Oct. 11, 1960 E. G. SHAFFSTALL 2,955,703

MAT DETECTOR FOR SLUG LINECASTING MACHINES

Filed Feb. 17, 1958

3 Sheets-Sheet 1

FIG. 1

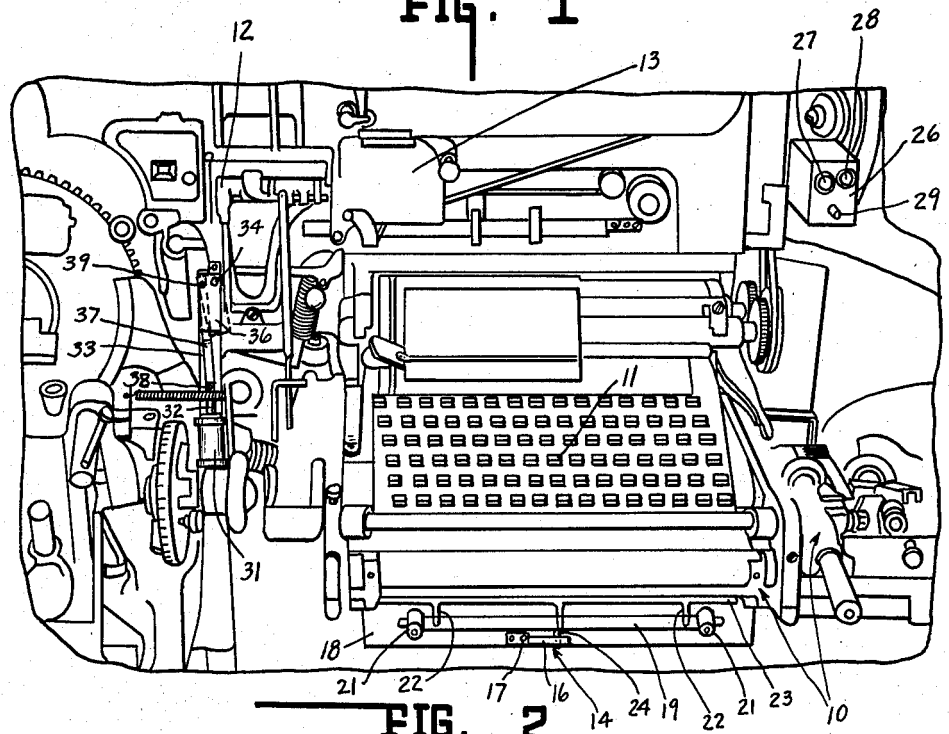

FIG. 2

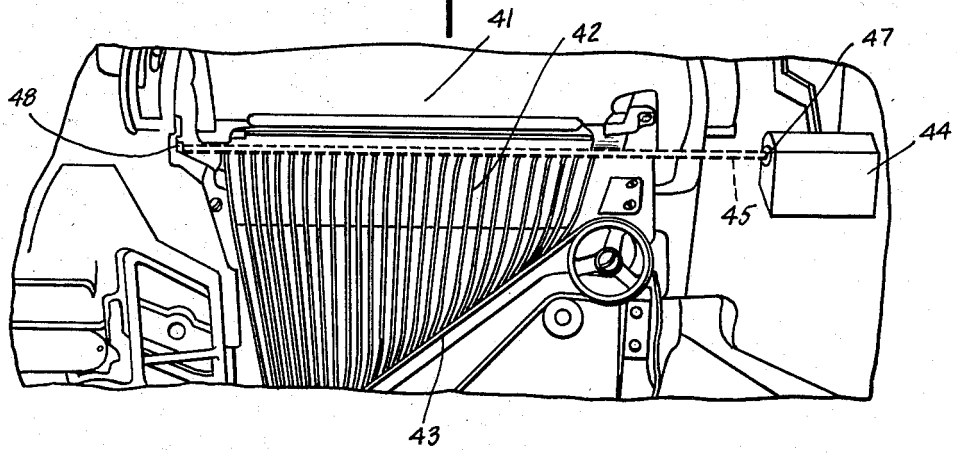

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FIG. 3

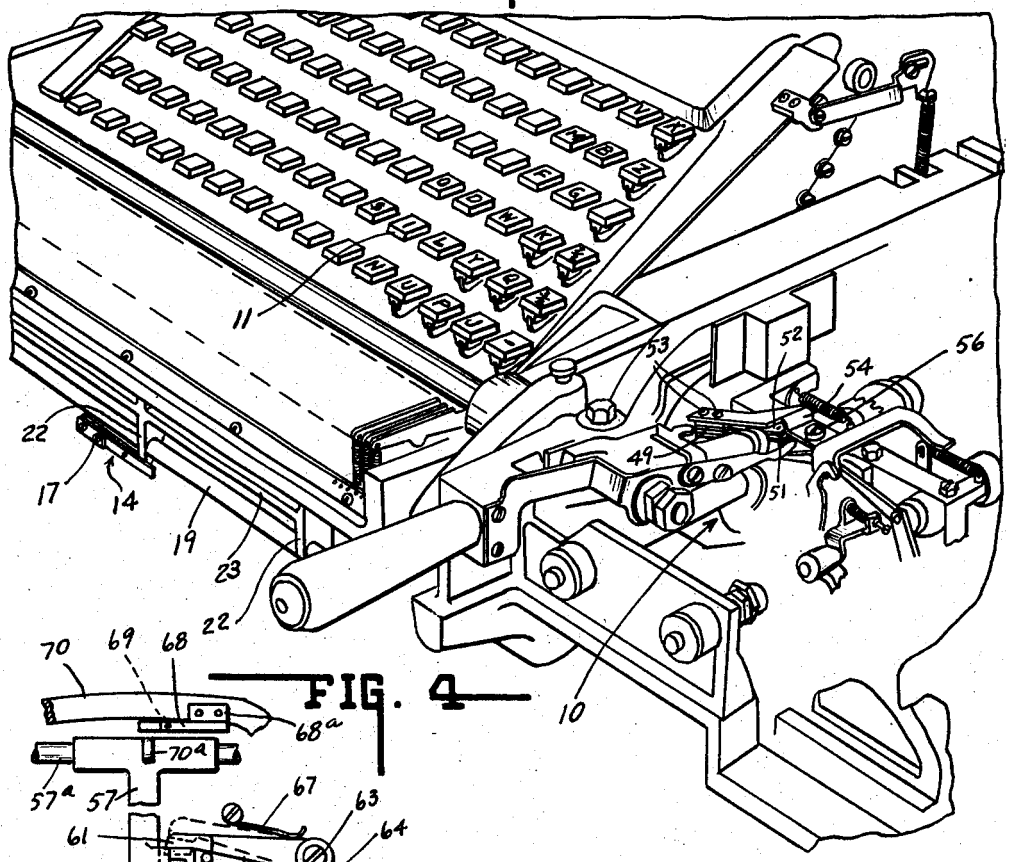

FIG. 4

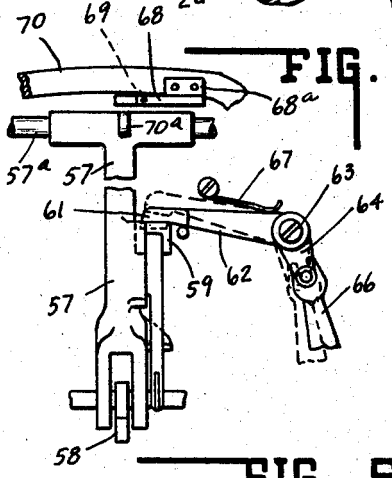

FIG. 5

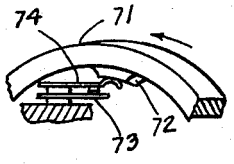

FIG. 6

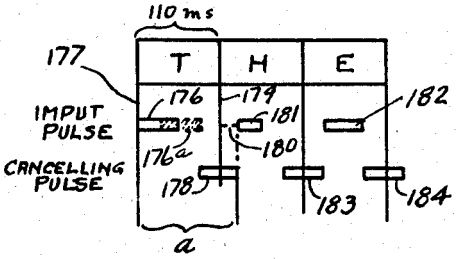

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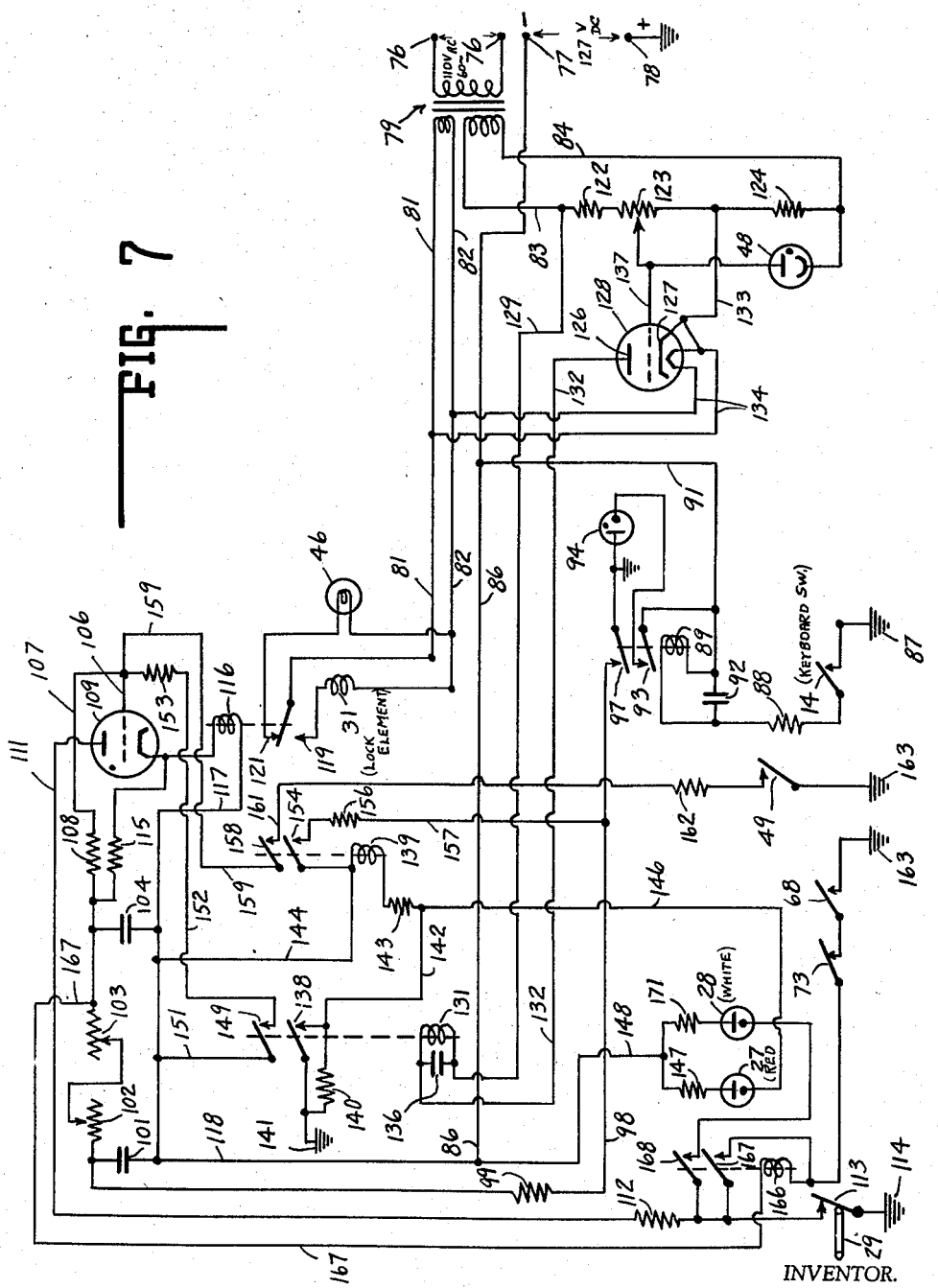
FIG. 7



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2,955,703

MAT DETECTOR FOR SLUG LINECASTING MACHINES

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Filed Feb. 17, 1958, Ser. No. 715,655

11 Claims. (Cl. 199—18)

This invention relates generally to malfunction detection apparatus for slug linecasting machines, and in particular to malfunction detection apparatus adapted for use with automatically operated linecasting machines.

To speed up and render more convenient the setting of type by slug linecasting machines, it has become conventional to provide such machines with attachment devices which automatically operate the linecasting machine. The mat releasing mechanism of machines provided with such attachment devices is operated in response to a perforated tape fed into the attachment rather than by direct manual operation of the linecasting machine keyboard by an operator. These attachments permit operation of the linecasting machine at high speeds and with such high speed operation it becomes quite important to detect the occurrence of malfunctions in the linecasting machine as soon as possible after they occur.

The present invention is directed to a malfunction detection apparatus which is described as incorporated into a conventional Mergenthaler Linotype machine having a Teletypesetter attachment for automatically operating the Linotype machine. The present invention is so described since the Linotype and Teletypesetter are the most common forms of slug linecasting machines and automatic operating attachments, respectively. It will be understood that the invention could be used with machines other than Linotype machines equipped with Teletypesetter attachments provided they were equipped with similar component parts.

The operation of the Linotype machine and of the Teletypesetter are not described in detail herein since these devices themselves are well known in the art and are but environment for the present invention. Detailed texts on the operation of the Linotype machine are commonly available, one such being the official Manual of Linotype Machine Principles, published by Mergenthaler Linotype Company, Brooklyn, N.Y. in 1940. The Teletypesetter attachment is described in detail in Teletypesetter Bulletins No. 1, dated 1939; No. 4, dated 1939; No. 6, dated January, 1938; No. 7, dated January, 1938; No. 9, dated March, 1941; No. 53, dated January, 1941; and No. 52, dated November, 1936, all published by Teletypesetter Corporation, 1400 Wrightwood Avenue, Chicago, Illinois, and in U.S. Patents No. 2,006,860; No. 2,057,652; No. 2,060,838 and No. 2,091,286.

In general the operation of the herein-described apparatus provides for closure of a switch each time the matrix or mat releasing linkage on the Linotype machine is operated. This action provides an input pulse, starting a timing cycle by charging a first condenser and starting the charging of a second condenser, which will actuate a locking element to stop operation of the machine in

a predetermined time (of the order of milliseconds) if a mat fails to leave the magazine when called for by operation of the mat releasing linkage. The cancellation of this input pulse and the stopping of the timing cycle is accomplished by a photo-electric circuit. A mat leaving the magazine and breaking a light beam which scans the front of the magazine causes the photo-circuit to actuate two relays which discharge both the first and the second condensers. If a mat sticks part way out of the magazine, thus continuously obstructing the light beam, a safety circuit is closed, and when contact points located over the Teletypesetter elevator shaft are closed by the rotation of this shaft at the end of the line being set, the locking element is actuated, stopping actuation of the Linotype machine. The machine is thus stopped immediately after assembly of a line in which one or more mats are missing. Should a line fail to cast, due to the line not being justified because of, for example, the spacebands becoming clogged in the spaceband chute, the locking element will be actuated to stop the machine. The apparatus herein described thus monitors the operation of the Linotype machine and halts it upon the occurrence of any of the above referred to malfunctions.

An object of the present invention is thus to provide a malfunction detection apparatus for Linotype machines in which an input pulse provided each time a mat is called for initiates a timing interval at the end of which the machine will be shut down unless a cancelling impulse, indicating proper operation of the machine, is presented to the detecting apparatus prior to the termination of the timed period.

A further object of the present invention is to provide an apparatus of the type referred to above, in which the Linotype machine is shut down immediately upon failure of a line to cast.

A further object of the present invention is to provide an apparatus of the type referred to above in which the presentation of the input pulse to the detecting apparatus is delayed, depending upon the speed of operation of the Linotype machine, so as to clear the cancelling impulse of the preceding operating cycle.

A further object of the present invention is to provide an apparatus of the type referred to above in which the Linotype machine is shut down at the termination of assembly of a line in the event that a mat fails to clear the magazine and sticks in a partially released position.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims:

Fig. 1 is a fragmentary front view of a portion of a Linotype machine with Teletypesetter attachment, and indicating the physical location of certain of the components of the present invention.

Fig. 2 is a fragmentary front view of a further portion of a Linotype machine illustrating the physical location of further components of the present invention.

Fig. 3 is a fragmentary, perspective view of a Linotype machine illustrating the location of a further one of the components of the present invention.

Fig. 4 is a fragmentary plan view of the elevating mechanism of a Linotype machine illustrating the present invention.

Fig. 5 is a fragmentary, diagrammatic view of the transferring cam of the Linotype machine illustrating the operation of one of the components of the present invention.

Fig. 6 is a chart indicating certain features of the operational sequence of the present invention.

Fig. 7 is a schematic circuit diagram of the apparatus embodying the present invention.

Referring initially to Fig. 1, there is shown a conventional Linotype machine having attached thereto a Teletypesetter attachment indicated generally at **10**. The Linotype machine includes a keyboard **11**, an assembling elevator mechanism **12** and an assembler **13**. The operation of the above-mentioned components of the Linotype machine is well known to those skilled in the art and is described in detail in the above-mentioned publications.

The components of the present invention shown in Fig. 1 include the normally open switch **14** having coextensive blades **16** mounted by means of screws **17** to a keyboard contact bar **18**. A shaft **19** is rotatably mounted at **21** upon the bar **18** and carries, by means of legs **22**, a bar **23** which is disposed across the front of the keyboard operating mechanism of the Teletypesetter attachment. The shaft **19** further carries a downwardly extending arm **24** which engages the end of one of the contact carrying blades **16**. The shaft **19** is spring biased into a position such that the arm **24** permits the switch **14** to remain in its normally open position. However, each time the Teletypesetter attachment operates the mat releasing linkage of the Linotype machine, the arm **24** is moved so as to mementarily close the switch **14**.

An indicator box **26** is mounted upon the Linotype machine and on its front face is provided with a glow bulb or pilot light **27** having a red translucent shield and a similar pilot light **28** having a white translucent shield. The indicator box also mounts a release push-button **29**.

Mounted just to the left of the assembling elevator **12** is an elevator locking element which includes a solenoid operator **31** and a plunger **32**. The solenoid is mounted upon an upwardly extending bar **33** which, at its upper end, provides a pivotal support **34** for a depending stop member **36**. A thrust member **37** is pivotally mounted at **38** to the upper end of the plunger. The thrust member extends beneath the stop member and is pivotally connected thereto at **39**. As shown in broken lines in Fig. 1, downward movement of the plunger results in pivotal movement of the stop member about its pivot **34**, thereby projecting it into the path of movement of the assembling elevator of the Linotype machine. In this position it arrests the movement of the elevator mechanism, thereby halting further operation of the Linotype machine.

Referring now to Fig. 2, a further portion of the Linotype machine is shown, particularly the magazine **41**, the guide chutes **42**, and assembler belt **43**. It will be understood by those familiar with the operation of Linotype machines that matrices, as they are selected by the keyboard mechanism, drop from the magazine into the guide chutes to be transported by the assembler belt into the assembling elevator. The components of the present invention shown in Fig. 2 are a lighthouse **44** enclosing an electric bulb **46** (Fig. 7) which, through an aperture **47** in the lighthouse casts a light beam, indicated at **45** in Fig. 2, across the path of the mats as they leave the magazine. Mounted so as to be intersected by this light beam is a conventional photocell **48**. Thus, each mat, as it is released from the magazine, momentarily interrupts the beam of light directed at the photocell.

Referring to Fig. 3, a further component of the present invention is shown mounted in cooperative relation with the elevator cam shaft which is a part of the Teletypesetter attachment indicated generally at **10**. The component referred to is a normally open switch indicated at **49** and comprising coextensive switch blades **51** and **52** which are secured by means of screws **53** to a mounting bracket **54**, which, in turn, is mounted by means of screw **56** upon an appropriate portion of the Teletypesetter mechanism. The switch blades **51** and **52** each carry cooperating electrical contacts at their free ends, and the blade **51** is engaged by the elevator cam so as to close the contacts at the end of the assembly operation for each line of type. The operation of the elevator cam in the Teletypesetter attachment is well known to those skilled in the art, and its function is not described herein in detail. Briefly, however, it may be pointed out that the elevator cam makes one complete rotation for each line of type assembled and through an appropriate lever mechanism operates the vertical elevator in the Linotype machine. Thus, the switch **49** is normally opened, but is momentarily closed at the end of the assembling operation for each line of type.

Referring to Fig. 4, there is shown a portion of the casting apparatus of the Linotype machine. The apparatus shown includes a portion of the pump lever **57** and the pump plunger rod **58**. The pump lever has rigidly attached thereto a block **59** beneath which is positioned a machined surface **61** formed on the end of the long arm **62** of the bell crank pivotally mounted at **63**. The short arm **64** of the bell crank is moved as indicated by broken lines in Fig. 4 by a lever **66**. It will be understood by those familiar with the operation of Linotype machines that the surface **61** is maintained beneath the block **59** until a line is to be cast at which time the surface **61** is moved to its broken line position of Fig. 4, against the force exerted by leaf spring **67**. When in this position the pump lever is released, permitting the pot cam to actuate the pump lever to complete the casting of the appropriately positioned line of type. Actuation of the pump lever causes it to rotate about its supporting shaft **57***a*. The component of the present invention which cooperates with the apparatus just described is the normally closed switch **68**, having contacts **69** carried by extending resilient blades. The switch is mounted by means of a suitable bracket **68***a* to adjacent portion **70** of the casting supporting the shaft **57***a*. In Linotype machines the transverse portion of the pump lever has extending therefrom a lobe or protrusion **70***a* which is herein utilized to contact one blade of the switch **68** to open its contacts each time the pump lever is actuated. Thus, each time a line is cast, the switch **68** is momentarily opened and, if the surface **61** is maintained beneath the block **59**, locking the pump lever against actuation, the switch **68** remains in closed position. It will be understood that the surface **61** is maintained in locking position with relation to the pump lever **57** whenever the tape passing through the Teletypesetter attachment does not properly justify the line of type or if the spacebands are clogged in the spaceband chute, thereby preventing their proper assembly in the appropriate line of type.

Referring to Fig. 5, there is shown a portion of the transfer cam **71** which forms a part of the Linotype machine and serves to actuate the means for transporting the assembled matrices in proper sequences within the machine. In accord with the present invention a fibre block **72** is mounted upon the inner surface of the cam and cooperates with a switch **73** so as to close the switch momentarily as the block engages the switch blade **74** during the cam travel. The switch **73** is shown mounted diagrammatically in Fig. 5 and it will be understood that any suitable stationary mounting means may be provided. The block **72** is positioned on the transfer cam so that it closes the contacts of switch **73** at the same time that the switch **68** is opened by the cam **70***a* (Fig. 4).

Referring now to Fig. 7 the circuit connections and the operation of the present invention will be described. The power input terminals **76** are connected to a stabilized source of 110 volt A.C., 60 cycle electrical power. The power input terminals **77** and **78** are connected to a 127 volt D.C. power source with the positive terminal **78** being grounded. The terminals **76** are connected to

the primary of a transformer 79 which provides power for the 6 volt A.C. lines 81 and 82 and for the 110 volt A.C. lines 83 and 84. The negative terminal 77 is connected to a bus wire 86. The keyboard switch 14 is connected to the positive side of the D.C. line at 87 and through resistance 88 to one side of a relay coil 89. The other side of the relay coil is connected by means of wire 91 to the supply wire 86. A delay-timing condenser 92 is connected across the relay coil and serves the important function of delaying energization of the relay coil 89 upon closure of the keyboard switch 14. The capacity of condenser 92 must be matched to correlate with the operating speed of the Linotype machine; thus the capacity of condenser 92 must be increased to provide increased delay when the operating speed of the Linotype machine is increased.

Energization of relay coil 89 closes switch 93 which energizes an indicating glow tube 94. Energization of relay coil 89 also closes switch 97 which, by means of wire 98 and resistance 99 charges a condenser 101. Although the input pulse provided by the keyboard switch 14 is of momentary duration, the condenser 101 is so sized that it is immediately charged by the input pulse. The condenser 101 is connected to the negative side of the D.C. line by means of wires 86 and 118 and, by means of wire 117 and variable resistances 102 and 103, is connected in parallel with a condenser 104. After the input pulse, though of only momentary duration, has charged condenser 101, the bleed-off of condenser 101 through variable resistances 102 and 103 serves to charge a condenser 104. As condenser 104 reaches a charged condition, the control electrode 106 of the gas-filled triode 109 is swung positive by means of its connection through wire 107 and resistance 108 to the condenser 104.

The anode of tube 109 is connected, by means of wire 111, through a resistance 112 and a normally closed push button operated switch 113, to the positive side of the line at 114, the switch 113 being operated by push button 29 previously referred to with reference to Fig. 1. The cathode of the tube 109 is connected to one side of a relay coil 116 and through bleeder resistance 115 to wire 107. The other side of the relay coil 116 is connected by means of wires 117 and 118 to the negative side of the D.C. line through wire 86. Relay coil 116 controls a double throw switch having contacts 119 and 121 connecting respectively the actuating coil 31 of the lock element to wire 82 and the lamp 46 to wire 82. When the condenser 104 causes the tube 109 to fire, the relay coil 116 will be energized, closing the normally open contacts 119 of the double throw switch, thereby connecting the actuating coil 31 of the lock element, previously described, across the power lines 81 and 82. As previously mentioned, energization of coil 31 serves to lock the elevator mechanism of the Linotype machine, halting its operation. Energization of relay coil 116 also opens the normally closed contacts 121 of the double throw switch, thereby de-energizing the lamp 46, which is housed in the lighthouse 44 and provides the light beam for photocell 48.

From the foregoing it will be evident that with each closure of the keyboard switch 14 an input pulse will be provided. After the delay provided by the condenser 92 the pulse will be applied to condenser 101 and, after a time interval of the order of milliseconds, tube 109 will fire, energizing relay coil 116, and shutting down the Linotype machine. This sequence of events will occur unless, before the termination of the time interval, a cancelling impulse is provided to prevent firing of the tube 109.

This cancelling impulse is provided by a means now to be described. Across wires 83 and 84 is connected a voltage divider comprising resistance 122, variable resistance 123 and resistance 124. The anode 126 and cathode 127 of a triode tube 128 are connected across a portion of the voltage divider, these connections being made by means of wire 129, relay coil 131 and wire 132 for the anode, and by means of wire 133 for the cathode type, having filament connections 134 to the wires 81 and 82. A condenser 136 is connected across the relay coil 131. The control electrode 137 of the tube 128 is connected to an intermediate point on the resistance 123 and to the photocell 48. The photo electric circuit just described is of conventional type and it will be evident that as long as the photocell 48 is illuminated by the lamp 46, tube 128 will be maintained nonconductive.

Upon interruption of the light beam, cell 48 will become nonconductive, swinging the control electrode 137 positive, causing tube 128 to conduct, thereby energizing relay coil 131. Energization of relay coil 131 closes the switch 138 which energizes relay coil 139 through the positive ground connection 141, wire 142, resistance 143, wire 144, and via wires 117 and 118 to wire 86. The red pilot bulb 27 is connected to switch 138 by means of wires 142 and 146, the other side of the bulb being connected to the line wire 86 through resistance 147 and wire 148. Closure of switch 138 thus also energizes the red pilot bulb 27 through wire 146, resistance 147 and wire 148. The contacts of switch 138 are protected by parallel connected resistor 140.

Energization of relay coil 131 also closes switch 149 which by means of the circuit through wires 151, 152, resistance 153, wire 107 and resistance 108, discharges the condenser 104. Switch 154 connects wire 144 to wire 98 via the resistor 156 and wire 157, and energization of relay coil 139 closes switch 154 which, by means of wire 144, resistance 156 and wire 157 provides a discharging circuit for the condenser 101. Energization of relay coil 139 also closes switch 158 which, by means of wire 159, wire 161 and resistance 162, provides a circuit from the control electrode 106 of tube 109 to the positive ground connection 163 which, however, is closed only upon actuation to closed position of the switch 49 previously referred to with reference to Fig. 3.

From the foregoing it will be evident that the proper release of a mat from the magazine in response to operation of the mat releasing linkage by the Teletypesetter will momentarily interrupt the beam from lamp 46 providing a cancelling impulse which discharges condensers 101 and 104 before the control electrode 106 can cause tube 109 to fire, thereby preventing energization of the lock element 31 and permitting operation of the Linotype machine to proceed. Each input pulse will be characterized by a momentary illumination of amber pilot bulb 94, and each cancelling impulse will be characterized by a momentary illumination of the red pilot bulb 27.

The casting pump lever switch 68 and the transfer cam switch 73, referred to with reference to Figs. 4 and 5, respectively, are connected to positive ground at 163 and by means of wire 164 to one side of a relay coil 166. The other side of the relay coil is connected by means of wire 167 to the wire 107. Should the switches 73 and 68 be closed simultaneously, indicating that a line has failed to cast (because of, for example, the spacebands being clogged in the spaceband chute), the control electrode 106 will be swung positive by means of wire 167, causing tube 109 to fire and energizing the lock element 31 stopping operation of the Linotype machine. Upon firing of tube 109, relay coil 166 will be energized closing the switch 167 which provides a holding circuit for the relay to the positive ground connection 114, subsequent manual running through of the machine will not, therefore, de-energize relay coil 166. Energization of relay coil 166 also closes a switch 168 which, by means of positive connection 114, wire 169, resistance 171, wire 148 and wire 86, energizes the white pilot bulb 28. After the malfunction thereby indicated has been corrected, the push button 29 may be depressed, opening switch 113 and breaking the holding circuit to relay coil 166 and rendering tube 109 nonconductive. Operation of the Linotype machine may then be resumed.

A table of preferred values for the various resistors and capacitors described is set out below together with the preferred number designations of the principal tubes used in the circuit:

Component:		Value
122	kilohms	12
123	do	2
124	ohms	2700
88	kilohms	15
153	do	10
162	do	2.2
156	do	10
108	kilohm	1
115	megohms	44
143	kilohms	15
103	do	200
102	do	200
140	do	220
147	do	47
171	do	47
112	ohms	820
99	kilohms	10
92	microfarads	1–4
104	microfarad	1
101	microfarads	2–3
136	do	1.5
Tube:		Number
128		2050–1
109		OA4G

From the foregoing, it will be evident that the circuit described provides safeguards for the occurrence of several malfunctions. If a mat fails to fall in response to operation of the mat releasing linkage, condenser **104** will fire tube **109**, causing the Linotype machine to stop. If a mat is stuck part way out of the magazine so as to continuously interrupt the light beam, relay switch **158** will remain closed and upon the momentary closure of switch **49** at the termination of assembling of the line, tube **109** will be immediately fired, causing the Linotype machine to stop. Illumination of the red pilot bulb **27** will indicate that the machine has stopped because of the occurrence of either of the two malfunctions above described. Should a line fail to cast, causing simultaneous closure of switches **73** and **68**, tube **109** will be fired, thereby halting operation of the Linotype machine. When the machine is stopped because of this type of malfunction, this fact will be indicated by illumination of both red pilot bulb **27** and white pilot bulb **28**. Proper operation and adjustment of the circuit is facilitated by the amber pilot bulb **94** which blinks with each input pulse and by red pilot bulb **27** which blinks with each cancelling pulse.

Fig. 6 illustrates the importance of the delay of the input pulse provided by the condenser **92**. This figure comprises a chart divided into time intervals of the order of, for example, 110 milliseconds. Each interval has set out above it, as an example, one letter of the three letter word "the." Assuming initially that condenser **92** and its input pulse delaying feature were omitted, the input pulse for the first letter of the word "the" would be initiated immediately upon closure of switch **14**. As indicated on the chart the input pulse designated by the solid bar **176** would start at the cycle dividing line **177**. A predetermined time after closure of switch **14**, this period being relatively unchangeable and dictated by the mechanics of the mat releasing mechanism, a cancelling pulse indicated by solid line block **178** will occur. As long as the machine is operated at medium or slow speed so that the start of the next input pulse is not initiated until after the completion of the preceding cancelling pulse, proper operation of the machine will be maintained. In other words, with reference to the chart of Fig. 6, as long as the distance between the cycle boundaries, designated at **177** and **179**, is sufficient to place the line **179** to the right of the terminus of block **178**, operation of the machine will proceed satisfactorily.

However, when the machine is run at high speed, so that the cycle is of the order of 110 milliseconds duration, since the distance indicated at "*a*" in Fig. 6 is unchangeable and fixed by the mechanics of the mat releasing mechanism, the cancelling pulses will now overlap or hang over the cycle boundaries. The latter portion of a cancelling pulse will thereby cancel a portion of the succeeding input pulse, as indicated at **180** in Fig. 6, leaving an unsatisfactorily foreshortened input pulse **181**. Since the first letter in a word, as for example the "t" in "the," is preceded by a space (release of spacebands create no cancelling pulse), the first letter in each word would, under these conditions, provide a full input pulse while each following letter would provide a foreshortened input pulse.

In order to eliminate this irregularity of the input pulses in high speed operation of the machine, the charging and discharging of condenser **92** serves to delay the energization of relay coil **89**, and hence the start of an input pulse, for a time interval after closure of switch **14**. Further, discharge of the condenser **92** after the opening of switch **14** delays the de-energization of relay coil **89** for a time interval subsequent to the opening of switch **14**. With reference to Fig. 6, this results in shifting rightwardly the input pulse **176** to its broken line position **176***a*, a similar rightwardly shifted input pulse being also shown at **182**. Thus, although closure of switch **14** occurs at the cycle boundaries **177** and **179**, the input pulse itself is delayed or shifted by the action of condenser **92** so that, in the case of inter-word letters, none of the input pulse is cancelled by hang over of the cancelling pulse of the preceding cycle. The result of this shifting of the input pulse will be apparent with reference to block **182**, representing a properly positioned input pulse, and blocks **183** and **184**, indicating the preceding and subsequent cancelling pulses.

It will thus be apparent that the proper positioning of the input pulse within a cycle, so that it is not obliterated in part by the hangover of the cancelling pulse from the preceding cycle is a vital factor in automatic operation of such machines as slug linecasting machines at high speed. The input pulse shifting means represents an important feature of the present invention.

From the foregoing it will be evident that the device embodying the present invention provides important economies in the operation of Teletypesetter-equipped Linotype machines. These economies are brought about by saving in correction time resulting from machine errors, by reducing revised proof-pulling and proofreading time, and by saving press time delays caused by needless corrections. The present invention provides for shutting down operation of the Linotype machine upon the occurrence of any one of several common malfunctions and provides indicating means for designating which type of malfunction caused the machine shutdown. By means of the delay provided for the input pulse the apparatus of the present invention is particularly adapted to high speed Linotype machine operation.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. A malfunction detection circuit for slug linecasting machines having an automatic operating attachment, said circuit including a locking element adapted when electrically energized to halt operation of the machine, a control tube having an anode, cathode and control electrode and adapted to energize said locking element upon being rendered conductive, timing means for firing said

control tube a timed period subsequent to receipt of an input pulse, said timing means including a first condenser charged by said input pulse and a second condenser charged by the discharge of said first condenser upon termination of the input pulse to thereby raise said control electrode to firing potential, means for discharging said condensers prior to the termination of said timed period upon receipt of a cancelling impulse, said last-mentioned means including discharge circuits for said condensers completed upon receipt of said cancelling impulse, means for applying said cancelling impulse to said discharge circuits including a photoelectric device operable to provide said cancelling impulse upon proper response of the linecasting machine to operation of its mat releasing linkage, means for providing said input pulse upon operation of the mat releasing linkage of the linecasting machine, and means for delaying the application of said input pulse to said first condenser including electromagnetically operated switching means connected in series therewith, a timing condenser connected in parallel with the electromagnetic operator for said switching means, the charging time of said timing condenser thereby delaying energization of said electromagnetic operator to permit said input pulse to clear the cancelling pulse of the preceding operating cycle.

2. A malfunction detection circuit as claimed in claim 1, having circuit means for firing said control tube independently of said condensers, a first normally open switch momentarily closed at the completion of the assembly of each line of type, a second normally open switch closed for the duration of said cancelling pulse, said first and second switches being connected in series in said circuit means for firing said control tube at the completion of the assembly of a line of type which is defective because of the incomplete delivery of a mat providing a prolonged cancelling pulse.

3. A malfunction detection circuit for slug linecasting machines having an automatic operating attachment, said circuit including a locking element adapted when electrically energized to halt operation of the machine, a control tube having an anode, cathode and control electrode and adapted to energize said locking element upon being rendered conductive, timing means for firing said control tube a timed period subsequent to receipt of an input pulse, said timing means including a condenser charged by said input pulse to thereby raise said control electrode to firing potential, means for discharging said condenser prior to the termination of said timed period upon receipt of a cancelling impulse, said last-mentioned means including a discharge circuit for said condensers completed upon receipt of said cancelling impulse, means for applying said cancelling impulse to said discharge circuit including a photoelectric device operable to provide said cancelling impulse upon proper response of the linecasting machine to operation of its mat releasing linkage, means for providing said input pulse upon operation of the mat releasing linkage of the linecasting machine, and means for delaying the application of said input pulse to said condenser including electromagnetically operated switching means connected therewith, a timing condenser connected in parallel with the electromagnetic operator for said switching means, the charging time of said timing condenser thereby delaying energization of said electromagnetic operator to permit said input pulse to clear the cancelling pulse of the preceding operating cycle.

4. A malfunction detection circuit for slug linecasting machines having an automatic operating attachment, said circuit including a locking element adapted when energized to halt operation of the machine, a control tube having an anode, cathode and control electrode and adapted to energize said locking element upon being rendered conductive, timing means for firing said control tube a timed period subsequent to receipt of an input pulse, said timing means including a first condenser charged by said input pulse and a second condenser charged by the discharge of said first condenser upon termination of the input pulse to thereby raise said control electrode to firing potential, means for discharging said condensers prior to the termination of said timed period upon receipt of a cancelling impulse, said last-mentioned means including discharge circuits for said condensers completed upon receipt of said cancelling impulse, means for applying said cancelling impulse to said discharge circuits including sensing means operable to provide said cancelling impulse upon proper response of the linecasting machine to operation of its mat releasing linkage, means for providing said input pulse upon operation of the mat releasing linkage of the linecasting machine, and means for delaying the application of said input pulse to said first condenser to permit said input pulse to clear the cancelling pulse of the preceding operating cycle.

5. A malfunction detection circuit for slug linecasting machines having an automatic operating attachment, said circuit including a locking element adapted when electrically energized to halt operation of the machine, a control tube having an anode, cathode and control electrode and adapted to energize said locking element upon being rendered conductive, timing means for firing said control tube a timed period subsequent to receipt of an input pulse, said timing means including a first condenser charged by said input pulse and a second condenser charged by the discharge of said first condenser upon termination of the input pulse to thereby raise said control electrode to firing potential, means for discharging said condensers prior to the termination of said timed period upon receipt of a cancelling impulse, said last-mentioned means including discharge circuits for said condensers completed upon receipt of said cancelling impulse, means for applying said cancelling impulse to said discharge circuits including means operable to provide said cancelling impulse in response to proper operation of the linecasting machine, and means for providing said input pulse upon operation of the mat releasing linkage of the linecasting machine.

6. A malfunction detection circuit for slug linecasting machines having an automatic operating attachment, said circuit including a locking element adapted when electrically energized to halt operation of the machine, a control tube having an anode, cathode and control electrode and adapted to energize said locking element upon being rendered conductive, timing means for firing said control tube a timed period subsequent to receipt of an input pulse, said timing means including a condenser charged by said input pulse to thereby raise said control electrode to firing potential, means for discharging said condenser prior to the termination of said timed period upon receipt of a cancelling impulse, means for generating said cancelling impulse including a photoelectric device operable upon proper mat delivery by the linecasting machine, means for providing said input pulse upon actuation of the mat delivery mechanism of the linecasting machine, and means for delaying the application of said input pulse to said condenser including electromagnetically operated switching means, a timing condenser connected in parallel with the electromagnetic operator for said switching means, the charging time of said timing condenser delaying energization of said electromagnetic operator to permit said input pulse to clear the cancelling pulse of the preceding operating cycle.

7. A malfunction detection circuit as claimed in claim 6, having circuit means for firing said control tube independently of said first-mentioned condenser, a first normally open switch momentarily closed at the completion of the assembly of each line of type, a second normally open switch closed for the duration of said cancelling pulse, said first and second switches being connected in series in said circuit means for firing said control tube at the completion of the assembly of a line of type which is defective because of the incomplete de-

livery of a mat providing a prolonged cancelling pulse.

8. A malfunction detection circuit as claimed in claim 6, having circuit means for firing said control tube independently of said cancelling pulse, switching means forming a part of said circuit means and closed upon failure of a line to cast, said locking element being thereby operated upon failure of a line to cast independently of proper mat delivery.

9. A malfunction detecting circuit as claimed in claim 8, having indicating means for indicating whether said locking means has been actuated by the absence of a cancelling impulse or by failure of a line to cast.

10. A malfunction detection circuit for slug linecasting machines including a locking element adapted when actuated to halt operation of the machine, control means for actuating said locking element a predetermined time subsequent to application of an input pulse to said control means, and means operable to prevent actuation of said locking element by said control means including an element responsive to proper operation of the machine for providing a cancelling pulse to said control means, and time delay means for delaying the application of said input pulse to said control means to permit clearing of the cancelling pulse of the preceding cycle.

11. A malfunction detection circuit for automatically operated machinery including a locking element adapted when actuated to halt operation of the machine, control means for actuating said locking element a predetermined time subsequent to application of an input pulse to said control means, and means operable to prevent actuation of said locking element by said control means including an element responsive to proper operation of the machine for providing a cancelling pulse to said control means, and time delay means for delaying application of said input pulse to said control means to permit clearing of the cancelling pulse of the preceding cycle.

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