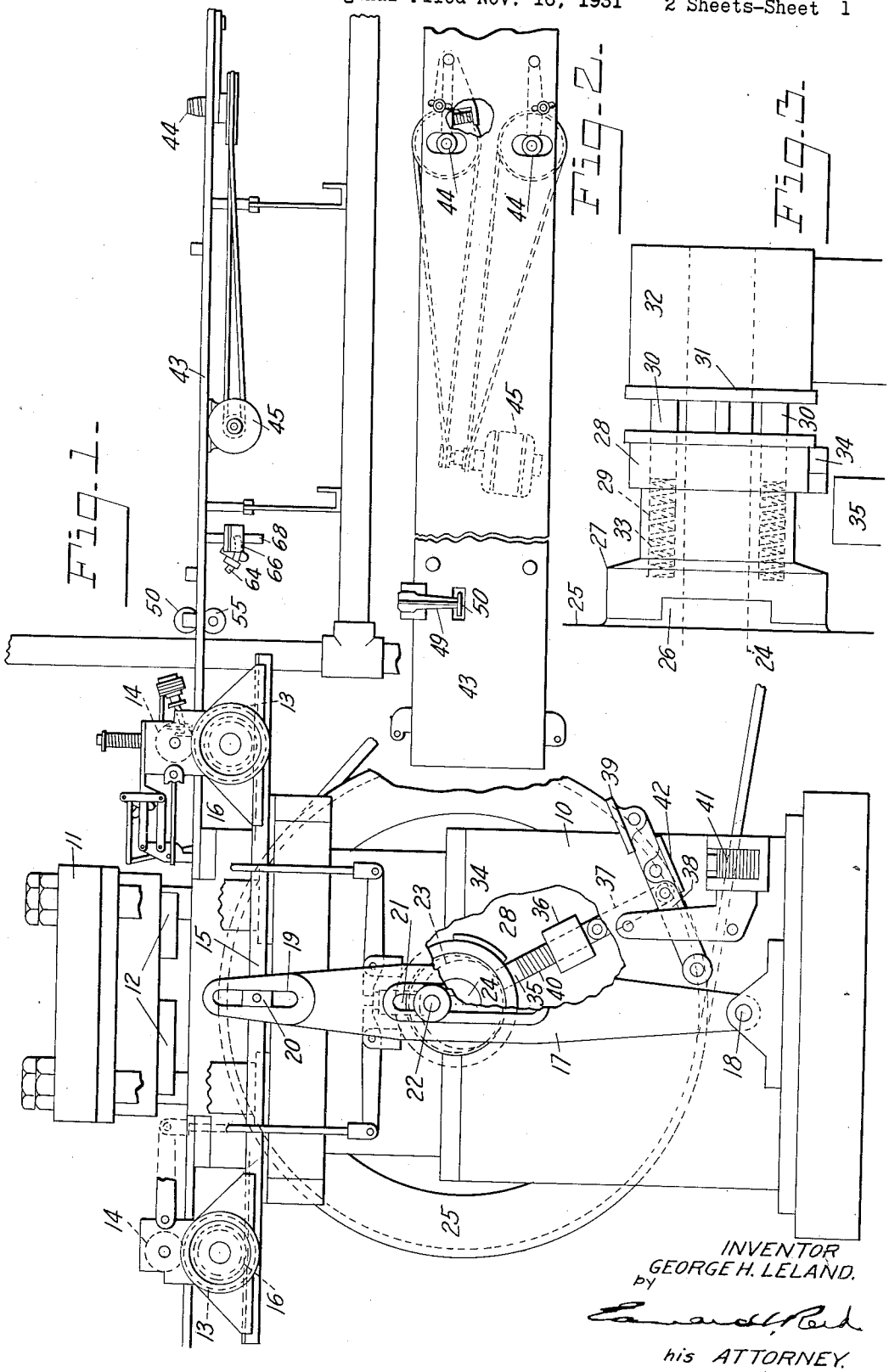
Sept. 26, 1933. G. H. LELAND 1,928,156

AUTOMATIC STOP FOR PUNCH PRESSES AND THE LIKE

Original Filed Nov. 16, 1931 2 Sheets-Sheet 1



Sept. 26, 1933. G. H. LELAND 1,928,156

AUTOMATIC STOP FOR PUNCH PRESSES AND THE LIKE

Original Filed Nov. 16, 1931 2 Sheets-Sheet 2

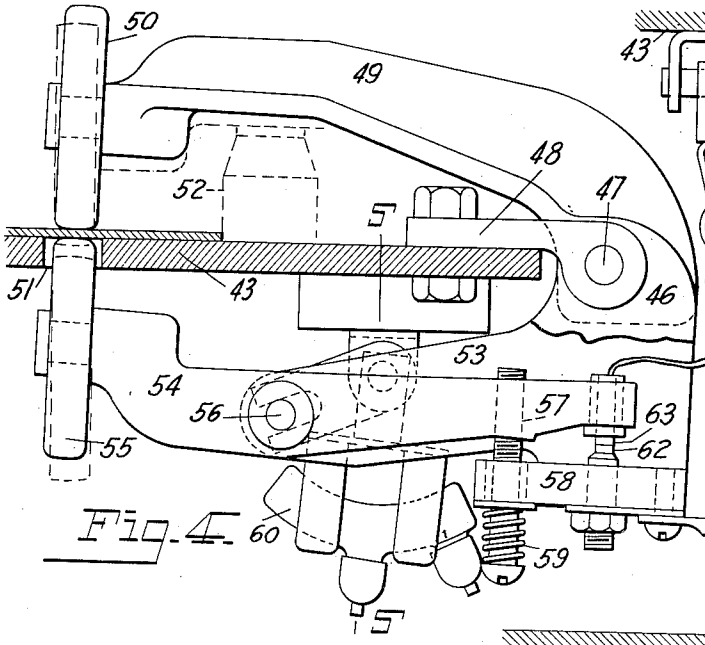


Fig. 4.

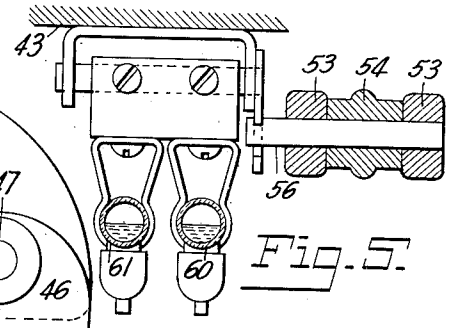


Fig. 5.

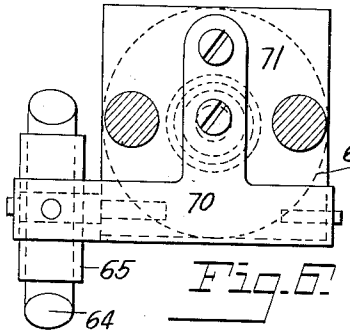


Fig. 6.

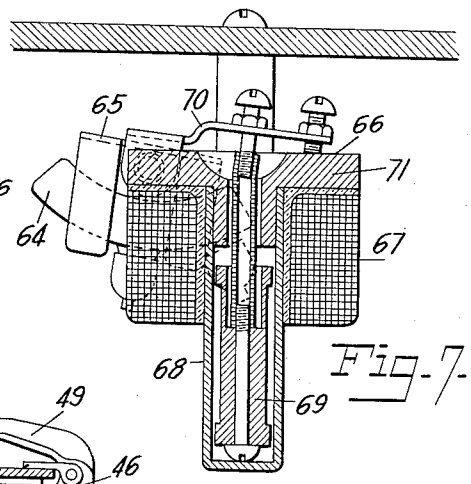


Fig. 7.

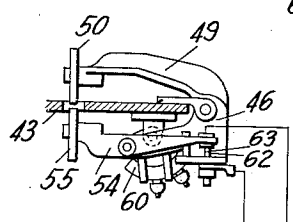
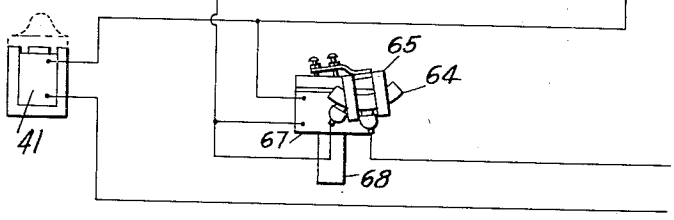


Fig. 8.



INVENTOR.
GEORGE H. LELAND.
by

his ATTORNEY.

Patented Sept. 26, 1933 1,928,156

UNITED STATES PATENT OFFICE

1,928,156

AUTOMATIC STOP FOR PUNCH PRESSES AND THE LIKE

George H. Leland, Dayton, Ohio, assignor of one-half to The Leland Electric Company, Dayton, Ohio, a corporation of Ohio

Original application November 16, 1931, Serial No. 575,324. Divided and this application September 14, 1932. Serial No. 633,163

16 Claims. (Cl. 192—126)

This invention relates to an automatic stop for punch presses and the like and is a division of the application for patent filed by me November 16, 1931, Serial No. 575,324.

In punch presses, and various other machines, which operate upon strips or sheets of thin material, the strips are delivered to feeding mechanism forming part of the machine and are moved by that mechanism to the operating parts of the machine. If a strip of excessive thickness or two superimposed strips are delivered to the feeding mechanism and inserted in the machine this not only results in an imperfect product but is very likely to injure the mechanism or to clog the machine and such a strip or strips are sometimes introduced into the machine, this being particularly likely to occur where an automatic strip delivery mechanism is employed.

One object of the present invention is to provide means for automatically interrupting the operation of the machine if a strip of excessive thickness or two strips are delivered thereto.

A further object of the invention is to provide such a device which will interrupt the operation of the machine before the strip or strips are engaged by the feeding mechanism.

A further object of the invention is to provide such a device with means which will prevent the operation of the machine from being interrupted if the thick portion of the strip is of short length and not of such a character as to interfere with the operation of the machine.

Other objects of the invention will appear as the mechanism is described in detail.

In the accompanying drawings Fig. 1 is a side elevation, partly broken away, of a punch press embodying my invention; Fig. 2 is a plan view of the feed table; Fig. 3 is a detail view of the clutch which connects the operating parts and feed mechanism of the press with the driving mechanism; Fig. 4 is a detail view of the switch actuating device; Fig. 5 is a sectional view taken on the line 5—5 of Fig. 4; Fig. 6 is a plan view of the retarding device; Fig. 7 is a sectional view taken centrally through the retarding device; and Fig. 8 is a circuit diagram.

In these drawings I have illustrated one embodiment of the invention and have shown the same as applied to a punch press but it will be understood that this embodiment has been chosen for the purposes of illustration only and that the invention may take various forms and may be applied to machines of various kinds.

The press here illustrated is of a well known type and comprises a main frame or supporting structure 10 on which is mounted a movable member or ram 11 which carries the operating parts, here shown as punches or die members, 12, adapted to cooperate with corresponding die members carried by the frame. The press is provided at its front end with a feeding-in device and at its rear end with a feeding-out device, each device comprising a lower positively driven roller 13 and an upper roller 14. The lower feed rollers are actuated by a reciprocatory rack bar 15, the teeth of which mesh with pinions 16 mounted about the axes of the respective rollers and connected thereto by pawl and ratchet mechanism, not shown, whereby the rack bar will rotate the rollers in one direction only. Reciprocatory movement is imparted to the rack bar by a lever 17 which is pivotally mounted on the frame at its lower end, as shown at 18, and has at its upper end a slot 19 in which is slidably mounted a block 20 secured to the rack bar. The lever 17 is also provided intermediate of its ends with a longitudinal slot 21 in which operates a crank pin 22 which, in the present instance, is carried by a cam disk 23 mounted on a shaft 24. The shaft 24 operates both the ram and the feeding mechanism and may be connected with the driving mechanism in any suitable manner but this is preferably accomplished by means of a clutch which is spring actuated in one direction. In the present mechanism, a fly wheel 25, which is connected with the source of power, is rotatably mounted on the shaft 24 and carries one member 26 of a jaw clutch. The other member 27 of the clutch is slidably mounted on the shaft 24 and is splined thereto. This clutch member has an extension 28 in which are formed longitudinal bores 29 into which extend studs 30 carried by a plate 31 mounted about the shaft and held against axial movement, as by contact with a bearing 32 in which the shaft is mounted. Springs 33 confined within the bores 29 tend to move the clutch member 27 into operative engagement with the clutch member 26 and thus establish the operative connection between the shaft and the fly wheel. For the purpose of retracting the clutch member 27 and thus disconnecting the shaft from the fly wheel the part 28 of the clutch member is provided with a peripheral cam 34 and a tripping device 35 is mounted for movement into and out of the path of the cam. In the present construction this tripping device is in the form of a plunger slidably mounted in the bearing 36 on the main frame and connected at its lower end by a link 37 with a lever 38, pivotally mounted on the frame and having at its free end a foot

piece 39. Ordinarily the lever 38 is held in its depressed or operative position by means of a latch which must be actuated by the hand or foot of the operator to release the lever but, in the present machine I have substituted for the latch an electro-magnet 41, the armature 42 of which is carried by a lever 38. The magnet is normally energized and when the lever is depressed it will be held in its depressed position by the magnet until the latter is deenergized and when the magnet is deenergized the lever will be released and a spring 40 will move the plunger into the path of the cam 34 and this cam, acting against the plunger, will retract the movable clutch member. The electro-magnet is well adapted for controlling a clutch operating mechanism of the type here shown but it will be obvious that the clutch operating mechanism may be controlled by electrically operated devices of various kinds.

A feed table 43 is arranged in advance of the feeding-in rollers 13 and 14 and the strips are moved over this table to the feeding mechanism, either by hand or by power mechanism. The particular feed table here illustrated is adapted for use with the automatic strip delivery mechanism shown and described in my co-pending application filed November 9, 1931, Serial No. 573,785, and is provided with cone-shaped feeding members 44 which project above the table and are adapted to receive the strip between them, one of these rollers being spring pressed toward the other roller to cause the strip to be gripped between the rollers and moved toward the press as the rollers are rotated by the motor 25. The feed rollers 13 are separated to permit the strip to be inserted between them by elevating the upper roller 14 and are held in their separated positions until the strip has been inserted the desired distance, and the upper roller is then automatically released and caused to engage the strip, as explained in the above mentioned application Serial No. 575,324.

For the purpose of interrupting the operation of the press in the event a strip of excessive thickness or two superimposed strips are moved toward the feeding rollers 13 and 14, I have connected a switch in circuit with the electrically operated device or magnet 41 and have mounted adjacent to the table 43 a switch actuating device which will engage the strips and will be controlled in accordance with the thickness thereof. This switch actuating device may take various forms but preferably it comprises two members arranged respectively above and below the path of the strip and which are normally spaced apart a distance sufficient to permit a strip of normal thickness to pass between the same. One of these members is so mounted that if a strip of abnormal thickness is introduced between the two members this member will be moved with relation to the other member and this relative movement of the members is utilized to actuate the switch. In the particular construction here shown the actuating device comprises a bracket 46 pivotally mounted at one edge of the table 43 a short distance in advance of the feeding-in rollers 13 and 14. In the present instance, the bracket is mounted on a stud 47 guided by a lug 48 rigidly secured to the table. The bracket comprises an arm 49 extending above the table and having at its free end a roller 50 which is arranged in line with an opening 51 in the table 43 and which, when there is no strip above the opening, will enter that opening, as shown in dotted lines in Fig. 4, the downward movement of the arm 49 being limited by a stop 52. The bracket also has a part or arm 53 extending beneath the table and pivotally mounted on the part 53 is another arm or lever 54 having on its inner end a roller 55 arranged beneath and adapted to enter the opening 51 in the table. The arm or lever 54 is pivotally mounted between its ends on the part 53, as shown at 56, and yieldable means are provided for holding the arms 49 and 54 normally against movement with relation one to the other and with the rollers spaced apart to receive a normal strip between them. In the present construction a screw 57 is mounted in the outer portion of the arm or lever 54 and extends through an opening in a plate 58 rigidly secured to a depending portion of the bracket 46. A spring 59, confined between the head of the screw and the plate 58, tends to draw the adjacent portion of the arm 54 toward the plate 58 and thus hold the arm 54 against movement with relation to the bracket. When a strip is introduced between the rollers 50 and 55 it will engage the upper roller 50 and lift the same above the surface of the table and the roller 55 will move with the roller 50, the two members being held against relative movement by the spring 59. This movement of the two members in unison may be utilized to actuate switches, shown at 60 and 61, as described in my above mentioned applications. The mechanism controlled by these switches form no part of the present invention. When a strip of abnormal thickness or two superimposed strips are introduced between the rollers 50 and 55 the roller 50 is moved upwardly with relation to the roller 55 and the latter roller fulcrums against the lower surface of the strip so that the movement of the bracket about its axis will cause the arm or lever 54 to rock about its pivotal mounting 56 on the bracket. This relative movement of the two members is utilized to actuate the switch which controls the electrically operated device. The switch may be connected with the switch actuating members in any suitable manner and, in the arrangement here shown, a contact member 62 is mounted on the plate 58 of the bracket and connected with one side of the magnet circuit. A second contact member 63 is mounted on the outer end of the arm or lever 54 and is connected with the other side of the magnet circuit. These contact members are so arranged that when the switch actuating members 50 and 55 are in their normal positions with relation one to the other two contact members will be in engagement and the circuit closed through the magnet but when relative movement is imparted to the switch actuating members the contact 63 will be moved away from the contact 62 and the circuit through the magnet broken, thus releasing the plunger 35 and permitting the same to retract the clutch and thereby interrupt the operation of the machine.

The action of the switch actuating device or controlling device thus described will stop the press almost instantly in the event two superimposed strips, or a strip of abnormal thickness, are introduced between the rollers 50 and 55. However, only a slight amount of relative movement need be imparted to the bracket 46 and the arm 54 in order to open the circuit and stop the press and it may sometimes happen that a small protrusion or lump on the surface of the strip passing through the rollers will open the circuit and stop the press when there is no necessity therefor. To avoid this unnecessary stopping of the press I have provided means whereby the deenergization of the magnet 41 will be so re-

tarded that a lump or other projection on the strip will pass the rollers and permit contact members 62 and 63 to be again closed before the magnet has been deenergized and the press stopped. For this purpose I have connected a switch 64, Figs. 6, 7 and 8, in circuit with the magnet 41 and in parallel with the switch 62—63 and have provided means controlled by the opening of the circuit at 62 and 63 for causing the switch 64 to be opened after a predetermined interval of time. The two switches being in parallel it will be obvious that the magnet cannot be deenergized until both switches are open and therefore if the circuit is closed at 62—63 before the switch at 64 opens the magnet will not be deenergized. As here shown, the switch 64 is in the form of a mercury tube carried by a bracket 65 which is pivotally mounted on a supporting member 66. Mounted on this supporting member is a magnet 67, here shown as a solenoid coil, and a cylinder 68 extends through the coil to a point below the same and has its lower portion closed. The armature or core for the magnet is shown as a plunger 69 slidably mounted in the cylinder 68 and operatively connected with the switch supporting bracket 65. In the present instance, an arm 70 is rigidly connected with the bracket 65 and is connected with the plunger 69 by a coiled spring 71. The plunger or armature 69 fits snugly within the cylinder with only a slight clearance about the same. The magnet coil 67 is connected at its respective terminals with the contacts 62 and 63 of the main switch. When the plunger 69 is in its lowermost position the switch 64 will be held in its closed position. Because of the relatively high resistance of the magnet coil 67 current will flow normally from the line through the switch 64, the contact 62 and 63 and magnet 41, but if the contacts 62 and 63 are separated and the circuit there broken the current will then flow through the switch 64, magnet 67 and magnet 41, thus maintaining the energization of the magnet 41 but also energizing the magnet 67 and causing the same to exert an upward pull on the plunger or armature 69 which will tend to move the switch 64 to its open position. However, the plunger can only move upwardly as fast as the fluid in the cylinder 68 can escape about the same and therefore its movement is retarded for a brief interval which will be sufficient to permit the strip to move forward a short distance before the switch 64 is opened. If during this movement the lump or other projection on the surface of this strip passes the rollers 50 and 55 the contacts 62 and 63 will again close and the magnet 67 will be either completely deenergized or deenergized to such an extent that it will not actuate its armature. However, if the contacts 62 and 63 are maintained separated for any appreciable length of time, as when superimposed strips are inserted between the rollers 50 and 55, the plunger 69 will complete its movement and the switch 65 will be opened, thereby breaking the circuit through the magnet 41 and permitting the clutch to be opened.

While I have shown and described one embodiment of my invention I wish it to be understood that I do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

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

1. In a punch press or the like having operating mechanism and means for driving said operating mechanism, an electrically operated device to control the connection between said driving means and said operating mechanism, a switch in circuit with said electrically operated device, a switch actuating device mounted in advance of said operating mechanism and comprising two members spaced apart a distance sufficient to permit the passage of a strip of material of normal thickness and movable transversely to the path of said strip, one of said members being arranged to be engaged and actuated by said strip, means to cause said members to move in unison when a strip of normal thickness is introduced between them and to permit one of said members to move with relation to the other member when a strip of abnormal thickness is introduced between said members, and means controlled by the relative movement of said members to actuate said switch.

2. In a punch press or the like having operating mechanism and means for driving said operating mechanism, an electrically operated device to control the connection between said driving means and said operating mechanism, a switch in circuit with said electrically operated device, a switch actuating device mounted in advance of said operating mechanism and comprising a pivoted arm having a part arranged above the path of a strip of material which is being moved toward said operating mechanism and adapted to be actuated by said strip to move said arm about its axis, a second arm pivotally connected with the first mentioned arm and having a part arranged below the path of said strip and spaced from the first mentioned part a distance sufficient to permit a strip of normal thickness to pass between said parts, yieldable means to cause said arms to move in unison when a strip of normal thickness is introduced between said parts and to permit said parts to have movement with relation one to the other when a strip of abnormal thickness is introduced between said parts, and means controlled by the relative movement of said arms to actuate said switch.

3. In a punch press or the like having operating mechanism and means for driving said operating mechanism, an electrically operated device to control the connection between said driving means and said operating mechanism, a switch in circuit with said electrically operated device, a switch actuated device mounted in advance of said operating mechanism and comprising a pivoted arm having a part arranged above the path of a strip of material which is being moved toward said operating mechanism and adapted to be actuated by said strip to move said arm about its axis, a second arm pivotally connected with the first mentioned arm and having a part arranged below the path of said strip and spaced from the first mentioned part a distance sufficient to permit a strip of normal thickness to pass between said parts, yieldable means to cause said arms to move in unison when a strip of normal thickness is introduced between said parts and to permit said parts to have movement with relation one to the other when a strip of abnormal thickness is introduced between said parts, means controlled by the relative movement of said arms to actuate said switch, an operable device mounted adjacent to said switch actuating device, and means controlled by the pivotal movement of the first mentioned arm to actuate said operable device.

4. In a punch press or the like having operating mechanism, driving mechanism for said op-

erating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in a position to maintain said connection, a switch in circuit with said magnet, and an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced to said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device and thereby deenergize said magnet and interrupt said connection.

5. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in a position to maintain said connection, a normally closed switch in circuit with said magnet, a switch actuating device mounted in advance of said operating mechanism and comprising two members arranged to engage the respective sides of a strip of material as the latter is moved toward said operating mechanism and spaced apart a distance sufficient to permit the passage of a strip of normal thickness, one member of said actuating device being so arranged that it will move with relation to the other member of said actuating device when a strip of excessive thickness is introduced between said members, and means controlled by the movement of said movable member to open said switch.

6. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a normally closed switch in circuit with said magnet, a switch actuating device mounted in advance of said operating mechanism and comprising two bodily movable members arranged to engage the respective sides of a strip of material as the latter is moved toward said operating mechanism and spaced apart a distance sufficient to permit the passage of a strip of normal thickness, one member of said actuating device being so arranged that it will be moved by a strip introduced between two members of said actuating device, a yieldable connection between said members of said actuating device to cause them to move in unison when a strip of normal thickness is introduced between the same and to permit the relative movement thereof when a strip of excessive thickness is introduced between the same, and means controlled by said relative movement to open said switch.

7. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a feeding table over which a strip may be moved toward said operating mechanism, said table having an opening therethrough, a bracket pivotally mounted adjacent to one edge of said table and having a part overhanging said table and provided with a roller which normally extends into said opening, an arm arranged below said table, movably mounted on said bracket and having a roller arranged beneath the opening in said table, said rollers being spaced apart a distance sufficient to permit the passage of a strip of normal thickness, yieldable means for holding said arm and said bracket normally against relative movement but to permit said arm to move relatively to said bracket when superimposed strips are inserted between said rollers, and a switch in circuit with said magnet and comprising a contact supported by said bracket and a contact supported by said arm, said contacts being so arranged that they will be in engagement one with the other when said bracket and said arm are in their normal positions with relation one to the other.

8. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a feeding table over which a strip may be moved toward said operating mechanism, said table having an opening therethrough, a bracket pivotally mounted adjacent to one edge of said table and having a part overhanging said table and provided with a roller extending into said opening, an arm arranged below said table, movably mounted on said bracket and having a roller arranged beneath the opening in said table, said rollers being spaced apart a distance sufficient to permit the passage of a strip of normal thickness, yieldable means for holding said arm and said bracket normally against relative movement but to permit said arm to move relatively to said bracket when superimposed strips are inserted between said rollers, a switch in circuit with said magnet and comprising a contact supported by said bracket and a contact supported by said arm, said contacts being so arranged that they will be in engagement one with the other when said bracket and said arm are in their normal positions with relation one to the other, and a switch connected with said arm and said bracket for operation thereby when said arm and said bracket are moved in unison by a strip which is being moved over said table.

9. In a punch press or the like having operating mechanism, and means for driving said operating mechanism, an electrically operated device to control the connection between said driving means and said operating mechanism, a switch in circuit with said electrically operated device, a switch actuating device comprising two members arranged to receive between them a strip of material as the latter is moved toward said operating mechanism, one of said members being movable with relation to the other member, means to hold said movable member normally against movement with relation to said other member and to permit it to be moved relatively to said other member by a strip of abnormal thickness, an operative connection between said movable member and said switch, a second switch in circuit with said electrically operated device and in parallel with the first mentioned switch, and means to cause said second switch to be actuated at the end of a predetermined interval following the actuation of said first mentioned switch.

10. In a punch press or the like having operating mechanism, and means for driving said operating mechanism, an electrically operated device to control the connection between said driving means and said operating mechanism, a switch in circuit with said electrically operated device, and a switch actuating device comprising two members arranged to receive between them a strip of material as the latter is moved toward said operating mechanism, one of said members being movable with relation to the other mem-

ber, means to hold said movable member normally against movement with relation to said other member and to permit it to be moved relatively to said other member by a strip of abnormal thickness, an operative connection between said movable member and said switch, a second switch in circuit with said electrically operated device and in parallel with the first mentioned switch, means controlled by the first mentioned switch to actuate said second switch, and means to retard the actuation of said second switch.

11. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a switch in circuit with said magnet, an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced toward said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device, and means to retard the de-energization of said magnet after said switch has been opened.

12. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a switch in circuit with said magnet, an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced toward said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device, a second switch in circuit with said magnet and in parallel with the first mentioned switch, means controlled by the opening of the first mentioned switch to cause said second switch to be opened, and means to retard the opening of the second switch.

13. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a switch in circuit with said magnet, an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced toward said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device, a second switch in circuit with said magnet and in parallel with the first mentioned switch, a magnet connected across the terminals of the first mentioned switch and means including a retarding device for operatively connecting the last mentioned magnet with said second switch.

14. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a switch in circuit with said magnet, an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced toward said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device, a second switch in circuit with said magnet and in parallel with the first mentioned switch, a magnet connected across the terminals of the first mentioned switch, an armature for the last mentioned magnet operatively connected with said second switch, and a dash pot connected with said armature to retard the movement thereof.

15. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a switch in circuit with said magnet, an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced toward said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device, a second switch in circuit with said magnet and in parallel with the first mentioned switch, a magnet coil connected across the terminals of the first mentioned switch, a cylinder mounted in said coil and having one end closed, a plunger slidably mounted in said cylinder and constituting an armature, and means for operatively connecting said plunger with said second switch.

16. In a punch press or the like having operating mechanism, driving mechanism for said operating mechanism, and a device to control the connection between said driving mechanism and said operating mechanism, a magnet to hold said device in its operative position, a switch in circuit with said magnet, an actuating device for said switch arranged in advance of said operating mechanism and controlled in accordance with the thickness of the strip which is being advanced toward said operating mechanism to open said switch when a strip of abnormal thickness or superimposed strips are delivered to said switch actuating device, a second switch in circuit with said magnet and in parallel with the first mentioned switch, a magnet connected across the terminals of the first mentioned switch and operatively connected with said second switch, and means requiring said first mentioned switch to be open for a predetermined interval of time before said second switch will be opened by the last mentioned magnet.

GEORGE H. LELAND.