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2,826,286

SAFETY LOCKING DEVICE FOR A PUNCH PRESS OR THE LIKE

Filed July 20, 1953

2 Sheets-Sheet 1

FIG. 1

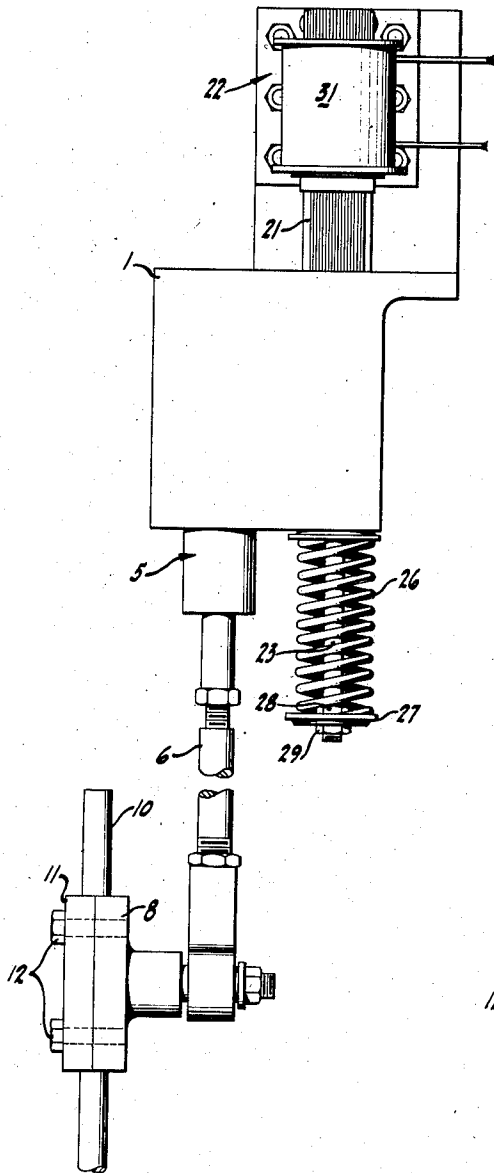
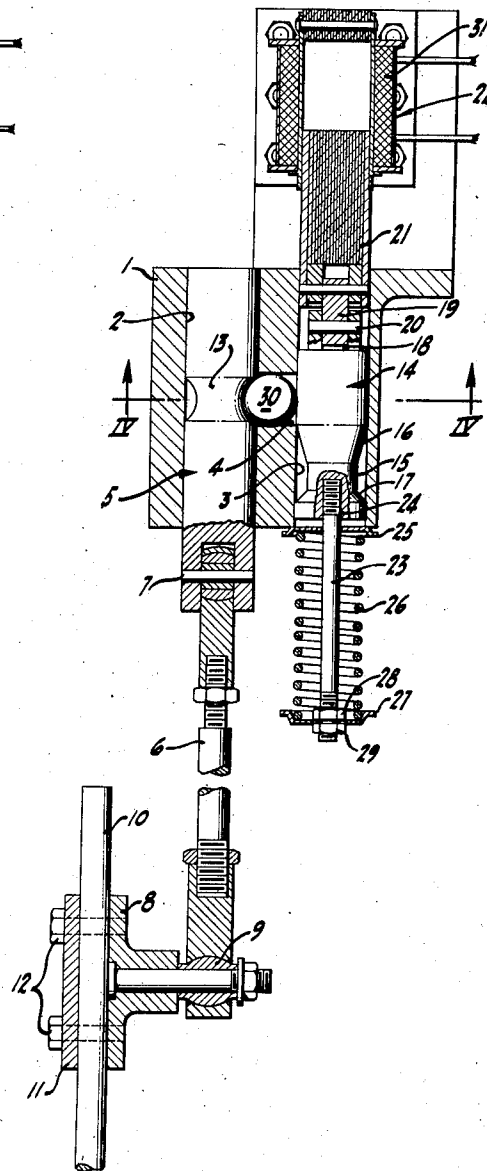


FIG. 2



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FIG. 3

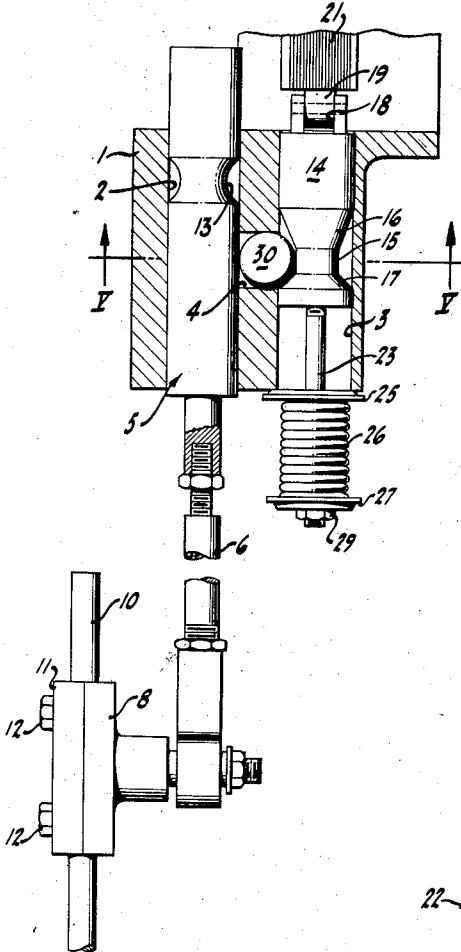


FIG. 4

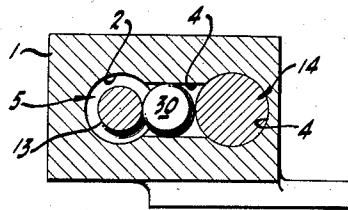


FIG. 5

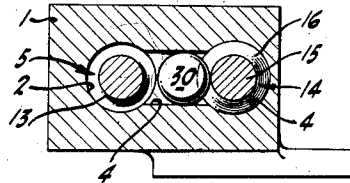
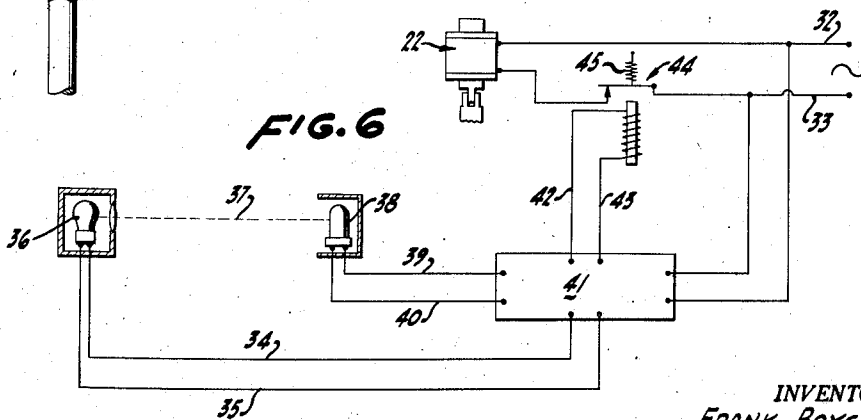


FIG. 6



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SAFETY LOCKING DEVICE FOR A PUNCH PRESS OR THE LIKE

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6 Claims. (Cl. 192-130)

This invention relates to a safety stop device for use with a punch press or the like, of the type having a photoelectric circuit beam across the operating zone to sense the presence of foreign objects in this zone.

The photo-electric sensing circuit is conventional and forms no part of the instant invention. This circuit is shown and described only to make a complete operative disclosure of the use of the applicant's safety device.

One object of the invention is to prevent accidental tripping of the press when the operator's hand, or other part of his body, is between the dies in the operating zone of the press.

A further object of the invention is to prevent the reciprocation of the operating plunger of the press in the event of a power failure in the safety device circuit.

Various other objects of the present invention will be apparent from the following description taken in connection with the accompanying drawings, wherein:

Fig. 1 is a side elevation of the safety device.

Fig. 2 is a sectional view similar to Fig. 1 showing the elements in the lock position.

Fig. 3 is a similar view to Fig. 2 showing the elements in the unlocked position.

Fig. 4 is a sectional view taken on line IV-IV of Fig. 2.

Fig. 5 is a sectional view taken on line V-V of Fig. 3.

Fig. 6 is a circuit diagram showing the electrical connections for the device.

It is customary in presses of the type mentioned above to have a trip mechanism operated by a treadle controlled rod to trip the press for each cycle of operation.

The device described herein is adapted to lock said trip rod, herein shown at 10, against longitudinal movement and consists of a frame 1, having two parallel longitudinally extending bores 2 and 3, and a transverse bore 4 connecting said two longitudinal bores 2 and 3. Said frame 1 being adapted to be attached to a fixed portion of a press with the axis of said longitudinal bores substantially parallel to the axis along which the trip rod 10 reciprocates. A cylindrical operating plunger 5 is reciprocally mounted in one of said vertical bores 2. Said plunger has a hemispherical annular recess 13 formed in the surface thereof intermediate its ends. A link 6 is pivotally connected at one of its ends to the lower end of said operating plunger 5 by means of a pin 7. A bracket 8 is connected to the other end of said link 6 by means of a ball joint 9, said bracket having a cover plate 11 and cap screws 12, whereby it may be attached to the trip rod 10 of the press.

A cylindrical locking plunger 14 is reciprocally mounted in the other of said parallel vertical bores 3. Said locking plunger 14 having an annular reduced portion 15 intermediate the ends thereof, and tapered portions 16 and 17 connecting said reduced portion with the remainder of said plunger. A slot 18 is formed in the upper end of said lock plunger. A link 19 having one end in said slot 18 is pivotally connected to said lock plunger 14 by means of a pin 20. The other end

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of said link being pivotally connected to the plunger 21 of a solenoid, generally indicated in Fig. 1 at 22 will be described in more detail below. Said solenoid is fastened to said frame 1 above and concentric with the bore 3.

A stud 23 is threaded into the lower end of said locking plunger 14 at 24 and extends beyond the lower surface of said frame 1. A spring retainer 25 bears against the lower surface of said frame 1. A compression spring 26 surrounding said stud 23 has one end bearing against said retainer 25 and the other end against a retainer 27, fixed to the lower end of said stud 23 by means of nuts 28 and 29, whereby said locking plunger is normally urged downwardly both by its own weight and by the action of spring 26.

A locking ball 30 is positioned in said transverse bore 4. Said ball having a diameter greater than the distance between said bores, whereby a portion of the ball is forced to project into one or the other of the vertical bores 2 and 3.

The solenoid 22 is more specifically shown in Fig. 2 and comprises a coil 31 wound with 2,000 turns of #29 wire having a resistance of 40 ohms. The wire used is a very highly insulated wire of the type known as Forbes wire, and a plunger 21 made of laminated strips of metal as shown in Fig. 2.

Fig. 6 shows a wiring circuit for a typical installation of the instant device in connection with a punch press. 32 and 33 indicate the lead in wires from a common source of 120 v. A. C. current. The lamp 36 is energized by a circuit indicated by leads 34 and 35 and produces a beam of light, indicated by dash line 37, directed against the photo-electric cell 38. Photo-electric cell 38 is in turn connected to an amplifier, generally indicated by box 41, by wires 39 and 40. The output of the amplifier 41 is connected by wires 42 and 43 to the field coil of heavy duty, normally open, relay 44 interposed in the circuit 32, 33 of the solenoid 22. The relay is biased toward the open position by spring 45.

The operation of the device is as follows. When the leads 32, 33 are connected to a conventional 120 v. A. C. the lamp 36 is energized and transmits beam 37 to photo-electric cell 38. The output of the photo cell is transmitted through amplifier 41 to relay 44 thus closing the contact points and energizing the solenoid 22. When the solenoid is energized the lock plunger 14 is drawn upward by the solenoid plunger 21 and connecting link 19 thus compressing the spring 26. This movement of the lock plunger places the reduced portion 15 adjacent the transverse bore 4, as illustrated in Fig. 3. When the lock plunger is in this position the locking ball 30 is permitted to extend into the bore 3 and the operating plunger 5 is free to reciprocate in the bore 2 in conjunction with the action of the trip rod 10 to which it is attached.

If for any reason, the photo cell becomes de-energized, for example, by an obstruction such as a hand being placed in the path of the light beam 37, or a power failure causes lamp 36 to go out, then the relay 44 opens under the influence of spring 45, the solenoid 22 is de-energized, and the lock plunger 14 is moved down to the position shown in Fig. 2 by spring 26. When moving to this position, the tapered portion 16 of the lock plunger forces the ball 30 into the recess 13 of the operating plunger 5 and effectively locks the trip rod 10 to which it is attached, against any further movement.

While one specific embodiment of the instant invention has been shown and described in detail the invention is not to be construed as limited thereby, but is only limited to the extent set forth in the appended claims.

Having thus described my invention, what I claim and desire to be secured by Letters Patent is:

1. For use with a machine having a fixed portion, an

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operating zone and a reciprocating element, a safety device comprising: an operating plunger mounted for reciprocation in said frame and adapted to be attached to and reciprocate with said reciprocating element, said plunger having a hemispherical recess in the surface thereof, a lock plunger mounted for reciprocation in said frame along an axis parallel to the axis of reciprocation of said operating plunger, said lock plunger having an inwardly tapered recess formed in the surface thereof, means responsive to an obstruction in the operating zone of said machine for moving said lock plunger longitudinally in one direction, a lock ball between said plungers having a greater diameter than the distance between the surfaces of said plungers, and constrained for movement only in a direction normal to the axis of movement of the plungers, whereby upon movement of said lock plunger in said one direction the tapered wall of the recess forces the lock ball into the recess in said first plunger and effectively locks said plunger against further movement, and movement of the lock plunger in the other direction permits the ball to enter the recess in said lock plunger permitting unobstructed reciprocation of said operating plunger.

2. A device as set forth in claim 1 wherein: said plungers are cylindrical, and said recesses are grooves cut into the outer surfaces of said plungers.

3. For use with a machine having a fixed portion, an operating zone and a reciprocating element, a safety locking device comprising: a frame adapted to be fastened to the fixed portion of the machine, said frame having two parallel longitudinal bores therein, a cylindrical plunger reciprocally mounted in one of said bores, said plunger having a hemispherically reduced portion intermediate its ends, a link connected at one of its ends to one end of said plunger, a clamp pivotally connected to the other end of said link and adapted to be affixed to the reciprocating element of said machine, a cylindrical lock plunger reciprocally mounted in the other of said bores and having an inwardly tapered groove formed in the surface thereof intermediate its ends, a solenoid coil mounted on said frame above and concentric with said second mentioned bore, a plunger in said solenoid coil, a link having one end pivotally connected to said solenoid plunger and the other end pivotally connected to the upper end of said lock plunger, a stud having a head

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thereon, said stud being fixed to the lower end of said lock plunger and extending beyond the lower end of said bore, a compression spring surrounding said stud and bearing against the lower face of said frame and the head of said stud, means for projecting a light beam across the operating zone of said machine, a photoelectric cell mounted in the path of said slight beam so as to be actuated thereby, means to energize said solenoid in response to the actuation of said photoelectric cell and to de-energize said solenoid when said light beam actuating said photoelectric cell is interrupted, a transverse bore in said frame connecting said two parallel bores intermediate the ends thereof, a locking ball in said transverse bore, said ball having a larger diameter than the distance between the surfaces of said two parallel longitudinal bores.

4. A device as set forth in claim 3 in which said solenoid coil is made up of substantially two thousand turns of very high insulated wire having a resistance of substantially 40 ohms.

5. A device as set forth in claim 1 wherein said lock plunger moving means includes a solenoid coil adapted to move said lock plunger in said one direction, and wherein said lock plunger is spring biased in the opposite direction.

6. A device as set forth in claim 2 wherein said lock plunger moving means includes a solenoid coil adapted to move said lock plunger in said one direction, and wherein said lock plunger is spring biased in the opposite direction.

References Cited in the file of this patent

UNITED STATES PATENTS

35	999,850	Palmer	Aug. 8, 1911
	1,040,705	Leppert	Oct. 8, 1912
	1,357,643	Lawson	Nov. 2, 1920
	1,958,128	Cate	May 8, 1934
	1,995,763	Basil et al.	Mar. 26, 1935
40	2,082,210	McMaster	June 1, 1937
	2,199,501	MacBlane	May 7, 1940
	2,371,727	Andrews	Mar. 20, 1945
	2,566,835	Hertzstark	Sept. 4, 1951
	2,632,821	Wright et al.	Mar. 24, 1953
45	2,683,515	Horn	July 13, 1954