Jan. 3, 1933. C. D. McDONALD 1,893,427

APPARATUS FOR AUTOMATICALLY STOPPING AUTOMATIC POWER PRESSES

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Fig. 1.

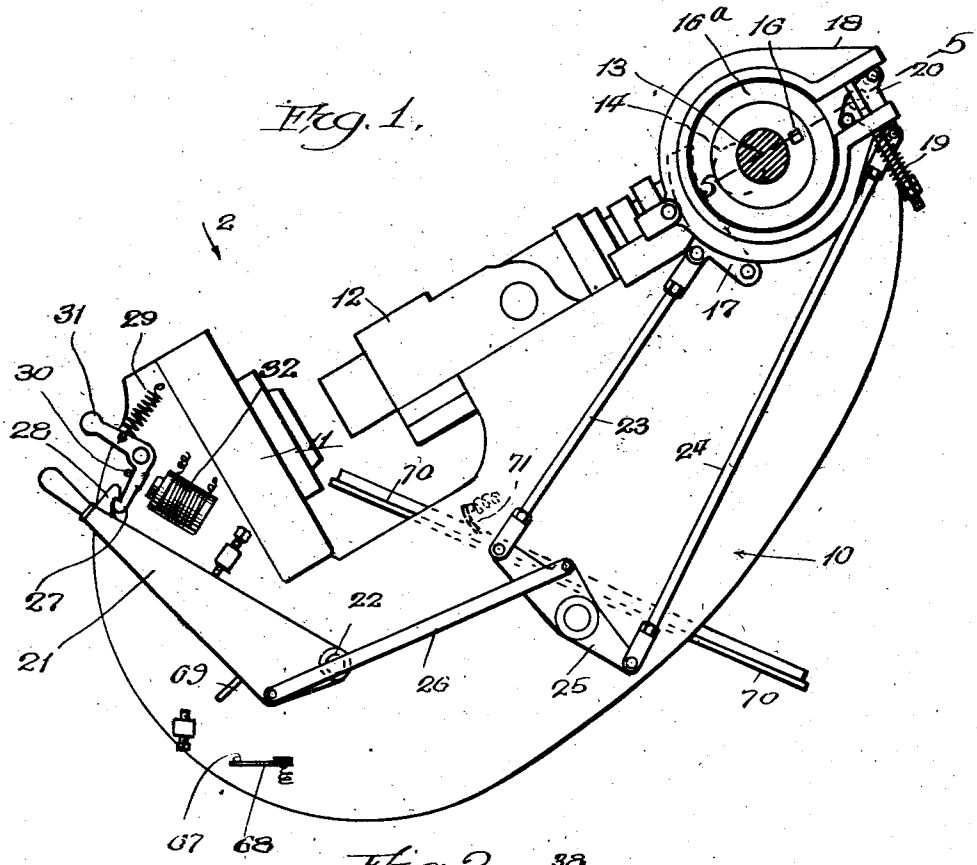
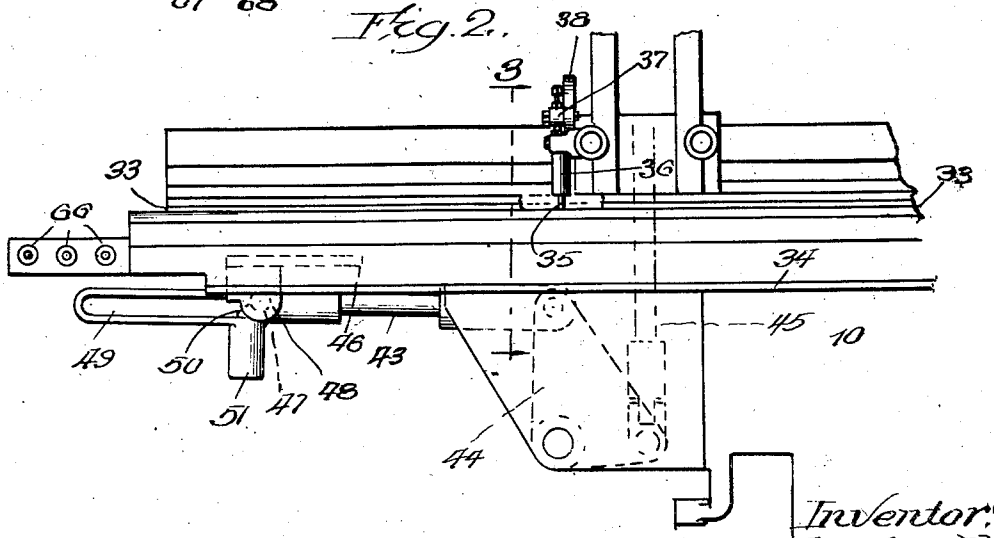


Fig. 2.



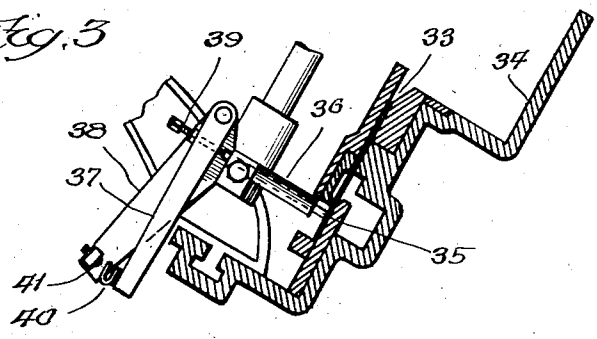
Inventor:
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APPARATUS FOR AUTOMATICALLY STOPPING AUTOMATIC POWER PRESSES

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Fig. 3



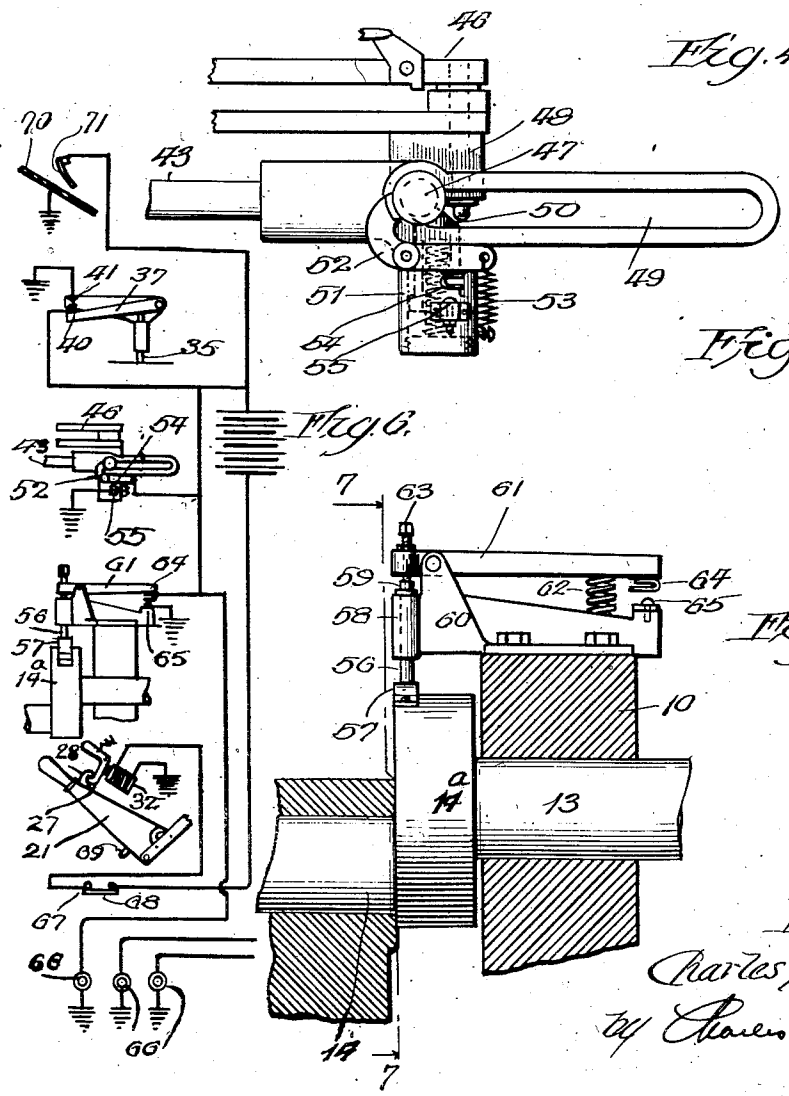


Fig. 4.

Fig. 6.

Fig. 7.

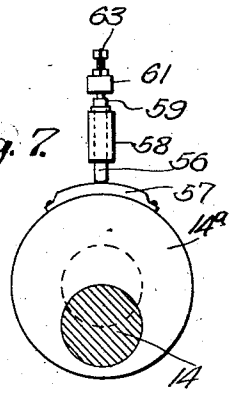


Fig. 5.

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Patented Jan. 3, 1933

1,893,427

UNITED STATES PATENT OFFICE

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APPARATUS FOR AUTOMATICALLY STOPPING AUTOMATIC POWER PRESSES

Application filed April 16, 1927. Serial No. 184,346.

This invention relates to apparatus for automatically stopping automatic power presses, and its principal object is to provide mechanical means for holding the starting lever of the press in starting position in connection with electrically operated mechanism for releasing the starting lever and permitting it to fall by gravity to thereby automatically stop the press in case an emergency arises or whenever it is desired to intentionally stop the press.

Most automatic power presses are entirely automatic in operation. In the type of press to which the present invention has been applied automatic mechanism is employed for inserting strips of material, one at a time, from a stack of strips into the feed way of the press. Automatic mechanism is employed for feeding the inserted strips in a step by step movement through the feed way and delivering them to the dies where the strips are operated upon and the desired articles blanked out therefrom or other operations performed upon the strips. Occasionally more than one strip of material is accidentally inserted into the feed way which makes it necessary to immediately stop the press. Occasionally a jam occurs in the feed way, as for instance one of the strips becomes buckled therein which makes it necessary to instantly stop the press. Occasionally some of the blanked out pieces pile up on each other between the dies or in the discharge chute which makes it necessary to instantly stop the press. Unless the press is stopped under any of these abnormal conditions there is a loss of the material and there is a possibility of serious injury to the press mechanism. Sometimes several presses are employed in a battery, and often the attendant desires to stop any of the presses from his present station. In accordance with the present invention, as soon as any of the abnormal conditions mentioned arise, or in case it is desired to intentionally stop any press of the battery, an electric current is passed through an electromagnet, solenoid or other electrically operated device, and the latter is thereby energized and operates to release the starting lever from its starting position whereupon it swings down and stops the press.

The invention, therefore, consists in mechanical means for holding the starting lever of the press in starting position in connection with an electrically operated release device for said lever holding means, and contained in a normally open electric circuit and having electric connections leading to one or all of the mechanisms referred to, whereby in case an emergency occurs in any of said mechanism which produces an abnormal condition or in case it is intentionally desired to stop a press, the circuit to the electric device is closed and the starting lever is thereby released from the lever holding means and permitted to swing down, thereby applying the usual brake and releasing the usual clutch mechanism of the press and instantly stopping the same. The invention further consists in the several novel features hereinafter fully set forth and claimed.

The invention is clearly illustrated in the drawings accompanying this specification, in which:

Fig. 1 is a side elevation of an automatic power press stripped of much of its operating mechanism and showing a simple form of the present invention applied thereto; Fig. 2 is a view of the press seen in Fig. 1 looking in the direction of the arrow 2 and illustrating the feed table and mechanism connected therewith; Fig. 3 is a vertical cross section taken on the line 3—3 of Fig. 2; Fig. 4 is a fragmentary rear elevation of the strip feeding mechanism; Fig. 5 is a detail cross section taken on the line 5—5 of Fig. 1 of the crank shaft of the press; Fig. 6 is a diagrammatic view of the electric circuits, and Fig. 7 is a detail vertical cross section taken on the line 7—7 of Fig. 5.

Referring to said drawings and first to Fig. 1 the frame or body of the press will be seen at 10 and in accordance with the common practice has a bed 11 for holding the stationary dies and a ram 12 for holding the companion movable dies, the ram being operated from a crank shaft 13 by cranks, a fragment of one of which is shown at 14 in Fig. 5. The invention is illustrated in connection with

automatic power presses of the type containing clutch and brake mechanism for controlling the operation of the press, strip inserting mechanism, strip feed mechanism and drive mechanism as is more fully shown and described in my prior patent as follows: Letters Patent No. 1,039,565, dated September 24, 1912. Usually a drive wheel (not shown) is provided for driving the crank shaft 13, and clutch mechanism is provided between the drive wheel and crank shaft which embodies a brake drum 16^a on the crank shaft, a clutch pin 16 engaging in said brake drum and drive wheel, and a clutch shoe 17, which clutch shoe operates to retract the pin when brought into engagement therewith and thereby disconnect the drive wheel from the crank shaft. Brake mechanism 18 is employed for applying a braking action on the brake drum of the crank shaft and the brake shoes of the brake mechanism are pressed upon the brake drum by a spring 19 as usual. A brake shoe spreader 20 is usually employed between the two brake shoes to spread them apart and when it is desired to release the brakes. The clutch and brake mechanisms are operated by a starting lever 21 fulcrumed on the side of the press body as at 22, and the connecting mechanism between the clutch and brake mechanism and the starting lever usually comprises links 23, 24 connected respectively to the clutch and brake mechanism and connected to a rocking lever 25 fulcrumed on the side of the press body and connected to the starting lever 24 by a link 26. The arrangement of the parts described is such that when the starting lever occupies the position seen in Fig. 1 the clutch pin has been released from a retracted position, thereby connecting the drive wheel with the crank shaft, and the brake shoes of the brake mechanism have been spread apart so as to release the brake drum, thereby permitting the press to operate. The press is stopped by swinging down the starting lever 21, and in accordance with the present invention said starting lever is held in its starting position by a mechanical device, and when released from said device and permitted to fall, it swings down under the influence of gravity thereby actuating the clutch and brake mechanism in a direction to retract the clutch pin and apply the brake.

The simple means illustrated for holding the starting lever in starting position comprises a latch device of some form as for instance a hook member 27 fulcrumed on the press body and arranged to engage with the starting lever or a co-acting hook member 28 thereon. In the form shown, a spring 29 connected to the hook member and to the press body, is provided for yieldingly holding the hook member 27 in position for engagement with the hook member 28 of the starting lever and a stop 30 is provided for stopping the hook member 27 at its operative position for engagement with the hook member 28. The latch device positively holds the starting lever in operative position and a knob or handle 31 is provided on the latch device 27 whereby it may be manually operated to disconnect it from the starting lever whenever it is intentionally desired to stop the press. In connection with the latch device is electrically operated release means for the latch device which will now be described.

Located adjacent the hook member is an electromagnet, a solenoid or similar electric device 32 which operates when energized to attract the hook member 27 and disengage it from the starting lever, whereby the starting lever may fall by gravity and stop the press. The electromagnet is contained in normally open electric circuits as seen in Fig. 6 and the circuits are arranged to be closed at any of the several places on the press which are likely to be placed under abnormal conditions. One circuit is also arranged to be closed by an ordinary push button located at a convenient place on the press or one located upon an adjacent press whereby any press of a battery of presses may be stopped by a person standing at any one of the presses.

Referring now to Figs. 2 and 3 the usual feed way, through which the strips of material are fed to the dies is seen at 33, and as is well understood the strips of material are fed from a stack of strips held upon a table 34 and inserted into said feed way by automatically operating strip inserting mechanism. Entering said feed way 33 is a push pin or plunger 35 which is guided in a sleeve like guide member 36 mounted upon the frame work of the press and arranged to engage with a throw amplifying lever 37 fulcrumed at one end upon a bracket 38 which usually forms part of the guide member 36 for the push pin or plunger 35. Usually an adjustment screw 39 is provided upon the throw amplifying lever 37 for engagement with the push pin or plunger 35. Said lever 37 is arranged to close the circuit through the electromagnet 32 whenever the pin or plunger 35 is lifted a greater distance than that which it is lifted when a single strip of material contacts with the pin in the feed way. Contact pieces 40, 41 are provided on the lever 37 and supporting bracket 38, respectively, which form terminals of an electric circuit for the electromagnet 32 (see Fig. 6). It will be observed that the contact pieces 40, 41 are normally held in spaced relation and that when more than one thickness of material is inserted into the feed way the push pin or plunger 35 will be lifted slightly beyond that caused by the insertion of one thickness of material, and this motion will be transmitted through the throw amplifying lever 37 to the contact piece 40 which will be moved into contact with the contact piece 41 and the circuit

through the electromagnet closed, whereby the latter is energized, the hook member 27 disengaged from the starting lever and the latter permitted to swing down thereby stopping the press.

As is well understood the mechanism which feeds the strips through the feed way is reciprocated by finger bar mechanism 46, actuated by certain operating mechanism of the press usually including a connecting rod 43, one end of which is connected to a bell crank lever 44, which receives a rocking motion from a link 45 operated by the press mechanism. The connecting rod is connected to the finger bar mechanism 46 by a pin or stud 47, which projects from a member 48 of the finger bar mechanism and enters a slot 49 in the connecting rod whereby the connecting rod may reciprocate independently of the finger bar mechanism in case a jam occurs in the feed way. As shown the pin 47 projects through the slot 49 of the connecting rod and is releasably held in an offset portion at one end thereof by an upwardly spring pressed pin 50 slidably mounted in a housing 51, which is formed on the bottom of the connecting rod. The upper end of the spring pressed pin 50 engages with the rounded lower side of the connecting pin 47. During normal conditions, the spring pressed pin 50 holds the connecting pin 47 in the offset end of the end of the slot 49, but in case a jam occurs in the feed way, the resistance to the finger bar mechanism and connecting pin 47 is sufficient to overcome the pressure in the spring back of the pin 50 whereupon as the connecting rod starts to move relative to the finger bar mechanism and connecting pin 47, the spring pressed pin is depressed by the connecting pin 47 thereby permitting the connecting rod to move independently of the finger bar mechanism. Means is provided in connection with the connecting rod and finger bar mechanism for closing a circuit through the electromagnet whenever the connection between the connecting pin 47 and connecting rod 43 is broken, and as shown said means comprises a lever 52 fulcrumed upon the housing 51 and held in engagement with a connecting pin 47 by a spring 53. Contact pieces 54, 55 are provided on said lever 52 and housing 51, respectively, which contact pieces comprise terminals in the electromagnet circuit and are normally held out of contact. In case of a jam in the feed way, however, and the connecting pin 47 being thereby disconnected from the connecting rod 43, the lever 52 becomes disengaged from the connecting pin and the spring 53 swings down the long arm of the lever 52 bringing the contact piece 54 into contact with the contact piece 55 and thereby closing the circuit through the electromagnet causing the starting lever to be released and permitting it to swing down and stop the press as before described.

In cases where two or more blanked out pieces lodge upon each other between the dies, a strain is placed upon the crank shaft and other parts, which is likely to cause serious injury. In order to automatically stop the press in the case of such emergency, I provide a push pin or plunger 56 above the cheek 14ª of the crank shaft and provide a cam block 57 on the cheek, which is arranged to normally pass by said push pin 56 without moving it, but which is arranged to engage said push pin and lift the same in case a strain is placed upon the crank shaft such as is occasioned by the presence of two or more blanked out pieces piling up on each other between the dies. The push pin 56 is guided in a guide member 58 and has a head 59 resting on the top thereof, which supports the push pin in position permitting the cam block 57 to pass idly by the same under normal working conditions between the dies. The guide member 58 is formed upon a bracket 60 bolted or otherwise secured to the press body 10 and on said bracket is fulcrumed a throw amplifying lever 61, the short end of which is held in contact with the push pin as for instance by a coiled spring 62. As a preference an adjustment screw 63 is employed in the short arm of the throw amplifying lever 61 for engagement with the push pin 56. Contact pieces 64, 65 are provided upon the throw anplifying lever 61 and some stationary piece, such as the bracket 60, which contact pieces are normally held out of contact, but which are arranged to be brought into contact whenever the crank shaft is forced upward under abnormal conditions between the dies, and the cam block 57 is brought into lifting engagement with the push pin 56. The contact pieces 64, 65 form terminals of an electric circuit for the electromagnet 32, which circuit is normally open, but when closed by the contact pieces 64, 65 permits the electromagnet to be energized thereby releasing the starting lever and permitting it to fall, stopping the press as heretofore explained. There is the usual clearance between the crank shaft and its bearings. When the press is operating under normal load, that is, on a single thickness of material, the shaft 13 will be forced against the bearing, but there will not be any material flexing of the shaft, and the cam block 57 will not be raised sufficiently to close the contacts 64 and 65. Under overload, when, for example, two thicknesses of material are placed in the press, then the shaft 13 will be flexed, and this flexing of the shaft will carry the cheek 14ª upward, raising the cam block 57 so as to close the contacts 64 and 65, and this will bring about the stopping of the machine. Some of the flexing of the shaft takes place in the bearings for the shaft, and other portions of the flexing takes place in the crank 14 itself.

The blanked out pieces fall upon a chute

70 and are discharged by said chute as is well understood. Sometimes the pieces fail to discharge from the chute and pile up therein and the press must be stopped. I have provided a contact piece 71 above the chute in a circuit with the magnet device 32, and spaced sufficiently above the chute to permit the blanked out pieces to pass by freely. When, however, the pieces pile up in the chute and contact with the contact piece 71 the magnet circuit is closed, the magnet energized and the latch device disconnected from the starting lever, thereby permitting it to fall and stop the press.

Any one of the devices described automatically stops the press in case of an emergency taking place in or about the mechanisms above described. In situations where a battery of presses containing two or more presses are used push buttons 66 may be provided at some convenient place on each press which push buttons may be in electric circuits running to the electromagnets of the several presses whereby any press of the battery may be stopped instantaneously by an attendant at any one of the presses by pressing the push button for the selected press and closing the circuit to the magnet 32 of that press.

Inasmuch as the contact pieces of any automatic circuit closing device described are likely to remain closed until the press is again started, I have provided a switch or other circuit breaking device below the starting lever 21, arranged to be operated whenever the starting lever is permitted to fall to its position wherein it stops the press. As shown in Fig. 1 this device may comprise a stationary contact piece 67 and a movable spring pressed contact piece 68 normally held in contact with the stationary contact piece and lying in the path of movement of the starting lever or a lug or other projection 69 thereon.

When the starting lever is lowered, the pin or other projection 69 engages the movable contact piece 68 and moves it out of contact with the stationary contact piece thereby breaking the circuit to the electromagnet. The electric circuits for the several instruments are diagrammatically illustrated in Fig. 6 where it will be seen that if contact is made between any of the open contact points a current will pass through the electromagnet, whereby the same will be energized and the hook member 27 attracted and disconnected from the starting lever, whereby the starting lever is permitted to swing down and stop the press. As soon as the starting lever strikes the contact piece 68 it breaks the electromagnet circuit. The attendant thereupon removes the material which caused the press to be stopped, which permits the contacting contact pieces to separate, and then lifts the starting lever into starting position, in engagement with the hook member 27 which is now held in position for engagement with the starting lever, since the magnet circuit is now open.

It will be observed that the latch device 27 operates to positively hold the starting lever 21 in operative position and entirely independent of any electrical device and may be manually operated to disconnect it from the starting lever to permit the latter to swing down and stop the press. Furthermore that the electrically operated mechanism is in a normally open circuit which is closed automatically when an emergency occurs or when it is closed intentionally by an attendant pressing the button 66. The only purpose of the electromagnet, solenoid or other electrical device 32 is to release the latch device from the starting lever so as to permit it to fall. Furthermore the circuit is broken immediately when the lever has fallen to stopping position, and the circuit cannot be closed until after the starting lever has been raised into starting position.

More or less variation of the exact details of construction is possible without departing from the spirit of this invention; I desire, therefore, not to limit myself to the exact form of the construction shown and described, but intend, in the following claims, to point out all of the invention disclosed herein.

I claim as new, and desire to secure by Letters Patent:

1. Stop motion mechanism for automatic power presses having press mechanisms comprising a crank shaft, a strip feed way and strip feeding mechanism, said stop motion mechanism including a manually operated clutch shifting starting and stopping lever, lever holding means engaging said lever and holding the same in its starting position, an electromagnetic device acting upon said lever holding means, when energized, to disengage said means from said lever, whereby the latter may automatically move to stopping position, said lever holding means having a member whereby it may be actuated independently of the electro-magnetic device, and said electro-magnetic device being contained in an open circuit, and circuit closing means including a throw amplifying lever and a push pin associated with one of said press mechanisms, said push pin being arranged to be acted upon by superfluous material.

2. Stop motion mechanism for automatic power presses having a crank shaft, dies, a strip feed way and strip feeding mechanism, said stop motion mechanism including a manually operated clutch shifting starting and stopping lever, lever holding means engaging said lever and holding the same in its starting position, an electro-magnetic device acting upon said lever holding means, when energized, to disengage said means from said lever, whereby the latter may automatically move to stopping position, said electromag-

netic device being contained in an open circuit, and circuit closing means located adjacent the crank shaft of the press and having a throw amplifying lever, and a push pin arranged to be actuated by a cam on the crank shaft, under abnormal conditions arising between the dies of the press.

3. Stop motion mechanism for automatic power presses having a crank shaft, dies, a strip feed way and strip feeding mechanism, said stop motion mechanism including a manually operated clutch shifting starting and stopping lever, an electromagnetic device, manually operable means, independent of the electromagnetic device, engaging said lever and holding the same in its starting position, said electromagnetic device acting upon said manually operable lever holding means, when energized, to disengage said means from said lever, whereby the latter may automatically move to stopping position, said electromagnetic device being contained in an open circuit, and circuit closing means located adjacent the crank shaft of the press and having a throw amplifying lever, and a push pin arranged to be actuated by a cam on the crank shaft, under abnormal conditions arising between the dies of the press.

4. In stop motion mechanism for automatic power presses, a manually operated and gravity operated clutch shifting starting and stopping lever, a manually operable latch device adapted to directly engage said lever when in starting position and to positively hold said lever in starting position, in combination with an electromagnetic device, contained in a normally open circuit, and operating when energized, to disconnect the latch device from the starting and stopping lever, automatic means for closing the circuit through said electromagnetic device, and circuit breaking means operated by said starting and stopping lever, when released from said latch device, to break said circuit.

5. An automatic power press including in combination a manually operated clutch shifting starting and stopping lever movable automatically to stopping position, latching means for holding said lever in starting position, said latching means having a member whereby it may be manually operated for releasing said starting lever for stopping the press, an electromagnetic device associated with said latching means and operating to release said latch for releasing the starting lever for stopping the press, and circuit closing means for said electromagnetic device including a throw amplifying press actuated contact making lever.

6. An automatic power press including in combination, a crank shaft, a crank carried thereby, a manually operated clutch shifting starting and stopping lever movable automatically to stopping position, latching means for holding said lever in starting position, an electromagnetic device associated with the latching means and operating to release said latch for releasing the starting lever for stopping the press, a circuit closing means for said electromagnetic device including a member positioned relative to the shaft so that the flexing of the shaft due to overload will operate through said member to close the circuit for said electromagnetic device and stop the machine.

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