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SAFETY DEVICE FOR POWER PRESSES

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2 Sheets-Sheet 1

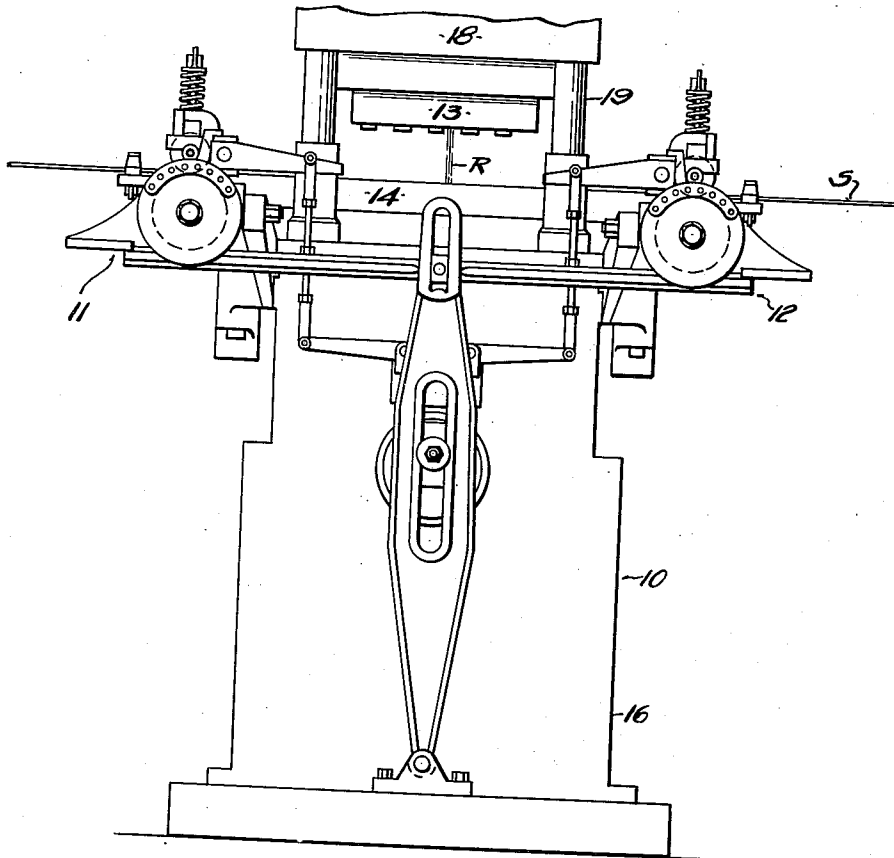


Fig. 1

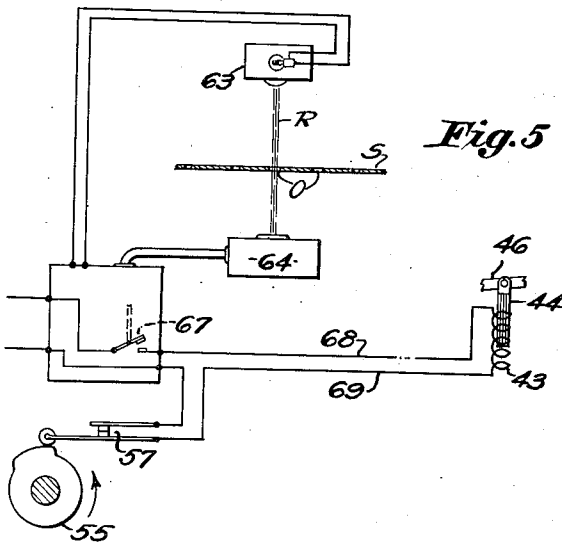


Fig. 5

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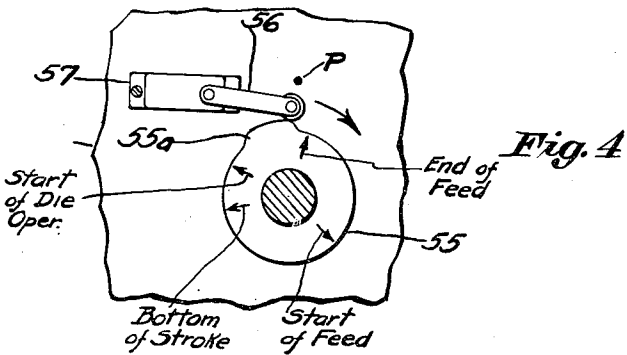
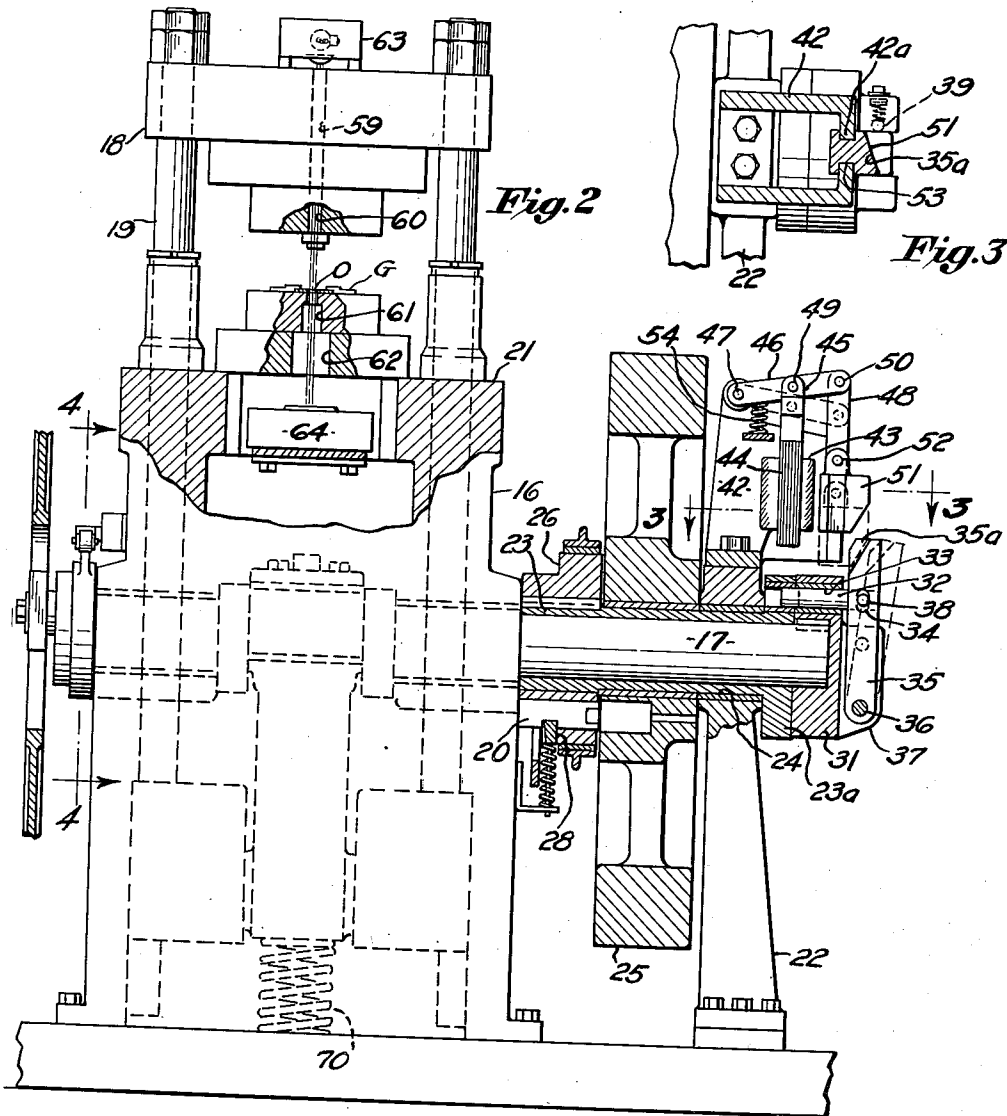
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SAFETY DEVICE FOR POWER PRESSES

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4 Claims. (Cl. 192-127)

This invention relates to safety devices for protecting power presses and the dies thereof from damage which may be occasioned by improper positioning of the subjects therein.

The invention relates more particularly to high speed presses which are supplied with strip feeding devices for advancing strip material through dies of the progressive forming or punching type. In this type of equipment, the strip feeding devices often fail to advance the strip properly, and before the fault, whatever its cause, is remedied, the dies are subjected to dangerous stresses, often resulting in breakage which may take weeks to repair or replace.

It is an object of the present invention to provide a safety device which will function to stop the press immediately after an improper feeding operation occurs. In accomplishing this, there is utilized a photo-electric control for a novel tandem clutch connection for the drive means of the press, which permits full control of the press, even in the higher speed ranges, without affecting the normal operation or control of the press in any way.

The more specific aspects of the invention will be better understood by reference to the accompanying specification and drawings, wherein:

Fig. 1 is a side elevation of the power press to which the safety device of the invention is applied;

Fig. 2 is an enlarged end view thereof, with portions shown in cross section;

Fig. 3 is a section on the line 3-3 of Fig. 2;

Fig. 4 is a section on the line 4-4 of Fig. 2;

Fig. 5 is a diagrammatic view showing the safety device control circuits.

The invention is shown organized with a power press 10, which, as shown in Fig. 1, is supplied with roll feed units 11, 12 for intermittently advancing a strip S of metal between the dies 13, 14 of the press. The press will be recognized by those skilled in the art as being of a well known type, which is particularly well suited for high speed precision work, especially where multiple operations are performed on the strip S in its step-by-step advance between the dies 13, 14.

The body 16 of the press carries a horizontal crankshaft 17, which drives an overhead slide or punch carrier 18 through vertical connecting rods 19. The body 16 is formed with a bolster portion 21 on which the lower dies 14 are supported. It will be observed that the lower dies 14 carry guides G for the strip stock S, whereby

the strip is properly supported during the successive punching or forming operations.

The right hand end of the crankshaft 17 extends through an outboard bearing pedestal 22 (Fig. 2) and it carries a loose sleeve 23 which is rotatably mounted in the bearing portion 24 of the pedestal 22. The sleeve 23 serves to rotatably carry a driving element or driven flywheel 25 and a keyed clutch drum 26. A clutch pin 20 is slidably carried in the drum 26, and it is movable to couple the flywheel and drum through a well known control mechanism including a clutch lever 28 and a suitably connected pedal 30.

A coupling member 31 is rigidly secured to the extremity of the crankshaft 17 which projects beyond the bearing pedestal 22, and such member carries a slidable safety pin 32 which may be entered in a bushed hole 33 in the adjoining flanged end 23a of the sleeve 23. It will thus be seen that the flywheel 25 is connectable with the crankshaft through the drum 26 and its accompanying sleeve 23 by means of the clutch pin 20 and the safety pin 32.

An arm 35 is pivotally mounted on the exterior of the coupling member 31 by means of a pivot stud 36 which is secured in lugs 37 formed on such member. The free end of the arm 35 is formed with a cam portion 35a, and it also contains a slot 34 for receiving a dowel 38 which is entered in the extremity of the safety pin 32. A spring-pressed ball detent 39 is carried by the coupling member 31, and it engages the side of the arm 35, so the arm is normally held in its inner position with the safety pin 32 entered in flanged end 23a of the sleeve 23.

A mechanism for causing the disengagement of the safety pin 32 is carried by the bearing pedestal 22, and it consists of a bracket 42 which is secured to the pedestal 22. A solenoid coil 43 is secured in the bracket 42, and the coil carries a core 44, whose upper end is formed with a clevis portion 45. A lever 46 is pivoted to the bracket by a pin connection 47, and it is also connected to the clevis portion 45 and to a link 48 by pins 49 and 50, respectively. The lower end of the link 48 is connected to a cam member 51 by a pin 52, and it will be seen in Fig. 3 that the cam member 51 has slide portions 53 which are received in slideways 42a formed in the bracket 42. A spring 54, carried by the bracket 42, engages the lever 46 and normally retains the solenoid core 44 and cam member 51 in the raised and inoperative position shown in Fig. 2.

The left hand end of the crankshaft 17 is fitted with a cam 55 (Fig. 4), whose lobe 55a is adapted to throw the arm 56 of a switch 57 to close an electric circuit of the solenoid coil 43, as will later be more fully described.

Fig. 4 is supplied with a timing index on the crankshaft, showing the movements of the several elements of the power press with reference to a point P on the body 16. It will be noted that immediately after the roll feed units 11, 12 have advanced the strip S to a new fixed position, the cam lobe 55a lifts the switch arm 56 momentarily to its closed position, and that following this period the dies start their actual work on the metal strip S, which work terminates at the bottom of the stroke of the press.

In Fig. 2 it will be seen that the overhead slide 18 and one of its dies 13, together with the mating lower die 14, are formed with aligned apertures 59, 60, 61, 62, which register with an opening O in the strip S. The opening O may be a punched hole, a notch, or any formed opening in the strip S which may be the result of preceding die operations thereon. A lamp and lens assembly 63 of a photo-electric cell unit is secured to the top of the slide 18, so that the ray R may be directed accurately through the described apertures and into the light-sensitive cell portion 64 of the assembly. The portion 64 may be arranged within the bolster 21, as shown, or, if sufficient space is available, it may be mounted within the lower die 14 (not shown).

Referring now to Fig. 5, it will be seen that the cell portion 64 is connected to an amplifier-relay unit 65 by a connection 66, and it will be assumed that when the cell portion 64 is energized by ray reception, the relay unit 65 will be caused to operate a switch 67 which opens the solenoid circuit 43, 44.

It will now be understood that when the strip S is properly advanced to a new position, the ray will project through the opening O in the strip S, and thus the switch 67 will be operated to open the solenoid circuit. Immediately following this action, the cam controlled switch 57, which is in series with the switch 67, will be closed, and under the circumstances the solenoid will remain deenergized.

In the event that the strip S is not properly advanced, it will be apparent that an opening O therein will not register properly, and as a result the switch 67 will remain closed. When the cam-controlled switch 57 is subsequently closed, then the solenoid will be energized and the cam member 51 dropped to a position where it will be engaged by the rotating cam portion 35a (Figs. 2 and 3). This will cause the safety pin 32 to be withdrawn from the hole 33 in the sleeve 23, and the crankshaft will accordingly be free of its driving connection. In view of the fact that the crankshaft meets considerable resistance on this portion of the down stroke, due to a counter-balance spring 70 and to pressure pads (not shown) in the dies themselves, it will be apparent that the crankshaft will be brought to a stop before the dies are actually engaged in the improperly positioned strip S.

The improper feeding of the strip S may be caused by a number of conditions, including wedging of the strip in the guides G, due to deformed or oversize strip stock. Regardless of

the cause, any failure of the feed units 11, 12 to advance the stock properly will result in the immediate functioning of the safety device to protect the dies 13, 14, and the press itself, from rupturing stresses.

It will be apparent to those skilled in the art that the control instrumentalities involving the circuit arrangement and the responsive elements therein which control the operation of the safety pin, may be varied in numerous manners, depending upon the type of press used, the die set-up, and other factors, without departing from the scope of the invention as set forth in the following claims.

I claim:

1. In a power press having an intermittent strip feed device and die units for forming the strip, a photo-electric device positioned to react to improper positioning of the strip in the dies, a crankshaft for the press, drive means for the crankshaft, a clutch drum on the crankshaft having means for engaging the drive means, a connection between the drum and crankshaft, and means controlled by said photo-electric device for disengaging said connection.

2. In a power press having an intermittent strip feed device and die units for forming the strip, a crankshaft for the press, drive means for the crankshaft, a clutch drum on the crankshaft, separate clutch pin means connecting the drum to the drive means and to the crankshaft respectively, solenoid operated means for disengaging one of said pin means, manually operable means for disengaging or engaging the remaining pin means, a photo-electric device positioned to react to improper positioning of the strip in the dies, and means controlled by said photo-electric device for energizing said solenoid.

3. In a power press having an intermittent strip feed device and die units for forming the strip, a photo-electric device positioned to react to improper positioning of the strip in the dies, a crankshaft for the press, drive means for the crankshaft, a connection between the drive means and crankshaft, electrically operated means for disengaging said connection, timing means for energizing the circuit of said electrically operated means in timed relation to the power stroke of the press, switch means in series with said timing means, and means controlled by said photo-electric device for closing said switch means upon reaction of the photo-electric means to improper strip positioning.

4. In a power press having an intermittent strip feed device and die units for forming the strip, a crankshaft for the press, drive means for the crankshaft, a clutch drum on the crankshaft, separate clutch pin means connecting the drum to the drive means and to the crankshaft respectively, manually operable means for engaging or disengaging one of said pin means, an arm carried by the crankshaft and being connected to said remaining pin means, cam means movable into the path of said arm to move said arm and associated pin out of drum-engaging position, a photo-electric device positioned to react to improper positioning of the strip in the dies, solenoid means for operating said cam means, and means controlled by said photo-electric device for energizing said solenoid.

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