Sept. 12, 1950 E. K. JOHANSEN 2,522,450

OVERLOAD DEVICE FOR METALWORKING PRESSES

Filed April 7, 1950 4 Sheets-Sheet 1

Fig. 1.

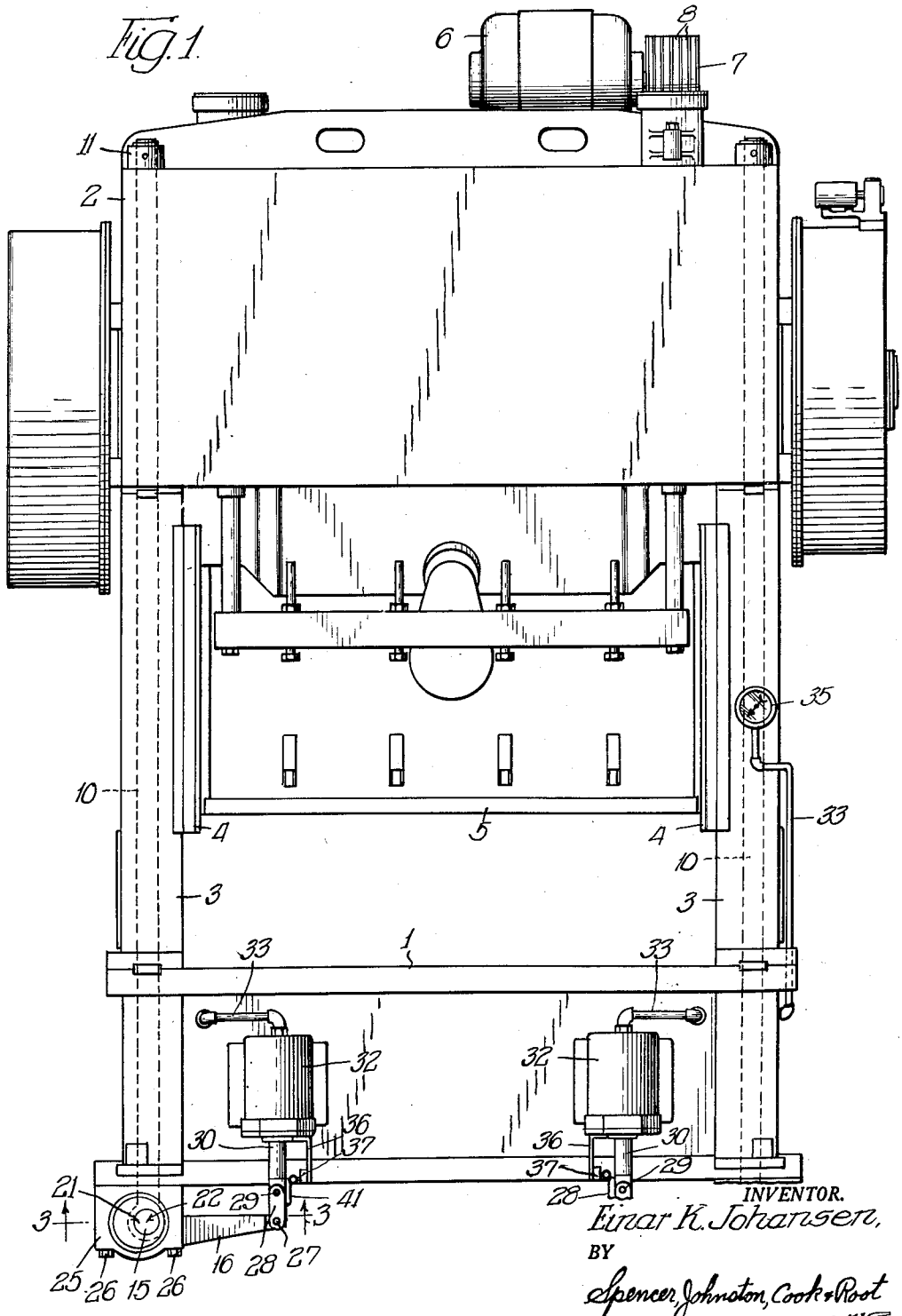

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Fig. 2.

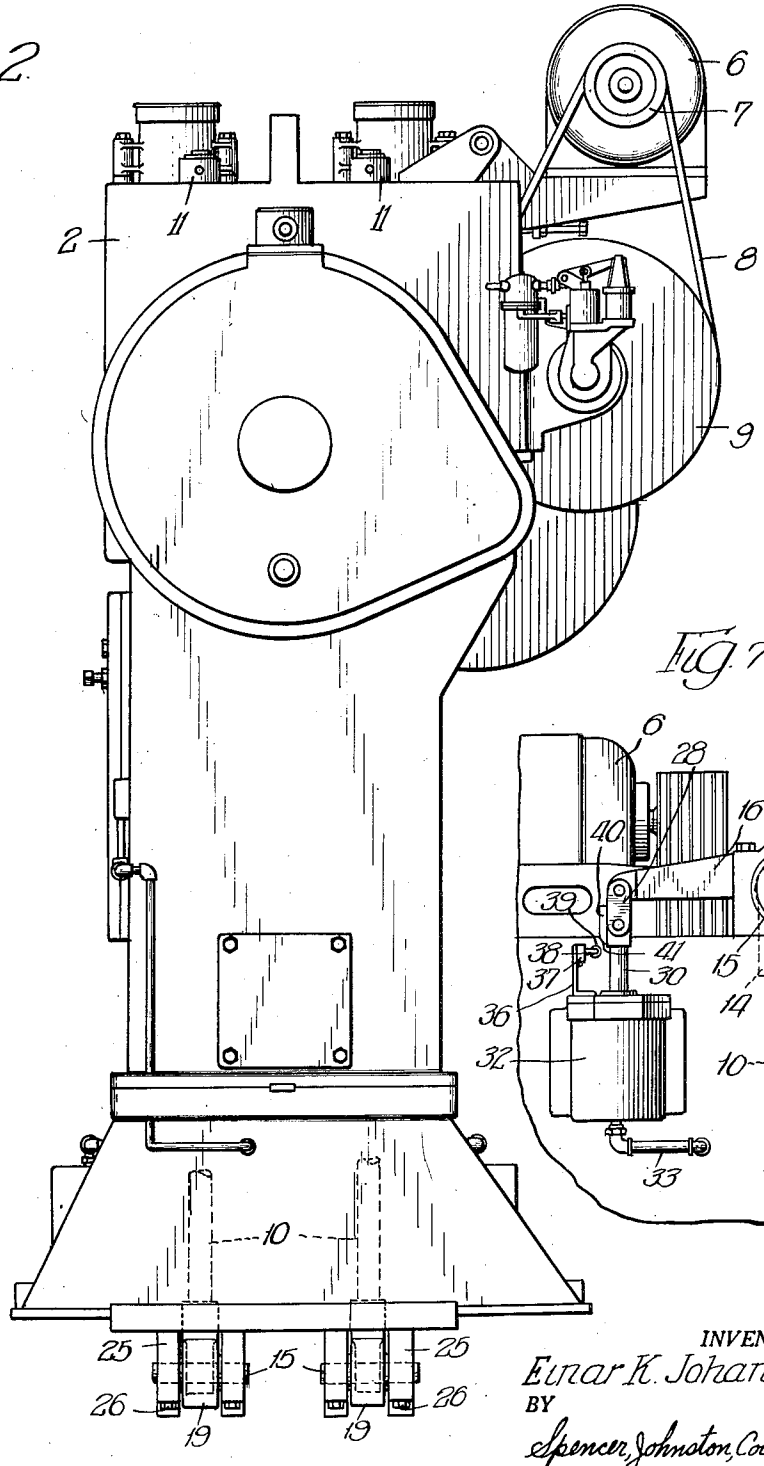

Fig. 7

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Fig. 3.

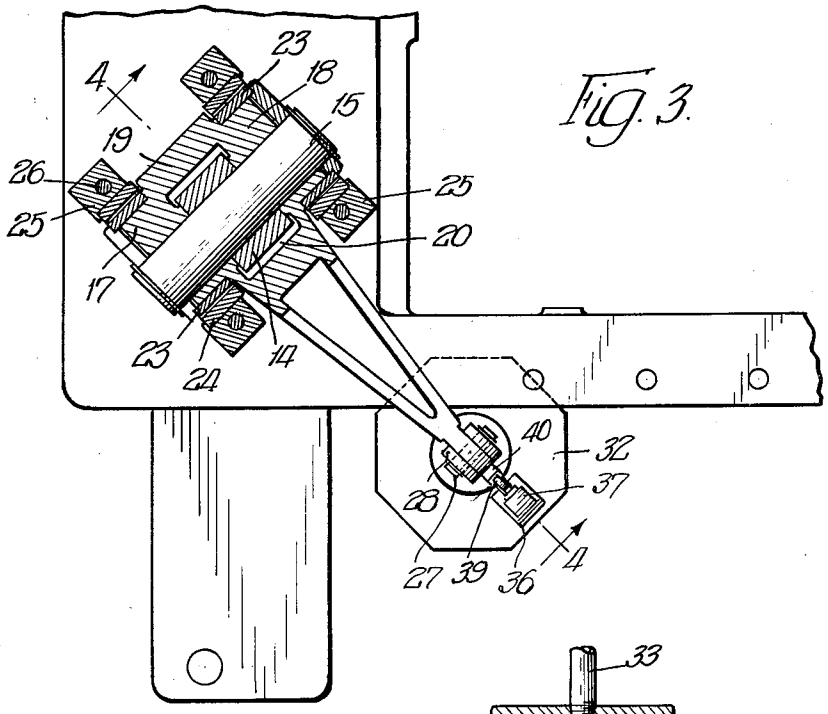

Fig. 4.

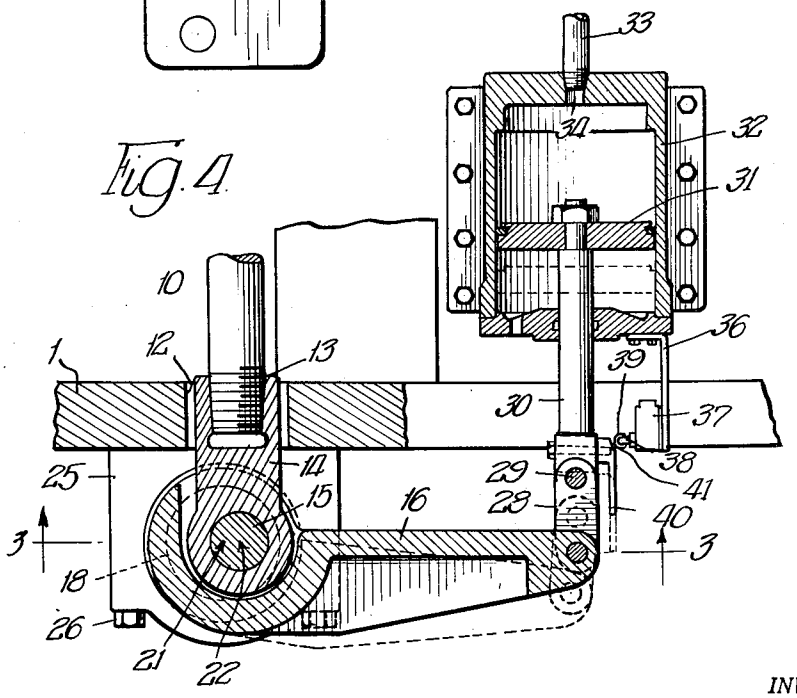

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Fig. 5.

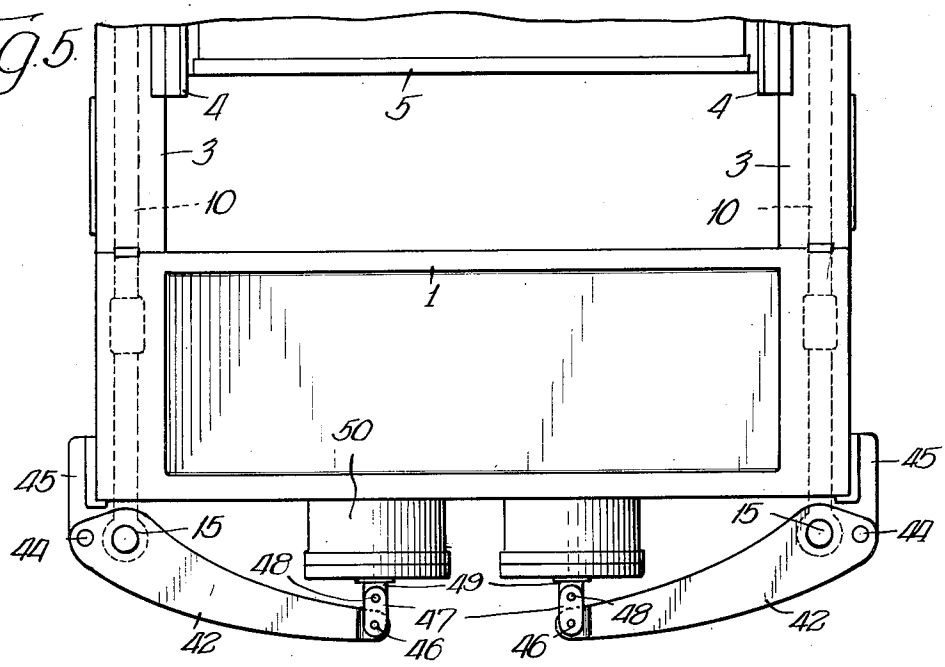
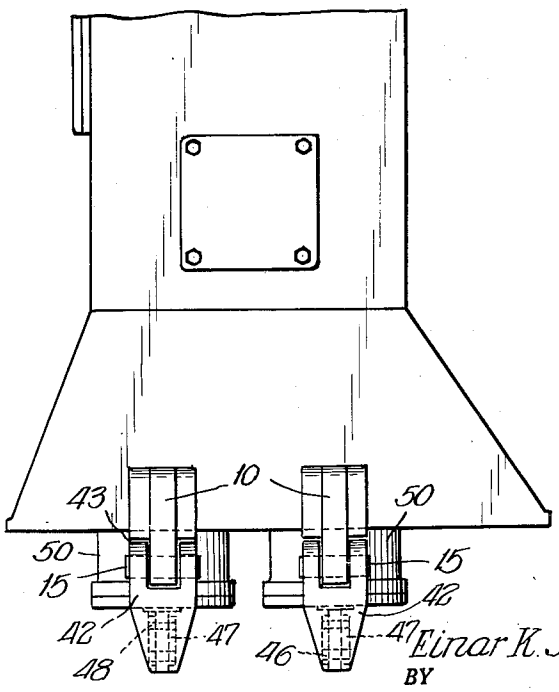


Fig. 6.



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UNITED STATES PATENT OFFICE

2,522,450

OVERLOAD DEVICE FOR METALWORKING PRESSES

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Application April 7, 1950, Serial No. 154,699

6 Claims. (Cl. 113—38)

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This invention relates in general to metal working and forming presses of the mechanical type, and is particularly directed to a novel form of overload device to prevent stalling or breaking of the machine when the press load exceeds a predetermined amount.

The invention is applicable primarily to the type of mechanical metal working press commonly known as a four piece tie rod frame which consists generally of a crown, a bed, and a pair of uprights, which are held together by a plurality of tie rods. The tie rods then extend between the crown and the bed at each corner of the frame. The customary procedure at the present time to preload the press frame is to shrink the tie rods to place them under stress.

It is not unusual during the preliminary steps of die setting for the die setter to set the dies in the movable slide too low. When this occurs it will be apparent that when the die members come together the crank or eccentric which operates the slide will be unable to complete its full downward travel possibly resulting in breakage of the press, and in some cases the clutch might slip causing the press to stall at the bottom of its stroke. When press breakage occurs, not only costly repairs are incurred, but also a one or two month delay in production may result during the necessary time for repair. When the press stalls it becomes necessary to unshrink the tie rods to relieve the stalled condition.

The present invention is directed to a novel form of overload device which is designed to prevent breakage or stalling of the press and which acts also to stop the press if the operator lowers the die beyond a predetermined point.

It is, therefore, one of the principal objects of the present invention to provide a novel form of overload device which will act automatically to prevent stalling and breakage of a metal working press when the press load exceeds a predetermined amount.

Another object of the invention is to provide an overload device for a metal working press which is associated with the tie rods therein and which obviates the necessity for preloading the press by shrinking the tie rods.

A further object of the invention is to provide a novel overload device for a metal working press wherein the action of a yieldable force on each of the tie rods in the press will preload the press, but will yield when the press load reaches a predetermined amount thereby to prevent stalling or breakage of the press.

Still another object of the invention is to provide an overload device for a metal working press wherein a lever arm is associated with each of the press tie rods and has an eccentric arrangement adjacent one end thereof so that a yieldable force exerted adjacent the opposite end of the lever arm will preload the press thus obviating the necessity for tie rod shrinkage, and will also yield when the press is overloaded to prevent stalling of the press.

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Still another and more specific object of the invention is to provide an overload device for a metal working press wherein a yieldable force is exerted against one end of an eccentrically mounted lever arm thereby to rotate the lever arm and impart a stress to the tie rod to which the arm is secured. The construction is such that an overload of the press will rotate the lever arm in the opposite direction to that which it was rotated during the preloading step, whereupon a limit switch will be contacted when a predetermined movement of the lever arm is exceeded.

A further object of the invention is to provide yieldable means in the form of fluid pressure which may exert a force against one end of a lever arm eccentrically mounted at its other end to a part of the frame and to one end of a tie rod, whereby the tie rod will be placed under stress so that when the press reaches a predetermined load the yielding action of the fluid pressure will prevent breaking or stalling of the press.

Other objects and advantages of the invention will become apparent upon reading the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a front elevational view of a metal working press illustrating one form of the present invention as applied thereto;

Fig. 2 is a side elevational view of the press shown in Fig. 1;

Fig. 3 is a fragmentary horizontal sectional view through the overload device taken along the plane of line 3—3 of Figs. 1 and 4;

Fig. 4 is a vertical sectional view taken along the plane of line 4—4 of Fig. 3;

Fig. 5 is a fragmentary front elevational view showing the bottom portion of a press like that shown in Fig. 1, but illustrating in elevation a modified form of the overload device;

Fig. 6 is a side elevational view of the structure shown in Fig. 5; and

Fig. 7 is a fragmentary elevational view illustrating the manner in which the overload device of Figs. 3 and 4 can be applied to the top of the press instead of at the bottom.

The metal working press illustrated in the draw-

ings is a mechanical type which is operated by means of cranks or eccentrics. The general construction and arrangement in the press is well-known to those skilled in the art, and includes, in general, a bed 1 and a crown 2 together with the uprights 3 at each side of the press which separate the crown 2 from the bed 1. These parts constitute the press frame and each of the uprights 3 is provided with a guideway 4 for the purpose of guiding the slide member 5 in its reciprocating movement. The slide 5 is caused to reciprocate by suitable and well-known mechanism. This slide actuating mechanism is operated by means of a motor 6 which drives a gear train by means of a pulley 7 on the motor shaft, one or more belts 8 and a driven wheel 9. The particular type of mechanism operating the slide may be any one of a number of different specific forms all well-known in the art which need not be specifically described herein inasmuch as it forms no part of the present invention. It is sufficient to point out that the mechanism reciprocates the slide 5 toward and away from the bed 1. The bed and slide may each have a die member mounted thereon so that when the two die members come together a sheet of metal may be stamped into a predetermined form.

A plurality of tie rods 10 may be suitably located in the frame of the press and in this particular instance a tie rod 10 is located at each corner of the press frame. It is necessary that the tie rods 10 be acted upon to draw the crown and press bed toward each other against the uprights so that each tie rod is placed under stress. Prior to the present invention, it was common practice to shrink the tie rods in order to draw the crown and bed toward each other. It will be noted in Figs. 1 and 2 that each tie rod is provided with a nut 11 at the top thereof which bears downwardly at the upper side of the crown. It has been customary also to provide a similar nut at the opposite end of each tie rod adapted to bear upwardly against the underside of the bed. When the tie rods are shrunk and placed under stress, the nuts at each end of the tie rods will bear against the upper and lower sides of the crown and bed respectively.

After the press is thus preloaded by placing the tie rods under a predetermined stress load, the necessary step in readying the press for use is to have the operator set the dies. The slide 5 which carries the upper die is adjustable in any customary and well-known manner so that the correct amount of pressure will be exerted by the upper die against the lower die at the moment the upper die reaches the lowermost extent of its movement. During the die setting preliminaries, the machine operator may become careless and set the upper die too low. When this occurs in presses having the usual and well-known construction, the die members will come together before the crank or eccentric, which drives the upper die, reaches its extreme lowermost position. An overload of the press then results and the press will either break or stall due to slippage of the clutch.

As stated hereinabove, the overload device of the present invention is adapted to be associated with each of the tie rods of the press so that such an overload condition will be prevented and the press will neither break nor stall. When an excessive overadjustment occurs, the press will be automatically stopped.

The details of construction of the preferred

form of overload device are illustrated in Figs. 3 and 4. It will be noted in Fig. 4 that the lower end of the tie rod 10 passes downwardly through an opening 12 in the bottom part of the bed frame 1. The lower end of the tie rod 10 is threaded as at 13 so that it may threadedly engage an opening in a link 14. The lower end of the link 14 is provided with an opening extending transversely thereof and is adapted to receive a horizontally disposed pintle 15.

A lever arm 16 is provided at one end thereof with an enlarged head portion consisting of circular end members 17 and 18 and an intermediate portion 19 partially surrounding an arcuate recess 20. Each end portion 17 and 18 is circular and has a center of curvature as indicated by the arrow 21 in Fig. 4. Each end portion 17 and 18 also has an opening therethrough adapted to receive the pintle 15 so that the axis of the pintle will be eccentric to the center of curvature of the end portions 17 and 18. This arrangement may be more clearly understood by viewing Fig. 4 where the axis of the pintle 15 is indicated by the arrow 22.

Each of the circular ends 17 and 18 of the head of the lever arm 16 is adapted to have antifriction bearing members located thereon. These bearing members may be seen in Fig. 3 where the inner race of each bearing is indicated at 23 and the outer race of each member is indicated at 24.

Spaced supporting brackets 25 have openings therethrough adapted to snugly receive the outer bearing race 24 of the antifriction bearing members surrounding the ends 17 and 18 of the lever arm 16. These supporting brackets 25 are then secured to a suitable part of the press frame adjacent the end of the associated tie rod 10, such as the bottom of the bed 1, as shown in Figs. 1 and 4, by means such as bolts 26.

It will be evident from the description thus far that one end of each tie rod 10 is secured by a link to a lever arm 16. The lever arm 16 is mounted for rotation or pivotal movement within the supporting brackets 25 about the point 21 as a center. In order for the device to operate properly, the axis 22 of the pintle 15 must be between the center of rotation 21 and the other end of the lever 16. Stated another way, it may be said that the tie rod 10 is connected to the lever 16 intermediate the ends of the lever. Thus, with this arrangement, as clearly illustrated in Fig. 4, when the lever arm 16 is in a substantially horizontal position, as shown, and a downward force is exerted at one end of the lever arm 16, there will be a rotation of the lever arm about the point 21. This rotation through the eccentric arrangement of the pintle 15 will cause this pintle and its connected link and tie rod to move downwardly. If the force exerted on the lever 16 is sufficient, there will result a stress in the tie rod urging the crown downwardly and the bed upwardly, the crown being urged downwardly due to the nut 11 at the top of the tie rod and the bed being urged upwardly due to the supporting brackets 25 which rotatably support one end of the lever arm 16. The result will be a preloading of the press in the same manner which has been heretofore accomplished by shrinking the tie rod.

The force to be exerted on the lever arm 16 may be created in any one of a number of different ways. In order to accomplish the ends hereinabove stated, it is necessary that the force be one which will yield at a predetermined load. While air under pressure has been illustrated

herein as the preferred means of exerting this force on the lever arm, it will be obvious that any other force such as weights, springs, or other fluids could be used. In the particular embodiment shown in Figs. 1 to 4, inclusive, the opposite end of lever arm 16 is pivotally secured as at 27 to a link 28. The upper end of link 28 is mounted by means of a pivot pin 29 to the lower or outer end of a piston rod 30. The opposite end of piston rod 30 has a piston 31 mounted thereon which is adapted to reciprocate within a cylinder 32 mounted on a suitable part of the press frame. A fluid inlet 33 communicates with an opening 34 at one end of the cylinder 32 and is connected with a suitable fluid supply tank (not shown) also mounted on the press frame. A pressure gauge 35 is inserted in the pipe 33 to indicate the fluid pressure which is applied against one side of the piston 31. In this particular instance the fluid used is air, but as mentioned previously, other fluids, such as a hydraulic fluid, could be used if desired.

The arrangements of the parts shown in Fig. 4 illustrate the piston 31 in its normal position without any fluid pressure applied thereto and before the application of any stress to the associated tie rod 10. Fluid under pressure is then admitted through the inlet 34 in the cylinder 32 and this pressure is sufficient to move the piston 31 downwardly and to cause a rotation of the lever arm 16 in a clockwise direction as viewed in Fig. 4. The various parts will then be in the dotted line position of Fig. 4, and several thousand pounds pressure will be exerted sufficiently to stress and elongate the tie rod 10 a predetermined amount. The amount of fluid pressure necessary and the stress on the tie rod will depend to a great extent on the size of the press under consideration. By way of example, it may be stated that in actual practice on one press the distance of the piston 31 from the bottom of the cylinder without fluid pressure applied thereto was normally 3⅝ inches. Air was then applied under pressure to the upper side of the piston 31 which moved the piston downwardly to within approximately 2 inches from the bottom of the cylinder at which point the tie rod 10 was stressed to 13,550 pounds per square inch. At this time the tie rod was elongated .074 inch.

As explained above, when the tie rods are shrunk into position, there is no yield when an overload occurs. The overload may be sufficient only to cause the clutch to slip and the press to stall. An excessive overload, however, would cause a breakage of the press.

With the present invention, however, when an overload would ordinarily occur, there will be pressure between the upper and lower dies on the slide and bed, respectively, so that a force upwardly will be exerted on the crown which will pull the tie rod upwardly. This upward force of the tie rod will tend to move the lever arm 16 in a counterclockwise direction, as viewed in Fig. 4, due to the eccentricity as between the points 21 and 22. The fluid pressure in the cylinder 32 will yield an amount sufficient to permit the drive mechanism or crank within the crown to complete its cycle without causing the clutch to slip and without stalling the press.

An extremely careless die setter, however, could cause movement of the piston to the end of its stroke where no further yield could take place, and this possibility is overcome by providing some means to stop operation of the press before such excessive movement is reached.

To this end a bracket 36 may be mounted on the underside of cylinder 32 and have associated therewith a limit switch 37. This limit switch is preferably a normally closed microswitch having a switch arm 38 extending outwardly therefrom with a cam roller 39 thereon. A cam member 40 may be mounted on the piston rod 30 and preferably is provided with a sloping cam surface 41 adjacent the roller 39 on the switch arm 38. The roller 39 and cam surface 41 may be so positioned with respect to each other that when an excessive piston travel is reached, the piston rod 30 will be moved upwardly to a point where the cam surface 41 thereon will come against the roller 39 and move the switch arm 38 inwardly to open the switch and stop the press.

It will thus be evident that a force exerted by the press up to a predetermined amount which is not excessive, will not cause the press to stall when the device of the present invention is utilized. It will also be evident that when an excessive overadjustment occurs, the press will stop due to the action of the cam 40 against the switch arm 38 to open the limit switch 37.

This condition may also occur during operation of the press when the operator inadvertently places more than one piece of metal in the press to be formed by the dies.

A device such as that shown in detail in Figs. 3 and 4 will be associated with each tie rod 10 so as to prevent an overload occurring at any of the four corners of the press, the overload device will operate to prevent stalling or breakage of the press.

While the invention is shown in its preferred form in Figs. 3 and 4, it is, nevertheless, possible to devise other specific means for utilizing an eccentrically mounted lever arm and yieldable pressure means to preload the machine and to prevent overloading. One modified form of the invention embodying the same principle is illustrated in Figs. 5 and 6 where the parts of the press itself are indicated by the same numbers used to indicate these parts in Figs. 1 and 2.

In the forms shown in Figs. 5 and 6, the tie rod 10 extends downwardly below the bottom of the bed 1 and has the pintle 15 extending transversely thereof. In this form, however, the lever arm is indicated by the numeral 42 and is provided with a bifurcated outer end, as shown at 43 in Fig. 6. The bottom end of the tie rod 10 extends between the bifurcations 43 and the pintle 15 is located within aligned openings in the end of the lever arm 42. The outer end of lever arm 42 is then pivotally connected at 44 to a bracket 45 suitably fixed to the press frame, as shown in Figs. 5 and 6. The opposite end of lever arm 42 may be pivoted as at 46 to the link 47, which, in turn, is pivoted at 48 to a piston rod 49 extending into the cylinder 50.

The operation of this form of the invention is identical with that described above in connection with the forms shown in Figs. 3 and 4. Air or other fluid under pressure may be admitted into the cylinder 50 to move the piston and piston rod 49 downwardly to place the tie rod 10 under stress. The lever arm 42 will pivot about the point 44. This pivot point of the lever arm and the axis of the pintle 15 being eccentrically located with respect to each other in the same manner as the eccentric points 21 and 22 of Fig. 4. When the yieldable force exerted downwardly on the lever arm 42 causes rotation in a clockwise direction of the lever arm, it will exert an upward force through bracket 45 against the

underside of the bed 1 and a downward force on tie rod 10 which will be transmitted to the crown of the press through the medium of the nut applied at the top of the tie rod. Again when an overadjustment in the press occurs, there will be an upward force of the crown and a tendency to move the tie rod 10 upwardly. This tendency will urge the lever arm 42 on the left side of Fig. 5 in a counterclockwise direction, and the right-hand lever 42 in a clockwise direction against the force of the fluid pressure within each cylinder 50 which will yield a sufficient amount to permit the press to complete the cycle without stalling. A cam and switch arrangement similar to that shown in Fig. 4 may also be utilized in connection with the forms shown in Figs. 5 and 6 to effect a stoppage of the machine when the piston travel becomes excessive.

It is also desirable in the forms shown in Figs. 5 and 6 that the bearings be antifriction similar to those shown at 23 and 24 in Fig. 3 because it has been discovered in this connection that bronze bearings provide excessive friction.

The modification shown in Fig. 7 illustrates the form of the invention in Figs. 1 to 4, inclusive, as applied to the top of the press instead of at the bottom thereof. In this form the lower end of each tie rod 10 will be provided with a suitable nut bearing upwardly against the underside of the bed. The cylinder 32 will be mounted on the press frame in a position reversed from that shown in Fig. 1.

The piston rod 30 will extend upwardly through the top of the cylinder 32 and will be connected to the lever arm 16 by means of the link 28. The mounting or supporting brackets 25 will be secured at the top of the crown 2 and will receive the outer end of lever arm 16 for pivotal movement in exactly the same manner heretofore described with respect to Figs. 3 and 4. The cylinder 15 will also be mounted adjacent the end of lever arm 16 and will be connected to tie rod 10 through link 14.

The pipe or conduit 33 will direct the air or other fluid under pressure into the bottom of the cylinder 32 to move the piston and piston rod 30 upwardly. The bracket 36 will be mounted on the upper end of the cylinder 32 and will support the limit switch 37. The roller 39 on the end of the switch arm 38 will be adapted to contact the cam surface 41 on the cam 40 to stop the press when excessive piston travel occurs.

The invention as described above contemplates the use of an eccentrically mounted lever arm adapted to be urged in one direction by the application of a yieldable force thereto for the purpose of preloading a metal working press by the application of stress to the tie rods thereof. Such a construction provides an effective overload device for a metal working press by permitting the device to yield when a predetermined force is exerted by the press, thereby preventing overload and press breakage by allowing the press to complete its cycle without stalling. The addition of limit switch means in association with the other parts of the overload device effectively prevents any possible breakage of the machine and consequent delays in operation by stopping the machine when an excessive piston travel occurs.

The yieldable means for exerting a force on the lever to preload the machine is preferably fluid under pressure, such as air or a hydraulic fluid. The invention would operate satisfactorily, however, if such yieldable pressure were to be applied by other means, such as spring means or weights.

The forms of the invention illustrated herein show the end of the tie rod pivotally secured to the lever arm between the axis about which the lever arm rotates and the point at which it is secured to the piston rod. To effect proper operation of the overload device with this arrangement, the fluid under pressure or to the yieldable force is exerted against the side of the piston opposite to that side to which the piston rod is secured. It will be apparent, however, that it is also within the contemplation of the present invention to secure the end of the tie rod to the lever arm on the opposite side of the axis of rotation of the lever arm to that shown in the drawings. The same result will then be accomplished by exerting the fluid pressure on the same side of the piston as that side to which the piston rod is secured. The eccentric arrangement will still be maintained, but will be reversed. It will also be apparent that the cam and switch arrangement for stopping the press will also be reversed because the piston and piston rod will then move in the opposite direction.

While it has been indicated herein that it is preferable to have as many overload devices as there are tie rods, it is, nevertheless, within the contemplation of the present invention that where there is a plurality of tie rods in a press, there may be an overload device associated with only some of the tie rods. It is considered that the invention lies in the overload device itself and its association with a tie rod regardless of whether all or only one of the tie rods in a press has such an overload device associated therewith.

Changes may be made in the form, construction and arrangement of parts from those disclosed herein without in any way departing from the spirit of the invention or sacrificing any of the attendant advantages thereof, provided, however, that such changes fall within the scope of the claims appended hereto.

The invention is hereby claimed as follows:

1. In a metal working press having a frame including a crown, a bed, uprights, tie rods connecting the crown with the bed, and a reciprocating slide, a load control device associated with one or more of the tie rods, comprising a yieldable member mounted on said frame, a lever arm connected at one end thereof to said yieldable member and having its other end mounted in a bearing in said frame to rotate about an axis, a pivot pin passing through said other end of the lever arm and the associated tie rod and having its axis parallel with said first axis and offset from said first axis and from a plane parallel to the axis of the tie rod and passing through said first axis, the location of said pivot pin being such that the axial projection thereof is contained within the axial projection of said bearing, whereby relative movement between the frame and the associated tie rod tending to produce excessive pressure or overload will cause rotation of said lever arm about said first axis against the pressure of said yieldable member.

2. In a metal working press having a frame including a crown, a bed, uprights, tie rods connecting the crown with the bed, and a reciprocating slide, a load control device associated with one or more of the tie rods, comprising a fluid pressure means mounted on said frame, a lever arm connected at one end thereof to said fluid pressure means and having its other end mounted in a bearing in said frame to rotate about an

axis, a pivot pin passing through said other end of the lever arm and the associated tie rod and having its axis parallel with said first axis and offset from said first axis and from a plane parallel to the axis of the tie rod and passing through said first axis, the location of said pivot pin being such that the axial projection thereof is contained within the axial projection of said bearing, whereby relative movement between the frame and the associated tie rod tending to produce excessive pressure or overload will cause rotation of said lever arm about said first axis against the pressure of said fluid pressure means.

3. In a metal working press having a frame including a crown, a bed, uprights, tie rods connecting the crown with the bed, and a reciprocating slide, a load control device associated with one or more of the tie rods, comprising a yieldable member mounted on said frame, a lever arm connected at one end thereof to said yieldable member and having its other end mounted in a bearing in said frame to rotate about an axis, a pivot pin passing through said other end of the lever arm and the associated tie rod and having its axis parallel with said first axis and offset from said first axis and from a plane parallel to the axis of the tie rod and passing through said first axis, the location of said pivot pin being such that the axial projection thereof is contained within the axial projection of said bearing, whereby relative movement between the frame and the associated tie rod tending to produce excessive pressure or overload will cause rotation of said lever arm about said first axis against the pressure of said yieldable member, and means associated with said yieldable member to stop operation of the press when said lever arm has rotated a predetermined distance around said first axis.

4. In a metal working press having a frame including a crown, a bed, uprights, tie rods connecting the crown with the bed, and a reciprocating slide, a load control device associated with one or more of the tie rods, comprising a fluid pressure means mounted on said frame, a lever arm connected at one end thereof to said fluid pressure means and having its other end mounted in a bearing in said frame to rotate about an axis, a pivot pin passing through said other end of the lever arm and the associated tie rod and having its axis parallel with said first axis and offset from said first axis and from a plane parallel to the axis of the tie rod and passing through said first axis, the location of said pivot pin being such that the axial projection thereof is contained within the axial projection of said bearing, whereby relative movement between the frame and the associated tie rod tending to produce excessive pressure or overload will cause rotation of said lever arm about said first axis against the pressure of said fluid pressure means, and means associated with said fluid pressure means to stop operation of the press when said lever arm has rotated a predetermined distance around said first axis.

5. A load control device adapted for use in a metal working press of the mechanical type having a frame including a crown, a bed, uprights, tie rods connecting the crown with the bed, and a reciprocating slide, said device comprising a yieldable member adapted to be mounted on said frame, a lever arm constructed at one end with a recess closed at one side by a web and having

outwardly extending laterally spaced bearing projections on opposite sides of the recess adapted to be mounted in bearing means in said frame for rotation about an axis, said recess adapted to receive one end of a tie rod, means connecting the other end of said lever arm to said yieldable member, a pivot pin passing through said one end of the lever arm and arranged to also pass through one end of the tie rod extending into said recess and having its axis parallel with said first axis and being offset from said first axis so that when the device is applied to the press said second axis will be offset from a plane passing through said first axis and parallel with the axis of the tie rod, said pivot pin being located so that the axial projection thereof will be contained within the axial projection of said bearing means in the frame, whereby relative movement between the frame and the associated tie rod tending to produce excessive pressure or overload will cause rotation of said lever arm about said first axis against the pressure of said yieldable member.

6. A load control device adapted for use in a metal working press of the mechanical type having a frame including a crown, a bed, uprights, tie rods connecting the crown with the bed, and a reciprocating slide, said device comprising a fluid pressure means adapted to be mounted on said frame, a lever arm constructed at one end with a recess closed at one side by a web and having outwardly extending laterally spaced bearing projections on opposite sides of the recess adapted to be mounted in bearing means in said frame for rotation about an axis, said recess adapted to receive one end of a tie rod, means connecting the other end of said lever arm to said yieldable member, a pivot pin passing through said one end of the lever arm, and arranged to also pass through one end of the tie rod extending into said recess and having its axis parallel with said first axis and being offset from said first axis so that when the device is applied to a press said second axis will be offset from a plane parallel to the axis of the tie rod and passing through said first axis, said pivot pin being located so that the axial projection thereof will be contained within the axial projection of said bearing means in the frame, whereby relative movement between the frame and the associated tie rod tending to produce excessive pressure or overload will cause rotation of said lever arm about said first axis against the pressure of said fluid pressure means.

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