein said electron discharge device includes a transistor having a base, means for applying said control voltage and said D.C. voltage to said base, and wherein said photoelectric control means includes a phototransistor connected to said source of A.C. voltage, said phototransistor being arranged to conduct when said strand is absent from said predetermined zone to eliminate said D.C. voltage from said base and permit said transistor to conduct.

8. An electrical control circuit in accordance with claim 6 wherein said rectifying means include a voltage doubling circuit.

9. An electrical control circuit in accordance with claim 6 wherein the irregularities in the diameter of said strand and normal oscillations of said strand in said predetermined zone cause said A.C. voltage.

10. An electrical control circuit for a stop motion device in accordance with claim 6 wherein said control voltage contains an A.C. component to provide a source of A.C. voltage.

11. An electrical control circuit for a stop motion device comprising, in combination, an electron tube having a control grid, means connected to said electron tube for initiating an interruption in the advance of a strand of textile material when said electron tube is conductive, means for producing a control voltage having an A.C. component, means for applying said control voltage to said grid for preventing ignition of said electron tube, a transistor having its collector connected to said control grid and being so arranged that a current flow in said transistor causes a voltage drop in said control voltage and permits said electron tube to ignite, means for applying said control voltage to the base of said transistor to produce a current flow in said transistor, means for rectifying the A.C. component of said control voltage to produce an opposing voltage of opposite polarity from the control voltage applied to said transistor base and combined therewith to maintain said transistor in a non-conductive condition, a phototransistor, a light source operatively associated with said phototransistor for defining a strand control zone, said phototransistor being arranged to produce a second A.C. voltage from the fluctuations in the current flow through said phototransistor produced by the irregularities in the strand diameter and oscillations of said strand advancing through said strand control zone, said second A.C. voltage being also rectified by said rectifying means together with said control voltage A.C. component and applied to said transistor base, said phototransistor being arranged to conduct in the absence of said strand from said strand control zone and eliminate said A.C. voltage to permit said transistor to conduct and produce ignition of said electron tube.

12. An electrical control circuit for a stop motion device comprising, in combination, an electron tube having a control grid, means connected to said electron tube for initiating an interruption in the advance of a strand of textile material when said electron tube is conductive, means for producing a control voltage, means for applying said control voltage to said control grid while preventing ignition of said electron tube, means for producing an opposing voltage of opposite polarity from the control voltage and being arranged in series with said means for producing said control voltage, said last-named means including a rectifier and a photoelectric device, a light source operatively associated with said photoelectric device for defining a strand control zone, said photoelectric device being arranged to permit said rectifier and rectify said opposing voltage to maintain a negative bias on said control grid while said strand is interrupting light from said source to said photoelectric device whereby, in the absence of said strand from said strand control zone, said opposing voltage of opposite polarity is eliminated to permit an increase in the voltage in said control grid to cause ignition of said electron tube for initiating an interruption in the advance of the strand.

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UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 3,043,991 July 10, 1962

Henri W. Schneider et al.

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 10, line 40, for "and" read -- to --.

Signed and sealed this 5th day of March 1963.

(SEAL)
Attest:

ESTON G. JOHNSON
Attesting Officer

DAVID L. LADD
Commissioner of Patents