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SAFETY STOP FOR PRESSES

Filed June 14, 1960

Fig. 3.

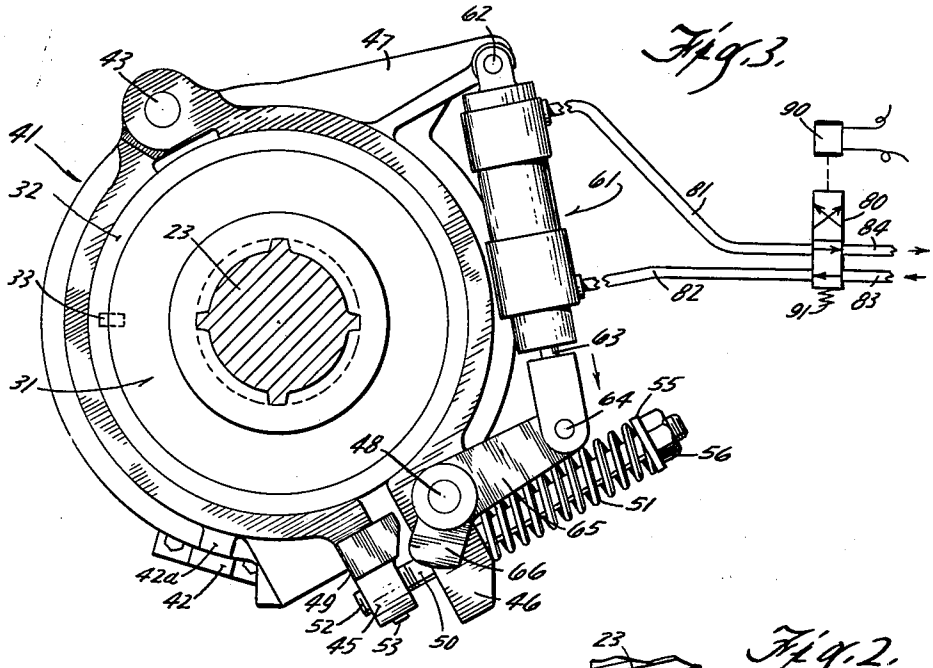


Fig. 2.

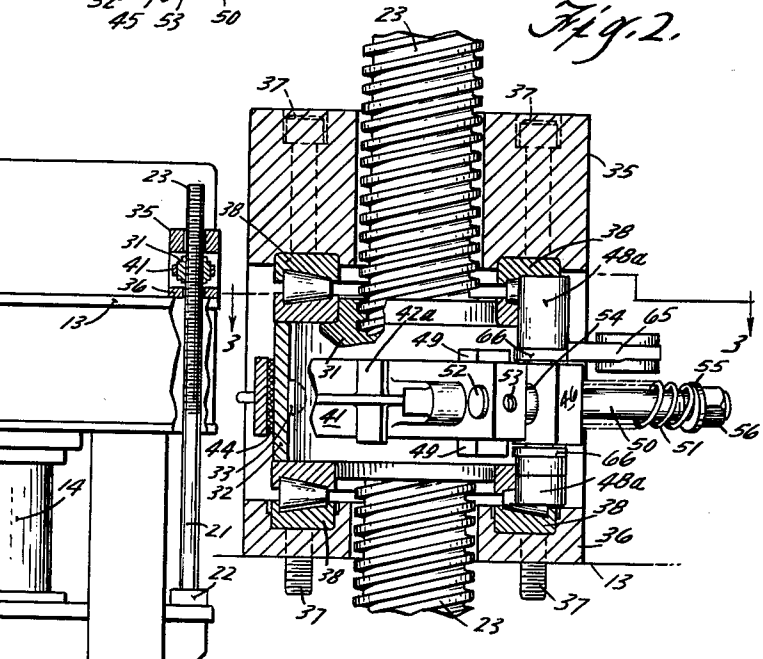
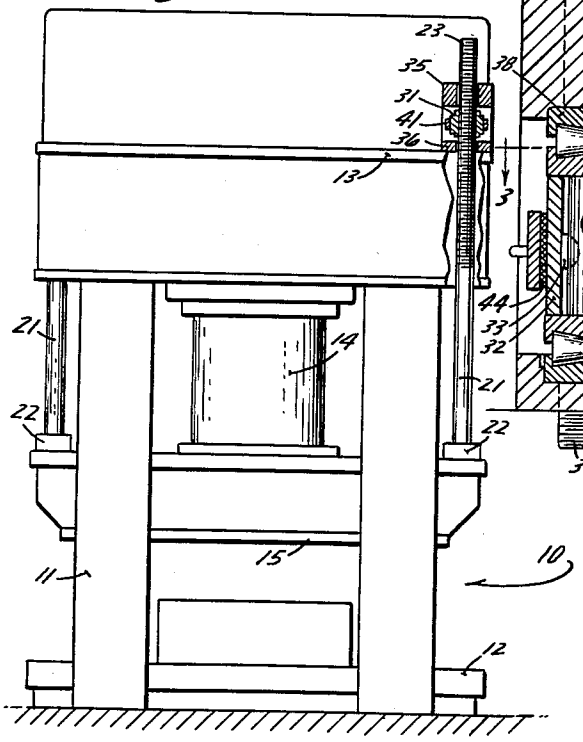


Fig. 1.



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SAFETY STOP FOR PRESSES

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This invention relates to presses, and particularly to a safety stop to support the platen or moving weights of vertical downward acting presses.

Vertical presses for metal working punching and other similar operations may often employ a ram and platen that weigh many tons. Various types of safety jacks and stops have been employed in the prior art to prevent accidental dropping of the platen while it is in a raised position so as to prevent damge to material, personnel and the press itself. Some of the disadvantages of these prior devices are that they interfere with the daylight opening of the press; they are independently engaged in operative position; and they may be damaged if not disengaged during a working stroke of the platen.

Therefore an object of the invention is to provide an improved safety stop for a press of this type which will be automatically engaged whenever the platen is in a full raised position or whenever the press is stopped with the platen in any raised position.

Another object is to provide an improved safety stop arrangement that safeguards the operator and material without interfering with the working area of the press.

Another object is to provide a safety stop device that will be automatically disengaged during a normal intended working stroke of the platen.

Still another object is to provide a safety stop device that will not be damaged if it fails to disengage on a normal power actuation of the press platen.

These and other objects and advantages will be apparent to those skilled in the art from the following description of the invention as shown in the drawings, in which:

FIG. 1 is a schematic representation of a hydraulic press, partially broken away to show the position of an apparatus embodying the present invention with respect to the press and parts thereof;

FIG. 2 is an enlarged side elevational view, partially in section, with appropriate parts broken away, showing details of the safety device embodying the present invention; and

FIG. 3 is a top view, slightly enlarged, taken substantially along line 3—3 of FIG. 2, partially in section, with certain parts removed for clarity, and showing a diagrammatic representation of a hydraulic valve for activating the apparatus embodying the invention.

While the invention may be variously modified, the preferred embodiment has been shown in the drawings and will be described hereinafter in detail. It should be understood that there is no intention to limit the invention to the specific form disclosed; but it is intended to cover all alternative constructions falling within the spirit and scope of the invention as expressed in the claims appended.

In FIG. 1 of the drawing, there is shown in schematic form a hydraulic press **10** having a frame **11**, a press bed **12**, a press head **13** and a ram **14** and platen **15** for vertical downward working movement. The electrical and hydraulic control mechanism and circuits for such presses are well known in the art and are not shown.

Stop rods **21** are fixedly attached, preferably by bolts, to diagonally opposite corners of the platen at **22**. The stop rods **21**, which extend through the press head **13**, have a threaded portion **23** at the upper end. (Only one rod shown in broken away portion.) The rods **21** move

vertically corresponding with movement of the platen **15**.

As seen more clearly in FIGS. 2 and 3 a circular wheel or nut **31** engages the threaded portion **23** of each rod **21**. The nut **31** is held in a vertically fixed position on the press head **13**, between bearing plates **35**, **36**, which are both affixed by suitable thru-bolts **37** to the press head **13**. Between each bearing plate and the upper face and lower face of the nut **31**, roller bearings **38** are mounted. These bearings **38** may be of any suitable commercially available stock such as Timken Bearing, type TTHD. Although restricted in vertical movement the nut **31** is free to rotate or spin on the threaded portion **23** of the rod **21**, as the rod **21** moves up or down with the platen **15**. On the outer circumference of the nut **31** is a wear band or drum **32** held in place by a key **33**. In order to enable the nut to freely spin in both directions lead must be carefully selected. It must be great enough so that the thread is not self-locking and must remain small enough so that a reasonable size brake, hereinafter described, will be able to hold the nut from spinning. In the embodiment disclosed the 5" nut and shaft have 4 Acme threads, 1⅓ threads per inch or a ¾" pitch, thus a lead of 3 inches.

Surrounding the drum **32** on each nut **31** is a brake band assembly **41**, comprised of two parts pivoted at **43**, the inner circumference of the band having a lining **44**. Opposite the pivot each part of said brake band has an ear or lever arm, **45** and **46**.

A spring **51** is employed to normally urge the two parts of said band **41** together about pivot **43** and set the brake about the drum **32** which is part of nut **31**. A stud **50** is threaded at one end to lever arm **45** at **52** and held by lock nut **53**. The stud **50** passes through the lever arm **46** on the opposite half of the brake band at **54** and the spring **51** is slipped over the stud **50** and secured by washer **55** and nut **56** at the outer end of the stud **50**. Tension of spring **51** may be increased or decreased by adjustment of nut **56**. As long as spring **51** is in compression the brake bands **41** are set and the nuts **31** cannot rotate thus preventing movement or dropping of rods **21** and the moving weights or platen **15**.

A cam arrangement actuated by a hydraulic cylinder **61** is employed to compress the spring **51** and release the brake band **41**. The hydraulic cylinder **61** is pivotally connected at **62** to an arm **47** on one part of the brake band **41**. The piston rod **63** of said cylinder **61** is pivotally connected at **64** to one end of a bell crank or cam arm **65** which is pivotally connected at **48** to lever arm **46**. Two cams **66** are located at the opposite end of the arm **65**. Two lugs or cam followers **49** are located on lever arm **45** so as to be engaged by cams **66** on clockwise movement of cam arm **65** about pivot connection **48** outward movement of piston rod **63** of the hydraulic cylinder **61**. Engagement of the cam followers **49** and cams **66** will urge the two parts of brake band **41** to open about pivot **43**, compressing the spring **51** and thus releasing the brake and allowing nuts **31** to spin upon movement of rods **21**.

In FIG. 3 a schematic valve arrangement is shown for control of hydraulic fluid operating cylinder. It is understood that there are two braking arrangements and the valve shown will control fluid flowing to both brake systems. Line **81** connects the piston or large area of the cylinder with valve **80**; while line **82** connects the differential area or pullback side of the cylinder with valve **80**. Line **83** leads from valve **80** to a pump (not shown) supplying auxiliary or pilot fluid pressure independent of hydraulic fluid pressure serving the press ram **14**. Line **84** leads from the valve **80** to a reservoir (not shown). Valve **80** is a four-way valve actuated by a solenoid **90** and returned to the position shown by a spring **91**.

The brake bands **41** are kept from cocking by extensions of the pivot connections **43** and **48** which substan-

tially fit between bearing plates. (Extensions 48*a* shown in FIG. 2 on pivot connection 48.) A stop 42 may also be bolted to the lower bearing plate 36 (FIG. 3), which engages a guide 42*a* on brake bands.

Having explained the drawings a cycle of operation will now be described.

Assuming the press platen 15 is at its uppermost position the spring 51 will automatically set the brake bands 41 as shown in FIG. 3 to prevent the nuts 31 from turning and thus support by rods 21 the platen 15 and other moving weights.

The valve 80 as shown is in position to admit pilot pressure fluid to the pullback side of cylinders 61 through line 82. When an electrical signal is given for the press platen 15 to descend the solenoid 90 is energized. The solenoid 90 moves valve 80 downward as shown in the drawing so as to admit pilot pressure fluid to the piston area of the cylinders through lines 81, 83 while fluid from the pullback area returns to the tank through 82, 84. Cam arm 65 will be rotated by the piston rod 63 thus moving cams 66 into engagement with cam followers 49 thus forcing brake bands 41 open against spring 51. This releases braking force on the nut 31 which will spin at a speed determined by descent of platen 15 which is controlled by pump stroke of the hydraulic system actuating ram 14.

The solenoid 90 stays energized thus holding brake bands 41 open until the platen 15 has again returned to its top position or the press is stopped by the operator. If the press is stopped or the platen 15 returns to its top position the solenoid 90 will no longer be energized and spring 91 will return valve 80 to the position shown. This will admit pressure fluid to the pullback side of the cylinder 61 and allow fluid from the piston side of cylinder 61 to return to the tank. The pullback of piston rod 63 will expedite the release of the cams 66 and the spring 51 will again set the brake bands 41 to prevent nuts 31 from rotating and support the rods 21 and thus the platen 15 so as to avoid accidental dropping due to hydraulic pressure or other failure in ram 14.

If at any time there is an electrical or pilot pressure failure the brake bands 41 would be automatically set by spring 51 which would bring the platen 15 to a stop.

What is claimed is:

1. In a press having a frame member, a relatively movable platen member and hydraulic means for actuating said platen member, a safety stop device auxiliary to said actuating means comprising threaded nut means affixed to one of said members; threaded shaft means affixed to the other of said members and having threaded engagement with said nut, said nut and shaft being relatively rotatable when one is moved axially with respect to the other; one of said threaded means being non-rotatably affixed to its respective member; and brake means for selectively preventing relative rotation between said nut and shaft thereby preventing further movement of said platen member.

2. In a press having a frame member, a relatively movable platen member and hydraulic means for actuating said platen member, a safety stop device auxiliary to said actuating means comprising threaded nut means affixed to one of said members; threaded shaft means affixed to the other of said members and having threaded engagement with said nut, said nut and shaft being relatively rotatable when one is moved axially with respect to the other; one of said threaded means being non-rotatably affixed to its respective member; brake means for normally preventing relative rotation between said nut and said shaft thereby preventing movement of said platen member; and means for releasing said brake means upon actuation of said platen member.

3. In a press having a frame member, a relatively movable platen member having an actuating ram, and means for actuating said ram, a safety stop device comprising a threaded rotatable nut affixed axially to said frame member; a threaded shaft non-rotatably affixed to said platen member and threadably engaging said nut, said nut being rotatable when said shaft is moved axially with said platen; a brake normally coacting with said nut for preventing rotation of said nut thereby preventing movement of said platen; and means for releasing said brake upon actuation of said ram.

4. In a vertically acting press having a frame and a reciprocably movable platen, a safety stop device comprising a rod non-rotatably affixed to said platen; said rod threadably engaging a rotatable nut fixed in a vertical position on said press frame; brake means coacting with said nut for restricting rotation thereof; thereby preventing movement of said platen; and means for releasing said brake means.

5. In a press having a frame and a vertically movable platen actuated by a ram, and actuating means for said ram, a safety stop device comprising a threaded rod non-rotatably fixed to said platen; said rod threadably engaging a rotatable nut fixed axially with respect to said press frame; brake means coacting with said nut; yieldable means normally setting said brake means thereby preventing movement of said rod and platen; and means for releasing said yieldable means upon actuation of said ram.

6. In a press having a frame and a vertically reciprocable platen actuated by a ram, and actuating means for said ram, a safety stop device for said platen comprising a threaded rod non-rotatably fixed to said platen; said rod threadably engaging a circular rotatable nut fixed in a vertical position to said press frame; a brake band coacting with said nut; spring means normally setting said brake band around said nut; and means for releasing said spring means and said brake band upon actuation of said ram.

7. In a press having a frame and a vertically reciprocable platen actuated by a hydraulic ram, and means for actuating said ram, a safety stop device for said platen comprising a plurality of threaded rods non-rotatably fixed to said platen; each of said rods threadably engaging circular rotatable wheels fixed in a vertical position to said press frame; said wheels including a brake drum on the outer circumference thereof; an expandable brake band surrounding said brake drum; spring means normally setting said brake band on said drum thereby preventing movement of said rods and platen; and hydraulically actuated means for releasing said brake band from said drum upon actuation of said ram.

8. In a press having a frame, a head, and a vertically reciprocable platen actuated by a hydraulic ram, and means for actuating said hydraulic ram, a safety stop device for said platen comprising, a plurality of threaded rods non-rotatably fixed to said platen; each of said rods threadably engaging circular rotatable wheels fixed in an axial position by bearing plates to said press head, said wheels including a brake drum on the outer circumference thereof; expandable brake bands surrounding said brake drums; spring means normally setting said brake bands on said drums whereby rotation of said wheels is prevented thus holding said rods and said platen in a fixed position; cam and lever means for expanding said brake bands against said spring means; hydraulic cylinders for acting said cam and lever means; pilot pressure fluid for actuating said cylinders; and a solenoid valve actuated simultaneously with said actuating ram for controlling flow of pilot pressure to said cylinders.

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