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SLIDE COUNTERBALANCE

Filed March 11, 1968

FIG. 2

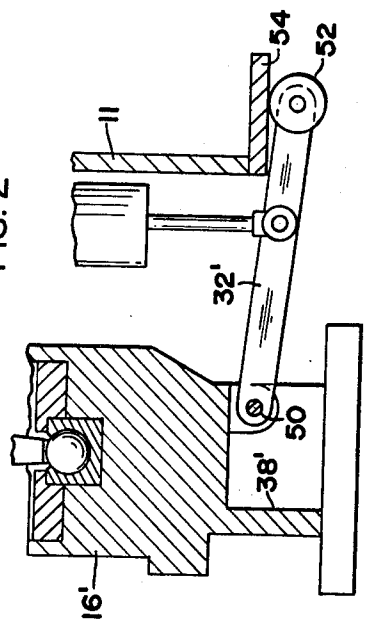


FIG. 3

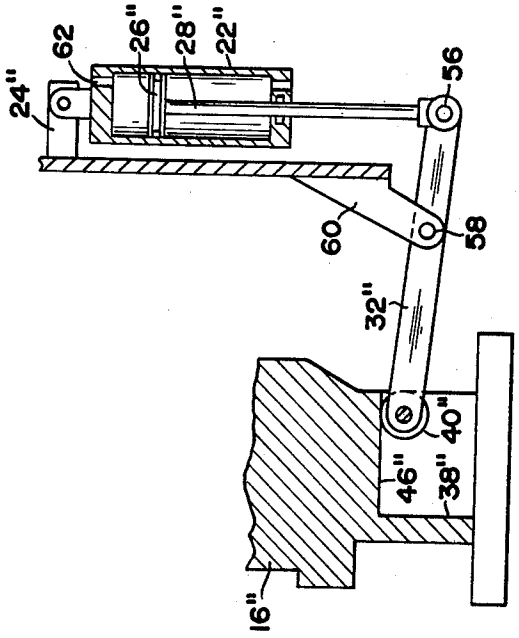
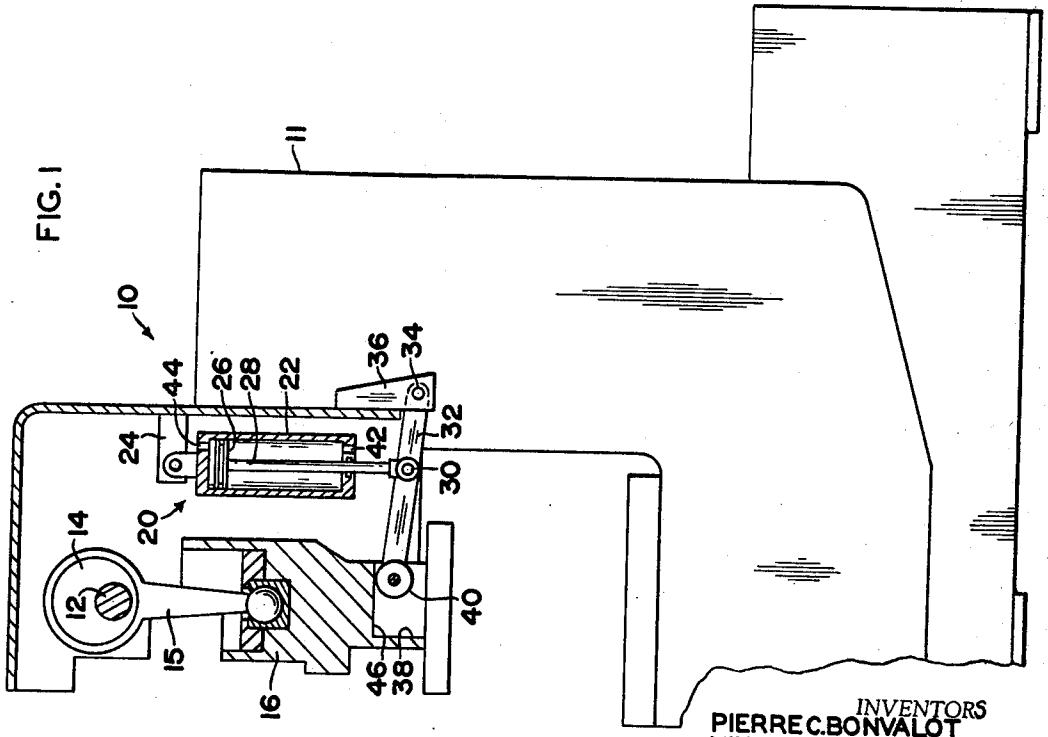


FIG. 1



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SLIDE COUNTERBALANCE

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ABSTRACT OF THE DISCLOSURE

A counterbalance for a press slide having a lever engaging the slide adjacent the slide centerline and a pneumatic cylinder biasing the lever and the slide in an upward direction. Either a first class or a third class lever arrangement may be used.

This invention relates to slide counterbalances for power presses.

For many years, power presses have employed some form of counterbalance for the slide mechanism in the press. These counterbalances have been used for many reasons, some of which are to relieve the shaft from the weight of the slide, to achieve smoother running and assist in the operation of the clutch and brake mechanisms. Typically, the counterbalances either comprise a spring arrangement or air cylinders which provide the counterbalancing force for the slide.

The most effective and economical means for counterbalancing the slide on all types of presses is the air counterbalance cylinder and these are used most extensively. Normally the air counterbalance consists of one, two, four or more stationary air cylinders mounted on the frame of the press with the piston shafts of the cylinders connected to the slide. One such arrangement is to position the cylinders on either side of the crown with the piston rods extending downward and connected to the slide. Another method is to support or build in the cylinders at each end of the press bed with the piston shafts extending upward to the slide of the press. Other arrangements have also been employed.

All of these approaches have proved generally effective from the standpoint of counterbalancing the slide but they have, in turn, caused certain problems. Thus, the positioning of the cylinders has resulted in a considerable off-center loading on the gibs and ways of the press. Moreover, the use of a multiplicity of cylinders has increased the cost of the counterbalancing arrangement. In addition, where the cylinders are mounted vertically above the slide, the overall height of the press is increased. Also, the counterbalancing mechanism has had to be designed and positioned to be kept clear of rotating and reciprocating parts in the press.

It is the primary object of this invention to provide an improved slide counterbalance mechanism for a power press.

More specifically, it is an object of this invention to provide an improved slide counterbalance which employs but a single cylinder and which eliminates off-center loading on the gibs and ways.

More specifically, this invention contemplates a power press having a frame and a slide mounted for reciprocation in the frame. In accordance with the preferred embodiment of the invention, the improved counterbalance comprises a lever which is pivotally secured at one end to the frame. An air cylinder is connected to the lever and maintains the other end of the lever in abutting engagement with the slide thereby biasing the slide in an upward direction. The cylinder is positioned behind the slide and the lever engages the slide adjacent its centerline thereby avoiding any off-center loading on the gibs and ways.

Other objects and features of the invention will become more apparent upon a complete reading of the following description which, together with the attached drawings, discloses but a few preferred embodiments of the invention. The disclosed embodiments are not intended to be limiting since they constitute but a few of the ways in which the principles of this invention may be employed.

Referring now to the drawings wherein like reference numerals indicate like parts in the various views:

FIGURE 1 is a schematic side elevation view, partly in section, showing the invention incorporated in a power press.

FIGURE 2 is a fragmentary view illustrating an alternate form of the invention.

FIGURE 3 is a view similar to FIGURE 2 and illustrates still another form of the invention.

Referring now to FIGURE 1, there is illustrated, somewhat schematically, a conventional power press employing the counterbalance mechanism comprising the instant invention. The details of the press have in large part been omitted since they form no portion of the instant invention but they are well known to those having ordinary skill in the art. As illustrated, the press **10** includes a frame **11** in which there is rotatably supported a shaft **12**. The shaft **12** includes an eccentric **14** in driving relationship with a connection rod **15**. The connection rod is connected to the press slide **16** with the slide being mounted for reciprocation in the press frame by any number of conventional means. These elements, all of which are conventional, form no portion of the present invention and are illustrated purely for facilitating an understanding of the invention. It is to be understood that the slide connecting rod and eccentric as well as the other conventional elements of a press shown herein may be varied without in any way departing from the principles of the invention disclosed hereafter.

In accordance with this invention, a slide counterbalance mechanism, indicated generally by the reference numeral **20**, is positioned behind the slide **16** within the press frame. The counterbalance mechanism includes an air cylinder **22** pivotally supported at one end on a bracket **24**. The air cylinder is conventional in construction and includes a piston **26** slidably received within the cylinder and a piston rod **28** secured at one end to the piston **26** with the other end of the rod projecting externally of the cylinder **22**. The projecting end of the rod **28** is pinned as at **30** to a lever **32**. One end of the lever **32** is pivotally connected at **34** to a bracket **36** secured to the press frame. The other end of the lever extends into a recess **38** in the slide **16**. The recess is positioned in the slide along the longitudinal axis of the slide **16**. A roller **40** is carried by the end of the lever **32** in the recess **38** with the roller adapted to engage the wall **46** of the recess. The cylinder **22** is adapted to receive a compressible fluid such as air and thereby provide a biasing force which maintains the roller **40** in engagement with the wall **46** of the recess **38**.

The counterbalance mechanism **20** operates in the following manner. A compressible fluid under pressure is introduced through a suitable opening, such as at **42**, into the rod end of the cylinder **22**. The head end of the cylinder communicates with the atmosphere through an aperture **44**. The air pressure causes the piston **26** to move vertically upward to the position shown in FIGURE 1, thereby maintaining the roller **40** in engagement with the upper wall **46** of the recess **38** and biasing the slide **16** toward an upper position. As the press is actuated and the slide **16** descends, the engagement of the wall **46** with the roller **40** causes the lever **32** to pivot about

the pivot **34** in a counterclockwise direction as viewed in FIGURE 1, thereby drawing the piston rod **28** and associated piston **26** in a downward direction. The compressible fluid in the cylinder is thereby compressed and provides a counterbalance for the slide **16**. As the slide completes its downward descent and returns in an upward direction, the previously compressed fluid in the cylinder **22** acts against the piston **26** to maintain the roller **40** in biased engagement with the surface **46**. In this relationship, the lever **32** biases the slide **16** in an upward direction thereby assisting in the return of the slide to its upper position.

As pointed out previously, the recess **38** in the slide **16** is positioned substantially along the longitudinal axis of the slide **16** and the lever **32** is received in the recess such that its biasing force is directed substantially along the longitudinal axis. In this arrangement of elements, the force is applied along the centerline so that the counterbalance mechanism imposes no off-center loading on the slide **16**.

The lever arrangement shown in the embodiment of FIGURE 1 constitutes a third class lever. FIGURE 2 illustrates another third class lever arrangement but differs from FIGURE 1 in that the lever **32'** is pivotally secured at pivot **50** in the recess **38'** in the slide **16'**. The opposite end of the lever **32'** carries a roller **52** which is in engagement with an abutment plate **54** secured on the frame **11**. It will be appreciated that the operation of the counterbalance mechanism shown in FIGURE 2 is essentially the same as that shown in FIGURE 1 except that the lever is turned end for end with the pivoted connection of the lever being in the slide instead of on the frame.

FIGURE 3 illustrates another embodiment of the invention in which a first class lever arrangement is employed. Thus, in lieu of the cylinder being positioned within the frame, the cylinder **22''** shown in FIGURE 3 is pivotally connected at one end to a bracket **24''** on the outer side of the frame. The cylinder includes a piston **26''**, a piston rod **28''** and a lever **32''**. However, the piston rod **28''** is pivotally connected at **56** to one end of the lever **32''** with the lever being fulcrumed at a pivot point **58** intermediate its ends, the fulcrum point being a bracket **60** secured to the frame. The other end of the lever **32''** carries a roller **40''** which is received in the recess **38''** of the slide in a manner similar to that shown in FIGURE 1. The counterbalance mechanism of FIGURE 3 operates in the same manner as that shown in FIGURE 1 with the exception that air pressure is introduced through appropriate connections **62** to the head end of the piston with the rod end of the piston being vented to the atmosphere. As the slide descends in the embodiment of FIGURE 3, the piston moves in an upward direction thereby compressing the air in the cylinder, with the subsequent expansion of the air as the slide ascends providing the biasing force maintaining the roller **40''** in engagement with the surface **46''** on the slide **16''**.

It is to be noted that in each of the embodiments illustrated, the counterbalancing force is applied to the slide at or near the centerline of the slide thereby avoiding any off center loading. Moreover, only a single cylinder is required for the counterbalance mechanism and the cylinder may be mounted in space previously unused and which is well protected.

Changes and modifications in the disclosed embodiments will suggest themselves to those having ordinary skill in the art. For example, the roller **40** on the end of the lever may be dispensed with, if desired, although the roller does serve to reduce the frictional contact between the lever and the slide.

Having thus described our invention, we claim:

1. In a power press having a frame, a slide mounted for longitudinal reciprocation in said frame, means supported on said frame for imparting longitudinal reciprocation to said slide, and an improved counterbalance means associated with said slide, the improvement comprising:

lever means pivotally secured to one of said frame and slide and engaging said slide adjacent the longitudinal axis thereof; and

means supported on said frame and acting on said lever means to resiliently bias said slide in one direction.

2. The improvement of claim **1** wherein the relationship of said lever means to said slide, frame and biasing means constitutes a first class lever arrangement.

3. The improvement of claim **1** wherein the relationship of said lever means to said slide, frame and biasing means constitutes a third class lever arrangement.

4. The improvement of claim **1** wherein said lever means is pivotally secured to said frame, and

a recess formed in said slide with one end of said lever means received in said recess.

5. The improvement of claim **4** wherein said biasing means comprises a pneumatic cylinder supported on said frame with the piston rod of said cylinder being connected to said lever means.

6. The improvement of claim **1** wherein said lever means is pivotally secured at one end to said frame,

a recess formed in said slide,

the other end of said lever means being received in said recess with said biasing means being in engagement with said lever intermediate its ends.

7. The improvement of claim **1** wherein said lever means is pivotally secured at one end to said slide,

the other end of said lever means being in engagement with an abutment on said frame with said biasing means engaging said lever intermediate its ends.

8. The improvement of claim **1** wherein said lever means is pivotally secured intermediate its ends to said frame,

a recess formed in said slide,

one end of said lever means being received in said recess with said biasing means acting on the other end of said lever means.

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U.S. Cl. X.R.

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