Aug. 24, 1954 J. P. NORTON 2,686,930

HYDRAULIC SAFETY DEVICE

Filed Dec. 22, 1951 2 Sheets-Sheet 1

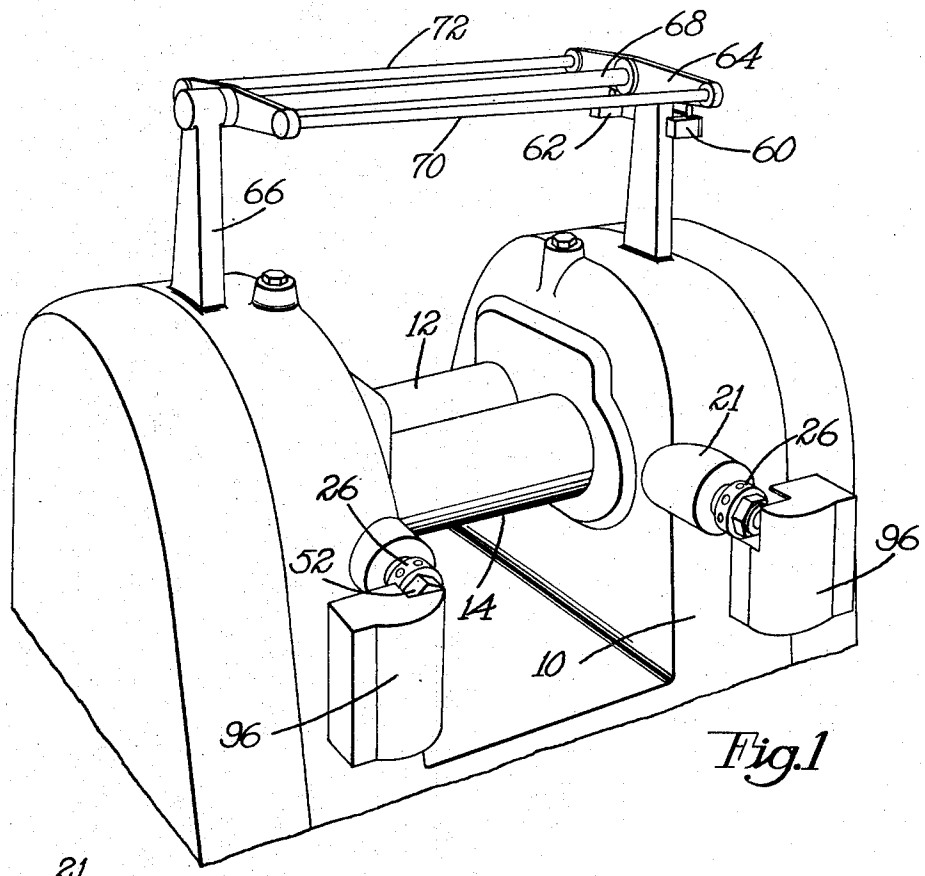


Fig. 1

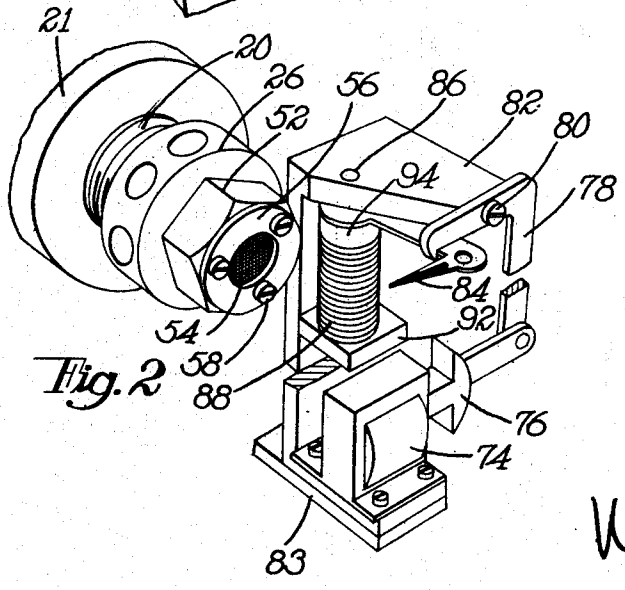


Fig. 2

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2 Sheets-Sheet 2

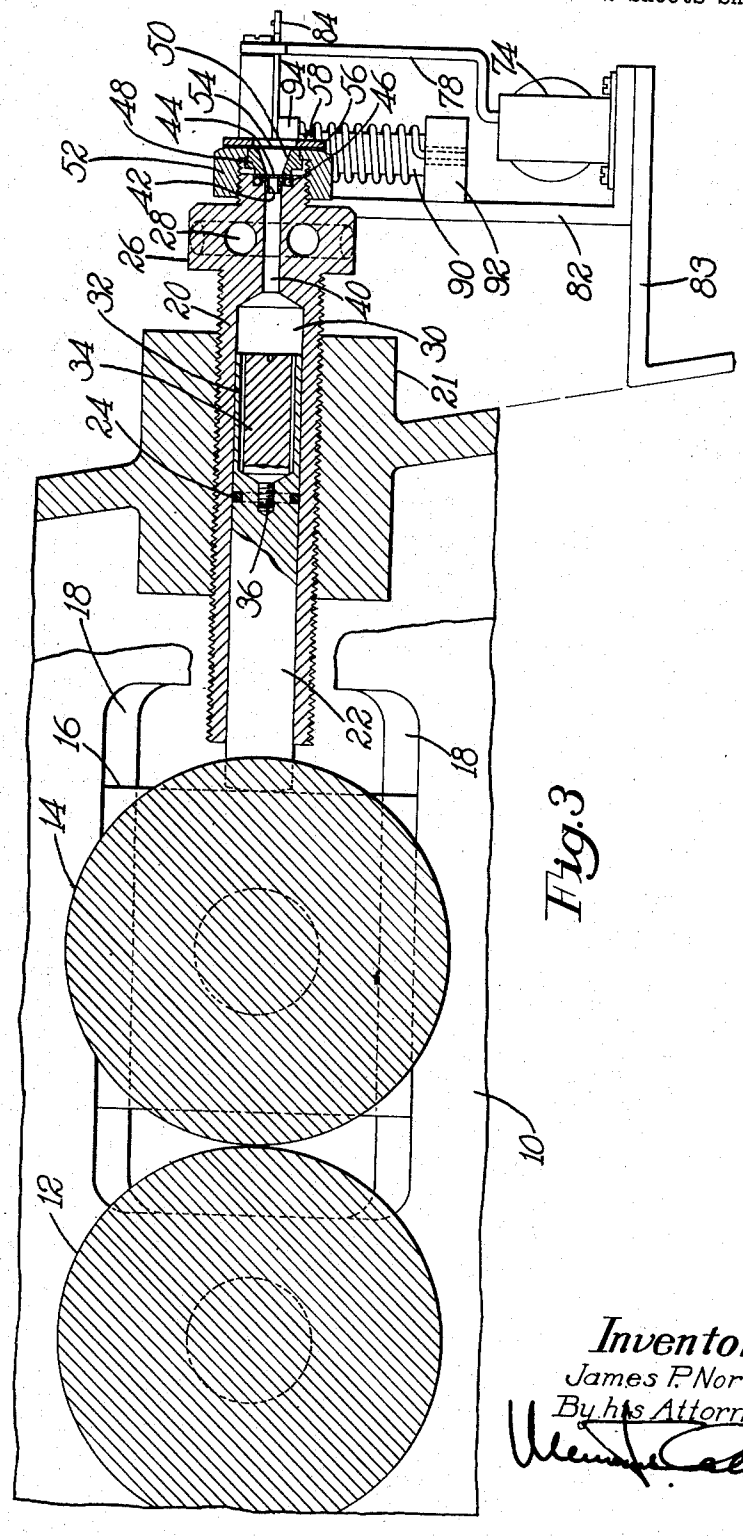


Fig. 3

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Patented Aug. 24, 1954

2,686,930

UNITED STATES PATENT OFFICE

2,686,930

HYDRAULIC SAFETY DEVICE

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Application December 22, 1951, Serial No. 262,982

2 Claims. (Cl. 18—2)

1

This invention relates to fluid pressure safety devices herein illustrated as applied to a machine, such as a rubber mill, having coacting rolls which are held together under fluid pressure.

A variety of safety devices have been provided for machines in which the operator is likely to catch his finger between two coacting rolls or the like but in those instances in which it is desired to hold the rolls together under high pressure, it is difficult to arrange the release device so that it will act quickly.

An object of the invention is to provide an improved safety device for machines in which the coacting rolls or other tools are held together under fluid pressure.

Some machines of the type described have one of the rotary tools mounted in slidable bearings and have utilized a screw to create pressure between the two tools by pressing against one of the bearings. In the illustrated arrangement and in accordance with features of the invention there is substituted for the direct-pressure screw, a screw having an internal plunger resting against a body of fluid. This fluid is normally held in the screw by means of a rupturable diaphragm and means are provided for breaking open this diaphragm when it is necessary to release the pressure.

Also, as illustrated, the machine has a spring-loaded puncturing tool, an electrically operated trigger for releasing this puncturing tool, and a manually operable switch placed where it is easy for the operator to reach it. To avoid the danger of flying fragments of metal when the pressure is suddenly released the device also provides a protective screen over the diaphragm which is also punctured by the spring-operated tool but which, being larger than the diaphragm, permits the quick escape of the contained fluid.

These and other features of the invention will best be understood from a consideration of the following specification, taken in connection with the accompanying drawings, in which

Fig. 1 is an angular view of a machine to which the invention has been applied;

Fig. 2 is a fragmentary angular view on a larger scale of the puncturing mechanism; and

Fig. 3 is a vertical section through the plunger and the diaphragm.

Although it will be understood that there are numerous applications of such a safety device, an explanation of the features thereof is simplified by showing it as applied to a rotary mill having a frame 10 in which there are mounted

2

coacting rolls 12 and 14. The roll 12 is journaled in fixed bearings while the roll 14 is journaled in a pair of bearing blocks 16 which are slidable in ways 18 formed in the frame.

In mills of this type it is common to provide adjustable means for moving the sliding bearing blocks 16 so as to control the pressure between the rolls. Frequently a manually adjustable screw bearing directly upon the bearing block is provided for this purpose. In the arrangement herein shown, there is substituted for such a direct-acting screw a hollow screw 20 (Fig. 3) threaded in a boss 21 of the frame and having therein a tightly fitting but slidable plunger 22 which has a packing 24 in a groove around the mid portion of the plunger. This screw has a head 26 having sockets 28 so that it may be turned by means of a spanner wrench (not shown).

As the screw is adjusted, a pressure created within a chamber 30 filled with fluid acts against the plunger 22 and forces the rolls 12 and 14 together. It is necessary that there shall be no leakage of the fluid past the plunger 22 and, accordingly, it is at one end recessed to provide a skirt 32 which is slightly expanded by the fluid to make a tight fit in the screw. At the same time the fluid capacity of the recess within this skirt may be reduced, when setting up the machine, by partially filling it with a plug 34 having a threaded tip 36 for holding it in position within the plunger. Thus the total volume of the fluid under pressure is reduced, and hence its compressibility, while the skirt construction is still possible.

The screw is provided with an exhaust passage 40 leading from the chamber to the exposed outer end of the screw. This passage has a soft metal bushing 42 against which there rests a thin diaphragm 44 of sheet steel or other material of suitable properties. The diaphragm closes the passage and presses against a packing 46. This diaphragm is held in position by means of an annulus 48 having a conical passage 50 which flares outwardly and this annulus is pressed against the diaphragm 44 to clamp the latter in position by means of an annular clamp nut 52 which overhangs and presses against a shoulder on the annulus 48. For reasons which will later appear, a fine mesh screen 54 is held over the outer end of the conical passage 50 by means of a washer 56 attached to the clamp nut 52 by means of screws 58 (Fig. 2).

When there is danger of injury to the operator, he will operate one or the other of electrical

switches **60** and **62** (Fig. 1) by means of a swinging trigger-frame **64** which is mounted on uprights **66** attached to the frame **10** by means of a central pivot rod **68**. The trigger-frame has cross rods **70** and **72** which may be struck whenever danger threatens and moved to bring one end of the trigger-frame against one of the switches to close it. These switches are connected in parallel to solenoids **74** at the sides of the frame **10**, each having a plunger **76** which is pivoted to a release-latch **78**, the latter in turn being pivoted by a screw **80** to a sub-frame **82** mounted on a bracket **83** which is attached to the main frame (Fig. 3). When this latch **78** is rotated in a clockwise direction, as viewed in Fig. 2, a puncturing tool **84**, swingable upon an upright pivot **86**, will be driven through the diaphragm by means of a coil spring **88**. This coil spring is wound around a supporting rod **90** (Fig. 1) and it has one end attached to a shelf **92** and its other end to a hub **94** forming part of the puncturing tool **84**.

Once released, this puncturing tool will be driven through the wire screen **54** and the diaphragm **44** to release the fluid in the chamber **30**, thus relieving all pressure by the plungers **22** against the bearings **16** and allowing the rolls to be separated by a distance represented by the length of the chamber **30**, which will be designed to give an ample factor of safety. It will be noted from Fig. 1 that the positions and directions of rotation of the puncturing tools are reversed on opposite sides of the machine but in each instance said tools are pointed at the center of the screen and diaphragm. Inasmuch as the pressure within the chamber **30** is very high it is found desirable to provide the wire mesh screen **54** to catch any fragments of the metal diaphragm which may be forced out. Covers **96** (Fig. 1) are designed to prevent accidental contact with the mechanism from releasing the puncturing tool when it is not needed and to catch the oil which is forced out. It will be understood also that breakage of the machine will be prevented in case a foreign object should pass between the rolls because the extraordinary pressure which would then be developed in the chamber **30** will break the retaining diaphragm **44** and allow the rolls to separate.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. In a machine, a frame, coacting rolls one of which is journaled in the frame, the other roll having a bearing slidable in the frame toward and away from the first roll, a device for pushing the slidable bearing comprising a hollow screw threaded in the frame and containing a fluid retained by a plunger abutting the bearing, said screw having an exhaust passage leading from the inside of the crew to its outer end, a rupturable diaphragm closing the outer end of said exhaust passage, annular means removably secured to the outer end of said screw for securing said diaphragm, a spring-loaded tool mounted on the machine for movement through said annular means to rupture said diaphragm, and manually operable means for releasing said rupturing tool for actuation by the spring.

2. A safety device for a fluid-pressure-operated apparatus having a pressure-chamber provided with an exhaust passage, a diaphragm for closing said exhaust passage, annular means for clamping said diaphragm over the outlet of the passage, a spring-loaded tool mounted for movement through said annular means into engagement with the diaphragm to rupture it, a latch holding said tool in loaded position, and a switch-controlled solenoid for releasing said latch.

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