March 21, 1961 F. E. MUNSCHAUER, JR., ET AL 2,975,701

POWER PRESS WITH SHIFTABLE BOLSTER MEANS

Filed Aug. 17, 1960 2 Sheets-Sheet 1

FIG. 1.

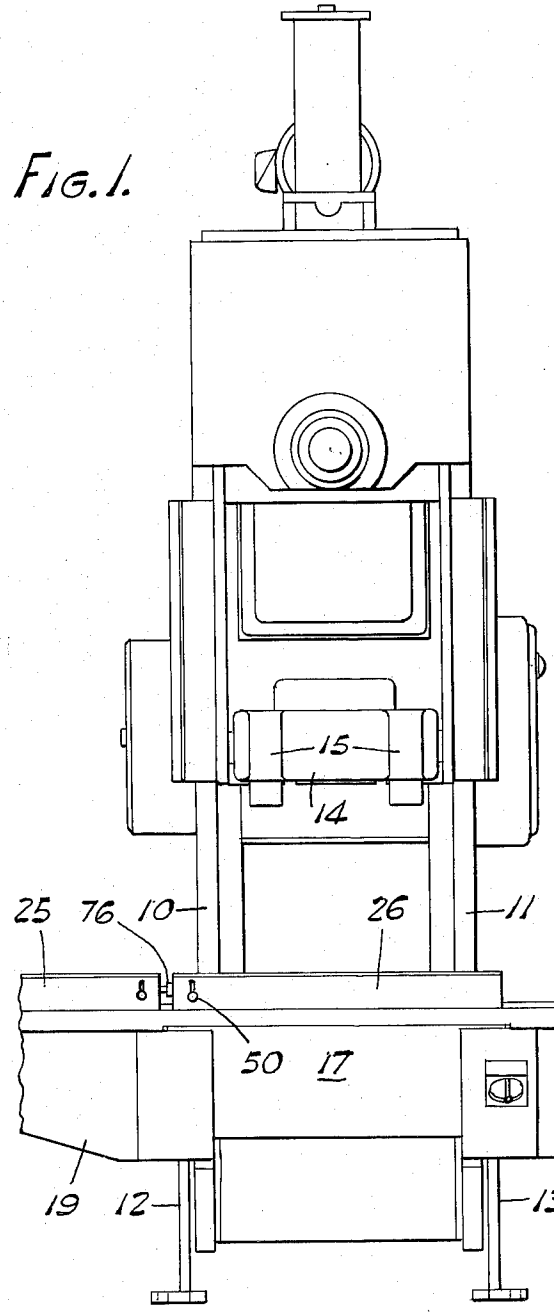
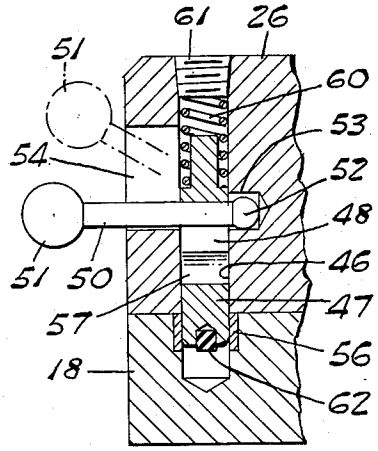


FIG. 4.



INVENTORS

FREDERICK E. MUNSCHAUER, JR.

GEORGE E. MUNSCHAUER & EDWIN A. MUNSCHAUER, JR.

BY Bean, Brooks, Bucklay & Bean

ATTORNEYS.

March 21, 1961 F. E. MUNSCHAUER, JR., ET AL 2,975,701

POWER PRESS WITH SHIFTABLE BOLSTER MEANS

Filed Aug. 17, 1960 2 Sheets-Sheet 2

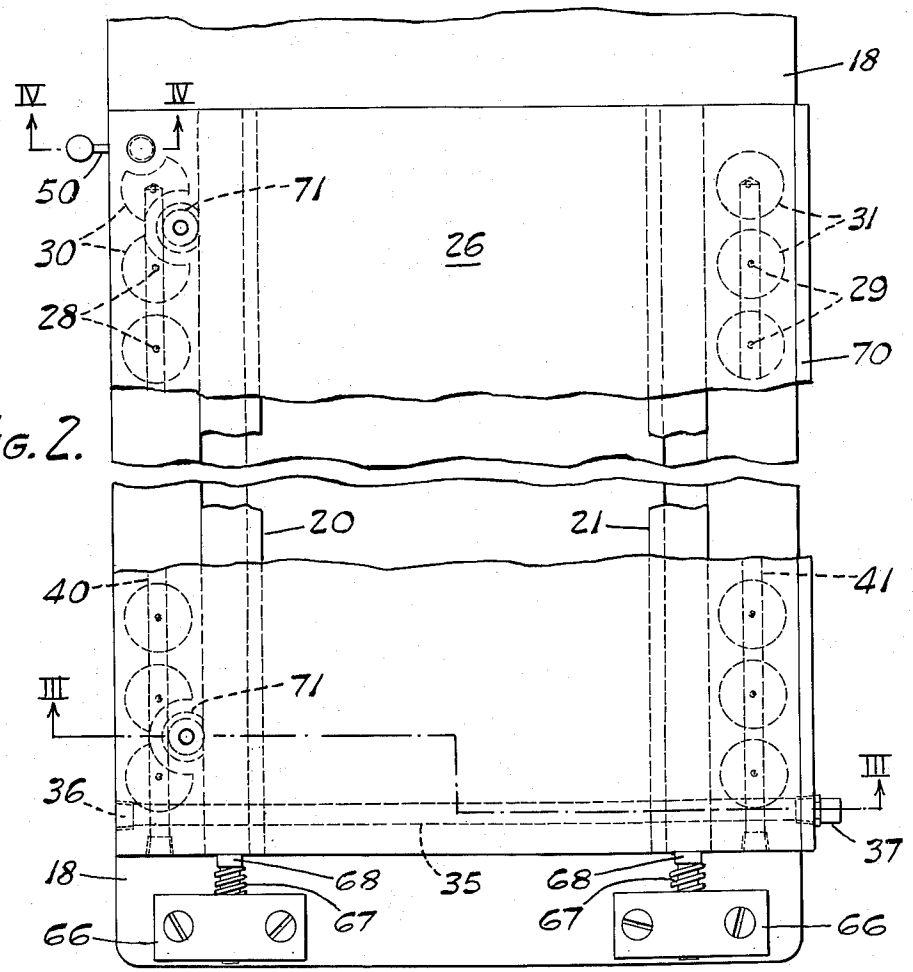


FIG. 2.

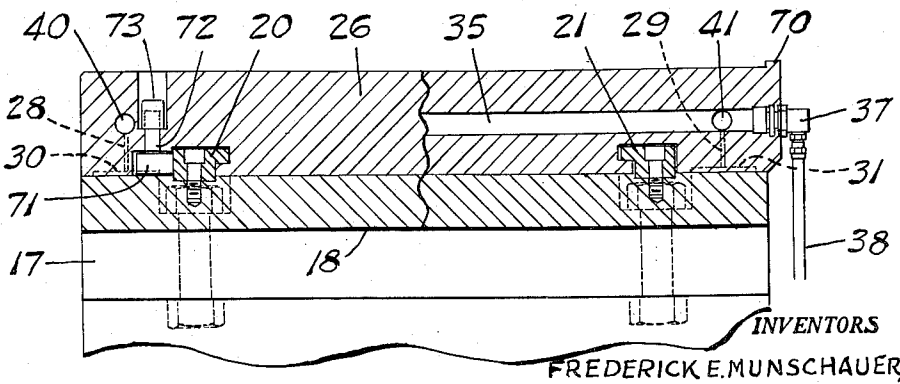


FIG. 3.

INVENTORS
FREDERICK E. MUNSCHAUER, JR
GEORGE E. MUNSCHAUER & EDWIN A. MUNSCHAUER, JR
BY Bean, Brooks, Buckley & Bean
ATTORNEYS.

United States Patent Office 2,975,701 Patented Mar. 21, 1961

2,975,701

POWER PRESS WITH SHIFTABLE BOLSTER MEANS

Frederick E. Munschauer, Jr., and George E. Munschauer, Eggertsville, and Edwin A. Munschauer, Jr., Snyder, N.Y., assignors to Niagara Machine & Tool Works, Buffalo, N.Y.

Filed Aug. 17, 1960, Ser. No. 50,254

10 Claims. (Cl. 100—214)

This invention relates to power presses and more particularly to novel power press construction for facilitating the introduction and removal of die sets from their operating positions on the beds of such presses.

Speaking generally, the present invention provides a novel press bed arrangement wherein die supporting bolsters are shiftable laterally to move die sets to and from their usual operating positions in which they are more or less centered with the bed of the power press. The general purpose of the apparatus is to provide means whereby a pair of bolsters are interchangeably moved between laterally offset positions at one side of the press or the other and a working position generally central with respect to the vertical center line of the power press. This general scheme of operation is not new and United States Patent No. 2,940,384 to Frederick E. Munschauer, Jr. et al., dated June 14, 1960 shows a power press wherein the bed is provided with lateral table-like extensions and a pair of bolsters are provided with hydraulic power means for driving them as a unit in a horizontal lateral direction so that either one or the other of the bolsters is centered on the bed of the press while the other is in a laterally offset position.

The present invention provides a novel power press bed and bolster arrangement wherein a pair of bolsters are independently and selectively movable in horizontally lateral directions for the above general purpose. The novel bolster support of the present invention is such that despite the very considerable mass of a bolster, particularly when a die set is mounted thereon, the bolster with or without a supported die set may readily be moved by manual operation between operating position and lateral offset position. This highly novel arrangement and mode of operation is achieved by providing fluid pressure means which acts between the lower side of a bolster and the supporting surface of the press which lies directly therebeneath. When the fluid pressure means is activated the bolster is in effect "floated" on a film of air so that the bolster may be moved virtually without friction and by mere application of manual pushing or pulling forces thereto.

The arrangement is extremely simple and does not require specially ground or otherwise finished surfaces as between the bottom of the bolster and the bolster supporting surface and is therefore much more economical than prior art devices or prior art proposals for this general purpose.

When the bolster has been thus moved to a desired position and the supporting air pressure is cut off the bolster is automatically solidly seated upon the supporting surface such as the bed or lower platen of the press or other associated die set supporting surface. This is extremely important in die operations such as are usually performed in power presses.

Conventional anti-friction bearing arrangements for facilitating manual bolster movement would be impractical for present purposes since the anti-friction bearings could not themselves provide proper bolster support during power pressing operations and therefore some complicated bearing retracting arrangement would be required. This would be so complicated and expensive as to be prohibitive from standpoints of original costs, maintenance and for other reasons.

Furthermore, anti-friction bearing arrangements require specially smooth operating surfaces which would require grinding extended bolster or bed surfaces and the additional vertical space required for accommodating such bearings would be undesirable.

The air supporting arrangement of the present invention is simpler and more economical in manufacture and operation than conventional anti-friction bearing arrangements even apart from the foregoing special objections to the use of the latter for present purposes. A further advantage of the arrangement of the present invention resides in the fact that air issuing from between the lower surface of each bolster and the underlying supporting surface of the power press tends to blow dust, metal particles and other debris from the supporting surface in advance of the movement of the bolster thereacross.

A single embodiment of the principles of the power press bolster shifting arrangement of the present invention is illustrated in the accompanying drawings and described in detail in the following specification. However, it is to be understood that such embodiment is by way of example only and that various mechanical modifications and variations may be introduced without departing from the principles of the invention, the scope of which is defined in the appended claims.

In the drawings:

Fig. 1 is a general front elevational view of a typical power press provided with one form of the bolster shifting arrangement of the present invention;

Fig. 2 is a fragmentary top plan view of the right-hand portion of the bed structure of the power press of Fig. 1;

Fig. 3 is a fragmentary cross-sectional view of the right-hand bolster and supporting bed structure of Fig. 2 taken approximately on the line III—III of Fig. 2; and

Fig. 4 is a fragmentary cross-sectional view taken on the line IV—IV of Fig. 2.

Like characters of reference denote like parts throughout the several figures of the drawings. One form of the apparatus of the present invention is illustrated in the accompanying drawing in conjunction with an otherwise conventional power press of the open back inclinable type. Referring to Fig. 1, the numerals 10 and 11 designate the usual side frame members of such a press, the lower portions of which are pivoted to legs or support members 12 and 13 so that the general body and framework of the press may be inclined rearwardly in a manner and for purposes which are clearly understood by those skilled in the present art.

In Fig. 1 the numeral 14 designates a conventional reciprocable upper slide or platen member. The numeral 15 designates means which is more or less automatically operable to engage the upper member of a die set located on the bed or bolster of the press and clamp such upper member to the upper movable platen 14. Such mechanism is illustrated and described in detail in a pending patent application of Frank J. Hohl, Serial No. 684,195 filed September 16, 1957, and the usefulness of the sliding bolster arrangement of the present invention is extended and augmented by use in combination with an automatically operable upper die member clamping apparatus of the general type illustrated therein.

In Fig. 1 the numeral 17 denotes a conventional press bed which extends laterally just beyond the frame members 10 and 11 and for the purposes of the present inven-

tion a table member 18 is attached to the top of bed 17 and extends laterally therebeyond for substantial distances at each side of the bed. Table 18 may be structurally reinforced at opposite sides of bed 17 as by the plate members 19.

The upper surface of table 18 is generally flat and may be finished by conventional machining such as shaping or planing and does not require grinding or other special surface treatment. Front and rear guide rails 20 and 21 are fixed to the upper surface of table 18 by screws and extend generally from end to end of the table 18 in a lateral direction with respect to the press proper. In the present instance the upper surface of table 18 is longitudinally grooved to provide secure and accurately positioned seats for guide rails 20 and 21, as shown in Fig. 3.

In Fig. 1 the numerals 25 and 26 designate a pair of like bolster plates of the general type which are normally secured to the bed of a power press and to which the lower member of a die set is in turn secured. The upper surface of the bolster plates may be T-slotted to facilitate securing die shoes or die members thereto or may be provided with other die securing arrangements.

In Fig. 1 the bolster 25 is in a left-hand position where it is removed from the operational area of the power press bed, while the bolster 26 is disposed directly over the conventional bed 17 of the press in the position it occupies when a die is attached thereto and the press is in operation.

The bolsters 25 and 26 are provided with longitudinally extending undercut grooves in their lower faces to receive the guide rails 20 and 21 by which they are retained in general surface contact with the upper surface of table 18. In the form of the invention illustrated herein by way of example the guide rail and groove tolerances are such that a slight raising movement of the bolster plates, of the order of several thousandths of an inch, is permitted.

Bolster 26 is shown in further detail in Figs. 2 and 3. Means are provided for emitting air pressure at a number of points spaced along the bottom of each bolster to tend to raise the same from supported engagement on table 18 and float the same on a film of air between the table and bolster interfaces. The actual areas of contact of the air emission passages with the table surface is not critical since in operation of the lifting arrangement air passes between the interfaces of the bolster and table, probably due to micrometric surface variations, and escapes about the edges of such interfaces.

Neverthless to insure against possible sticking of the abutting surfaces of the bolster and table or other possibly faulty operation the bolster, in the illustrated instance, is provided with slightly relieved surfaces in its bottom face at the point of emergence of the air passages. In the present instance these relieved portions are in the nature of very shallow counterbores which, since they are only of the order of two thousandths of an inch in depth, may merely be scraped surfaces.

In Figs. 2 and 3 the air passages extend in two rows along the bottom surface of each bolster near is front and rear longitudinal marginal edges and are designated by the numerals 28 and 29. The shallow concentric recesses just described are in turn designated by the numerals 30 and 31. The bolsters 25 and 26 are suitably bored and drilled internally to conduct operating air pressure to the passages 28 and 29.

Referring particularly to bolster 26 which is illustrated in detail in Figs. 2 and 3, a horizontal passage 35 through the bolster from the front to the rear thereof is plugged at its front end as at 36 and is provided with a swivel connection 37 at its rear end for an air pressure supply conduit 38. Horizontally extending front and rear passages extend from passage 35 as illustrated in Fig. 2, these passages being designated 40 and 41 respectively, and the vertical drilled holes which extend upwardly from each recess 30 and 31 to the associated passages 40 and 41 form the individual air pressure passages previously designated 28 and 29, respectively.

The air pressure conduit 38 and a corresponding pressure conduit connecting with the left-hand bolster plate 25 are flexible to permit free travel of the bolsters and are both connected to a two-way control valve which has a manual operating handle designated 45 in Fig. 1. Air pressure may thus be selectively connected to the recesses 30 and 31 of bolster 26 or to the corresponding recesses of bolster 25 to apply the desired pneumatic lifting force which forms the aforesaid bolster-supporting air film between the bottom surface of either bolster and the top surface of the supporting table 18.

An applied pressure of 25 p.s.i. is entirely adequate to "float" either bolster and pressures of approximately 50 p.s.i. are employed when a die set is mounted on the bolster. These pressures provide an ample safety factor and very much lower unit pressures may suffice. In the instance set forth herein by way of example the effective pressure surfaces of the underside of each bolster comprise the strips extending outside of the rails 20 and 21 along the front and rear edges of each bolster.

It appears that the effective lower surface portions of the bolster act in the nature of a regulating valve. Only enough lift is required to provide a continuous air film between the bolster and table surfaces. If the bolster tends to lift too high, more air escapes around the edges thereof, the pressure tends to drop, and the bolster lower to reduce the amount of escaping air.

When air pressure is thus applied and the bolster is thus floated on an air film the same may readily be moved longitudinally along the table 18 guided by the rails 20 and 21. Means for manually effecting such movement and for positively retaining either bolster in either of its limit positions will now be described with reference particularly to Fig. 4.

Bolster 26 which is shown in Fig. 4 by way of example is vertically drilled as at 46 to receive a dowel pin 47. Dowel pin 47 is vertically slotted as at 48 to receive a medial shank portion of a control handle member 50 which is fitted at its outer end with a control knob 51 and in the present instance has a ball formation 52 at its inner end which is disposed in a recess 53 in bolster 26.

The bolster 26 is vertically slotted as at 54 in Fig. 4 to permit handle 50 to swing upwardly to the dot and dash line position of Fig. 4, bearing against the upper end of slot 48 and thus raising the dowel 47 to lift the lower portion thereof from a guide bushing 56 in table 18. The lower end of slot 48 in dowel 47 is enlarged as at 57 to permit assembly of the ball formation 52 of the handle member through such enlargement.

A compression coil spring 60 bears downwardly against the upper end of dowel 47, being held in place by a threaded block 61, so that the dowel pin is normally urged resiliently downwardly. The lower end of dowel 47 is preferably provided with a non-metallic plug as at 62 of nylon, Teflon or the like for smooth, non-marring sliding contact with the top of table 18 during longitudinal movements of bolster 26 therealong.

Guide bushings 56 are provided in table 18 at suitable locations to receive the lower ends of the dowel members 47 to retain both of the bolsters 25 and 26 selectively in their desired limit positions. That is, each of the bolsters 25 and 26 may be selectively retained either in centered position with respect to the power press or in removed lateral position by engagement of the lower end of the dowel member 47 thereof in an appropriately located guide bushing 56.

Thus the operator, after connecting air pressure to a given bolster 25 or 26 by manipulation of valve handle 45, raises handle 50 to raise dowel member 47 and by means of handle 50 manually moves the air supported bolster to either the "in" or the "out" position with respect to the working zone of the power press, as the case may be.

Bolsters thus supported by air pressure move very freely, either empty or when a die set is mounted thereon, since they are literally floating on air. Accordingly, it is desired to provide resilient stop means at the ends of table **18** to cushion the movements of the bolsters to such end positions. In Fig. 2 the numeral **66** designates a pair of blocks fixed to the upper surface of table **18** and compression coil springs **67** which extend into counterbores in the lateral faces of blocks **66** are held in position by bolts **68**. The nut members of bolts **68** are not shown, being housed in counterbores in the outer faces of blocks **66**, the lower faces as viewed in Fig. 2. Thus the heads of the bolts **68** provide resiliently yieldable bumpers which engage the adjacent end surfaces of the bolsters as they move to their outermost positions.

As stated previously herein, the novel bolster arrangement of the present invention while not limited to such use, is very advantageously employed in conjunction with inclinable presses. For this reason the rear edge of each bolster is provided with an upstanding ledge **70** so that die sets will be prevented from sliding rearwardly off of a bolster when the latter is inclined and before and after such die set is secured to the bolster in the usual manner by bolts or screws or the like.

Furthermore, the rearward inclination of a press raises the forward portions of the bolsters and the underlying table **18** so that the bolsters with the dies mounted thereon tend to move downwardly along the rearwardly inclined table. To avoid the friction which would thus be introduced, particularly between the surfaces of the rail members **20** and **21** and their complementary grooves in the bolsters, anti-friction rollers **71** are provided which are mounted in each of the bolsters **25** and **26** and adapted to roll along the adjacent vertical front face of front rail **20**.

A pair of rollers **71** is provided in each of the bolsters **25** and **26** and each roller **71** is provided with a stem **72** seated in a vertically drilled hole in the bolster and retained by a nut **73** engaging a threaded upper end of stem **72**. Anti-friction ball or needle bearings intervene between each roller **71** and its supporting stem **72** so that the rollers **71** roll freely along the adjacent surface of rail **20** when the bed of the press is in an inclined position.

A screw **76** in one end face of bolster **25** is provided to prevent the bolsters **25** and **26** from coming into end-to-end engagement and thus avoid the danger of the fingers of an operator being pinched between the bolsters.

What is claimed is:

1. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a pair of die receiving bolsters disposed on said bed surface in side by side relationship, means guiding said bolsters for movement along said bed surface and for retaining the same against substantial lifting movement relative to said bed surface, each bolster having a plurality of apertures at its underside and passage means in each bolster communicating with the plurality of apertures thereof, conduit means for supplying air under pressure to each of said passage means and a manual valve selectively operable to connect air pressure to either of said bolster passage means to effect a lifting force on the associated bolster by pressure of air passing from said apertures horizontally between said bolster and said bed surface.

2. In an inclinable power press, a rearwardly inclinable press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a pair of die receiving bolsters disposed on said bed surface in side by side relationship, means guiding said bolsters for movement along said bed surface

and for retaining the same against substantial lifting movement relative to said bed surface, each bolster having a plurality of apertures at its underside and passage means in each bolster communicating with the plurality of apertures thereof, conduit means for supplying air under pressure to each of said passage means and a manual valve selectively operable to connect air pressure to either of said bolster passage means to effect a lifting force on said bolster by pressure of air passing from said apertures horizontally between the associated bolster and said bed surface, and anti-friction bearing means acting between each of said bolsters and said bed in a front to rear direction to absorb the rearward component of force of said bolster when the bed is in inclined position.

3. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a pair of die receiving supports on said bed surface, means guiding said die receiving supports for movement along said table surface and for retaining the same against substantial lifting movement relative to said table surface, each die receiving support having a plurality of apertures at its underside and passage means therein communicating with the plurality of apertures thereof, conduit means for supplying air under pressure to said passage means to effect lifting forces on said die receiving supports by pressure of air between said die receiving supports and said bed surface.

4. In an inclinable power press, a rearwardly inclinable press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a pair of die receiving supports on said bed surface, means guiding said die receiving supports for movement along said table surface and for retaining the same against substantial lifting movement relative to said table surface, each die receiving support having a plurality of apertures at its underside and passage means therein communicating with the plurality of apertures thereof, conduit means for supplying air under pressure to said passage means to effect lifting forces on said die receiving supports by pressure of air between said die receiving supports and said bed surface, and anti-friction bearing means acting between said die receiving supports and said bed to absorb the rearward component of force of said supports when the bed is in inclined position.

5. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a die support member on said table surface, means guiding said die support for movement along said bed surface between operative and inoperative positions and for retaining the same to limit lifting movement relative to said bed surface, said die support member having a plurality of apertures at its underside and passage means therein communicating with said plurality of apertures, and valve means selectively operable to connect air pressure to said passage means to effect a lifting force on said support member by pressure of air passing from said apertures horizontally between said support member and said bed surface.

6. In an inclinable power press, a rearwardly inclinable press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a die support member on said table surface, means guiding said die support for movement along said bed surface between operative and inoperative positions and for retaining the same to limit lifting move-

ment relative to said bed surface, said die support member having a plurality of apertures at its underside and passage means therein communicating with said plurality of apertures, valve means selectively operable to connect air pressure to said passage means to effect a lifting force on said support member by pressure of air passing from said apertures horizontally between said support member and said bed surface, and anti-friction bearing means acting between said die support member and said bed in a front to rear direction to absorb the rearward component of force when said bed is in inclined position.

7. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a pair of die receiving bolsters disposed on said bed surface in side by side relationship, means guiding said bolsters for movement along said bed surface and for retaining the same against substantial lifting movement relative to said bed surface, each bolster having a plurality of apertures at its underside and passage means in each bolster communicating with the plurality of apertures thereof, conduit means for supplying air under pressure to each of said passage means and a manual valve selectively operable to connect air pressure to either of said bolster passage means to effect a lifting force on the associated bolster by pressure of air passing from said apertures horizontally between said bolster and said bed surface, and manually releasable means for latching said bolsters in predetermined positions with respect to said bed surface.

8. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a die support member on said table surface, means guiding said die support for movement along said bed surface between operative and inoperative positions and for retaining the same to limit lifting movement relative to said bed surface, said die support member having a plurality of apertures at its underside and passage means therein communicating with said plurality of apertures, and valve means selectively operable to connect air pressure to said passage means to effect a lifting force on said support member by pressure of air passing from said apertures horizontally between said support member and said bed surface, and manually releasable means for locking said die support member in predetermined position with respect to said bed surface.

9. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a die support member on said table surface, longitudinally extending rail means guiding said die support for movement along said bed surface between operative and inoperative positions and for retaining the same to limit lifting movement relative to said bed surface, said die support member having a plurality of apertures along its underside between said rail means and the front edge of said member and between said rail means and the rear edge of said member, passage means therein communicating with said plurality of apertures, and valve means operable to connect air pressure to said passage means to effect a lifting force on said support member by pressure of air passing from said apertures horizontally between said support member and said bed surface.

10. In a power press, a press frame and a bed rigidly associated therewith, a movable platen above and reciprocable toward and away from said bed, said bed including a top surface portion extending laterally substantially beyond the normal working area of said bed, a pair of die receiving bolsters on said bed surface in lateral adjacency, rail means for guiding said bolsters for movement along said bed surface and for retaining the same to limit lifting movement relative to said bed surface, each bolster having a plurality of apertures along the underside thereof between said rail means and the front edges thereof and between the rail means and the rear edges thereof, passage means in each bolster communicating with the plurality of apertures thereof, conduit means for supplying air under pressure to each of said passage means, and a manual valve selectively operable to connect air pressure to either of said bolster passage means to effect a lifting force on the associated bolster by pressure of air passing from said apertures horizontally between said bolster and bed surface.

References Cited in the file of this patent

UNITED STATES PATENTS

2,918,183	Petersen et al.	Dec. 22, 1959
2,938,590	Barnett	May 31, 1960
2,940,384	Munschauer et al.	June 14, 1960