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Weyer

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[54] **INDUSTRIAL MACHINE PRESS HAVING MULTI POST STRUCTURE PROVIDING OPEN WORK AREA FREELY ACCESSIBLE FROM THREE SIDES**

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[52] **U.S. Cl.** ..... **100/53,** 100/231, 100/258 A, 100/266, 100/269 A

[51] **Int. Cl.** **B30b 15/28,** B30b 15/04

[58] **Field of Search** ..... 100/53, 214, 266, 100/269 A, 258, 258 A, 231, 193; 72/455, 441, 453, 456; 83/523, 624, 701

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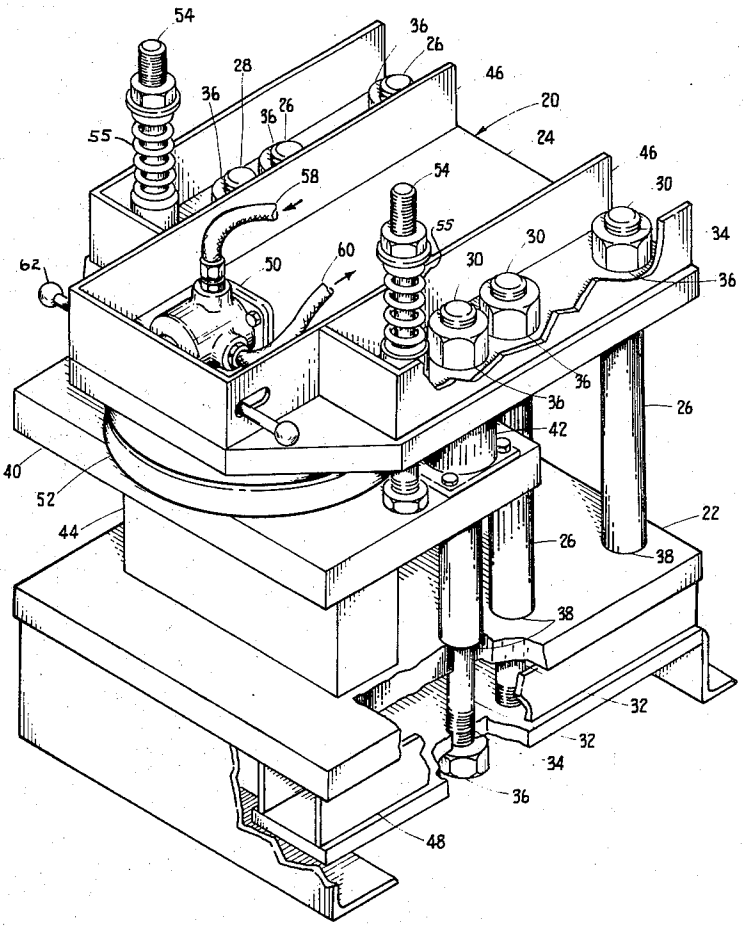
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[57] **ABSTRACT**

An industrial machine press having multiple post structures providing an open work receiving and forming area freely accessible from three sides without obstruction, utilizes some of the structural posts for the additional function of guiding a movable upper platen. All posts during pressing operations are sustaining either tension or compression loads without the creation of bending stresses in them. Their lower portions are rigidly mounted to a stationary platen and its supporting structure, and their upper portions are less rigidly mounted to upper positioning structure. Preferably all posts are equally sized and placed to withstand similar loadings, being grouped, as necessary, to supplement one another and remain free of bending stresses thereby assuring the upper and lower platens remain parallel to one another at all times. An embodiment particularly directed to fully utilizing posts sized and placed to withstand similar loadings, has six posts, with four in tension and two in compression.

17 Claims, 12 Drawing Figures



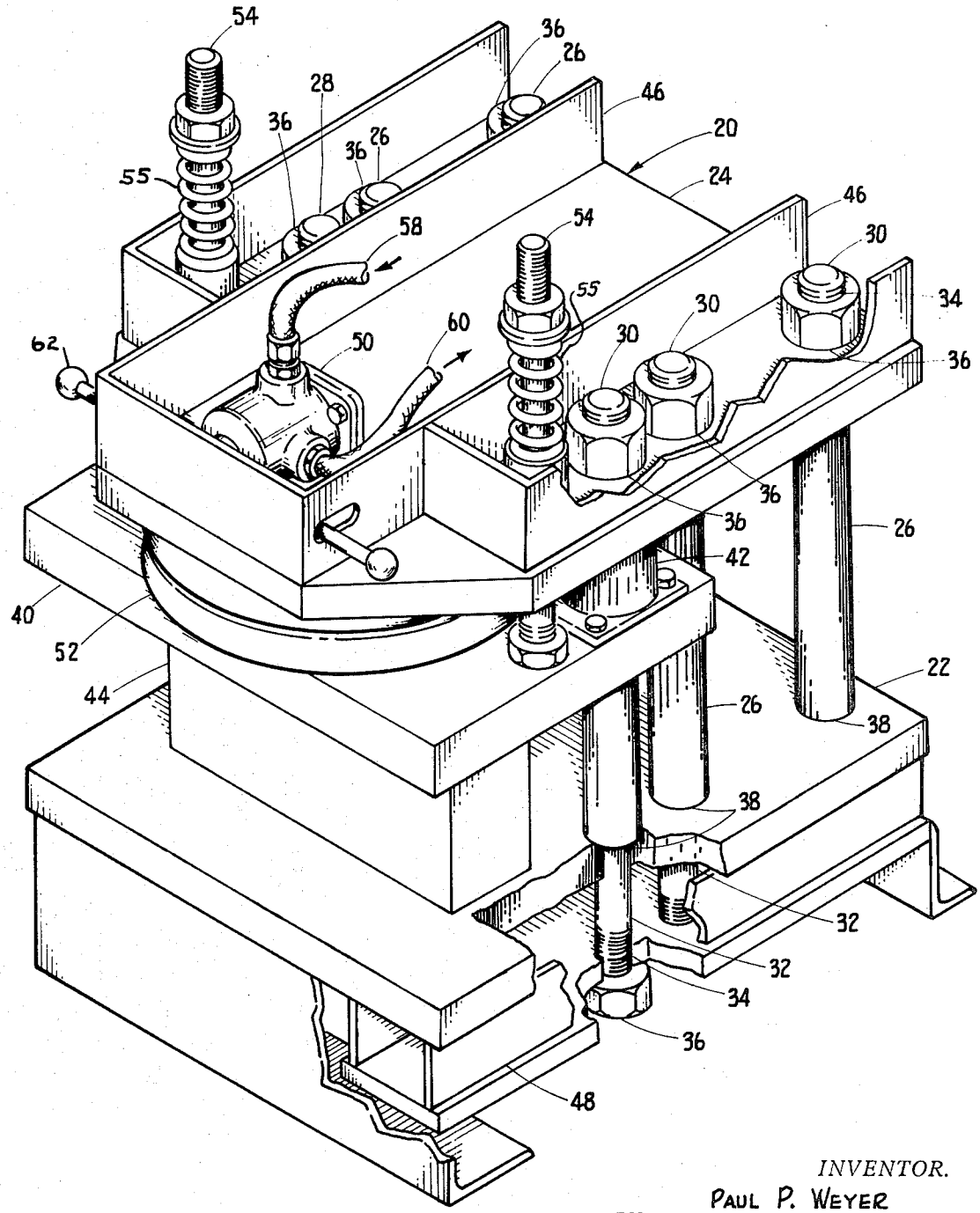


Fig. 1

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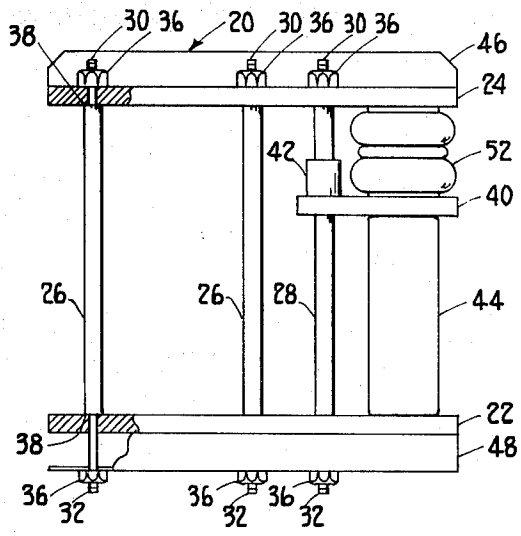


Fig. 2

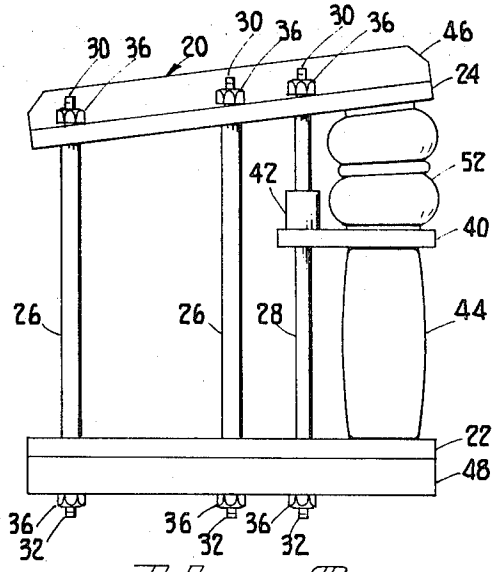


Fig. 3

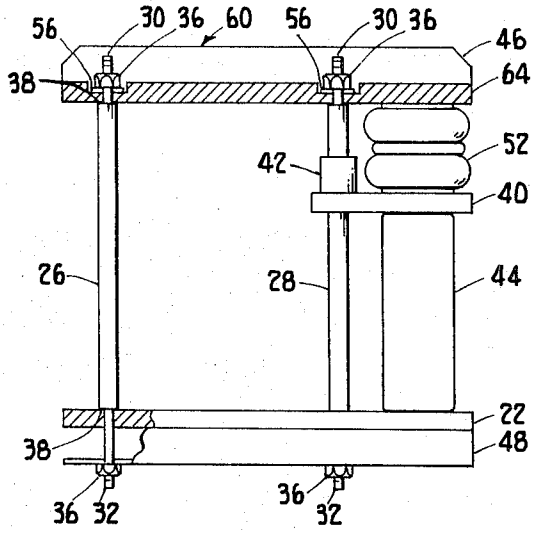


Fig. 4

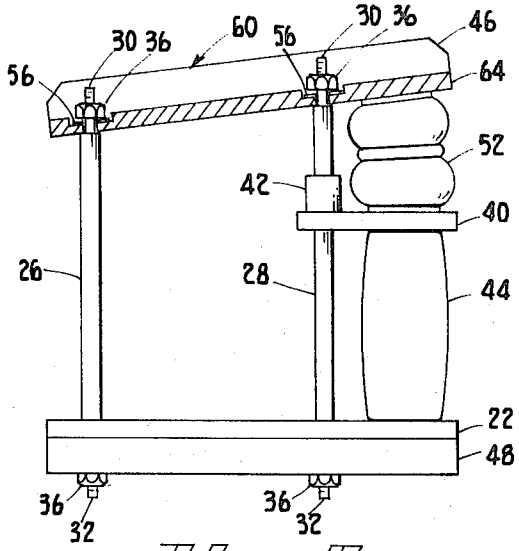


Fig. 5

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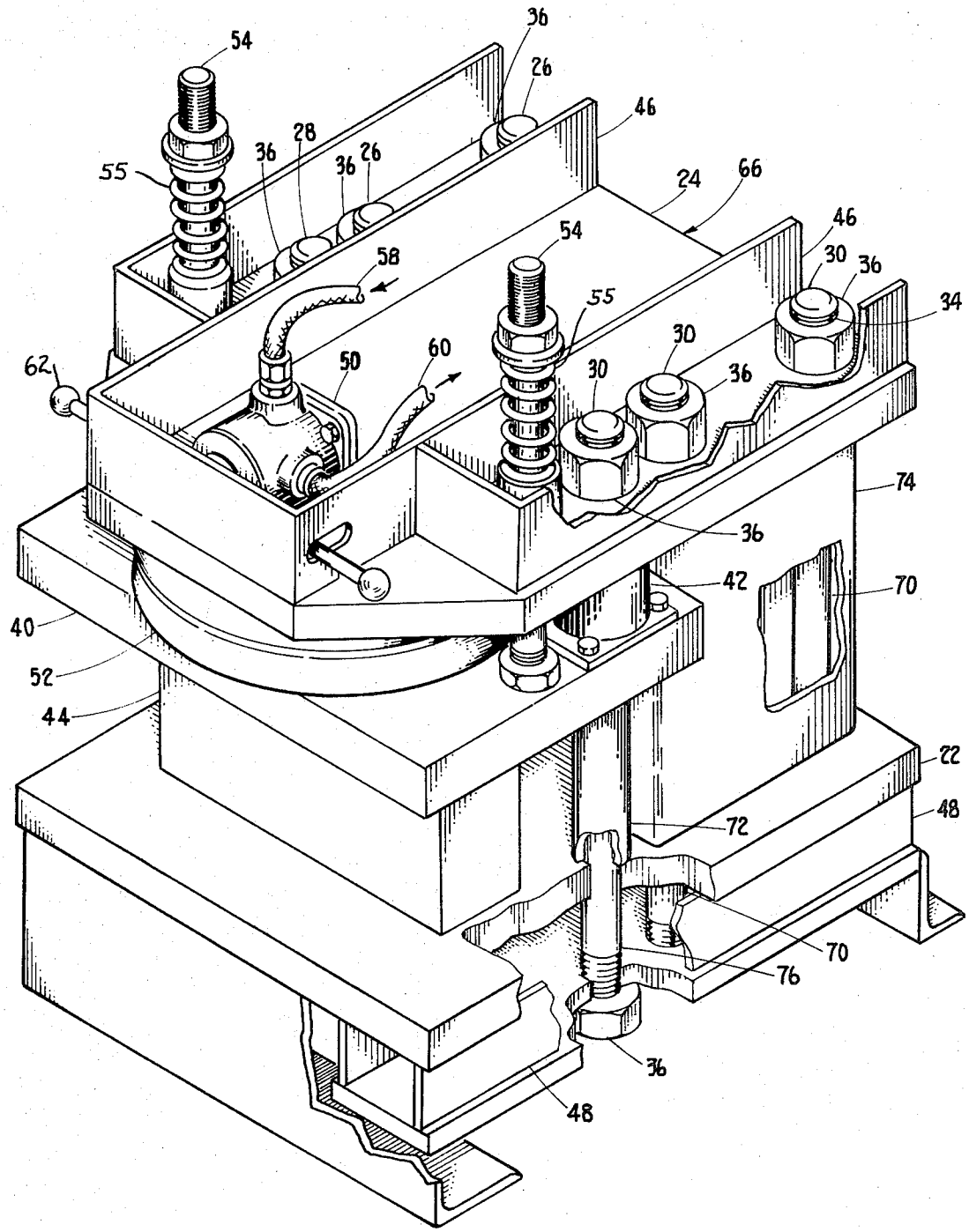


Fig. 6

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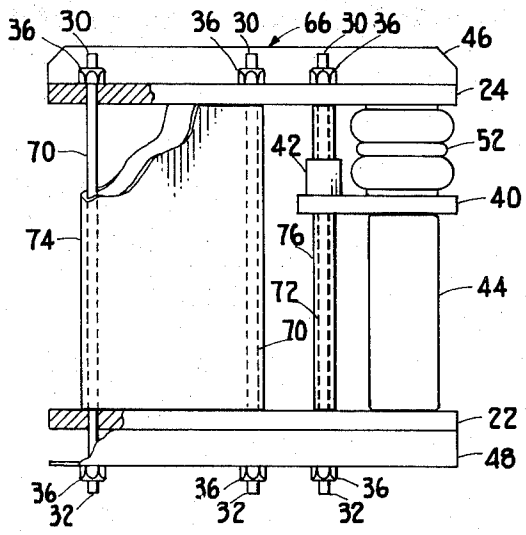


Fig. 7

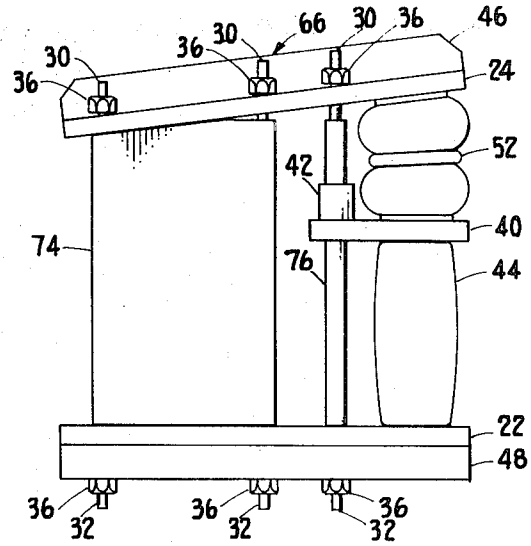


Fig. 8

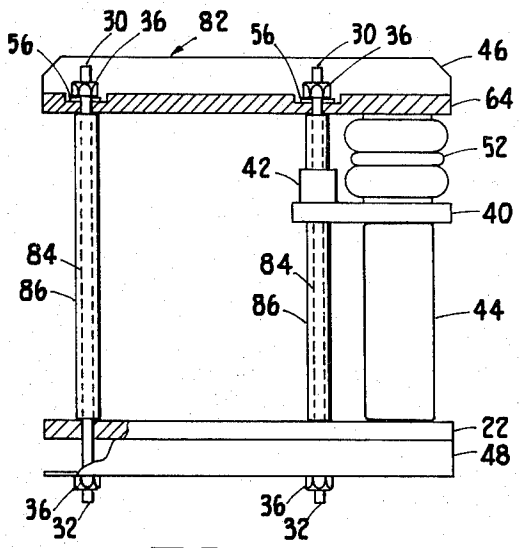


Fig. 9

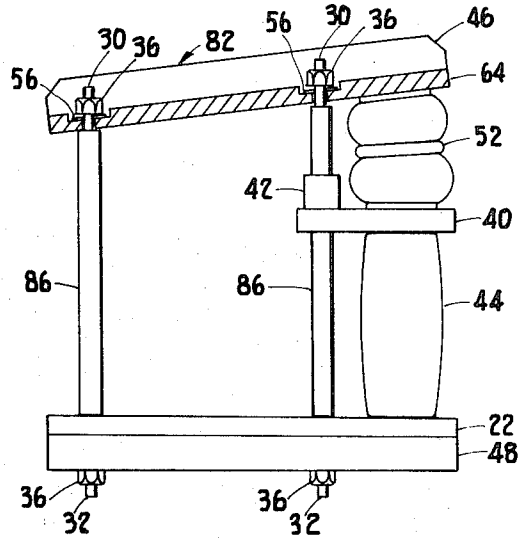


Fig. 10

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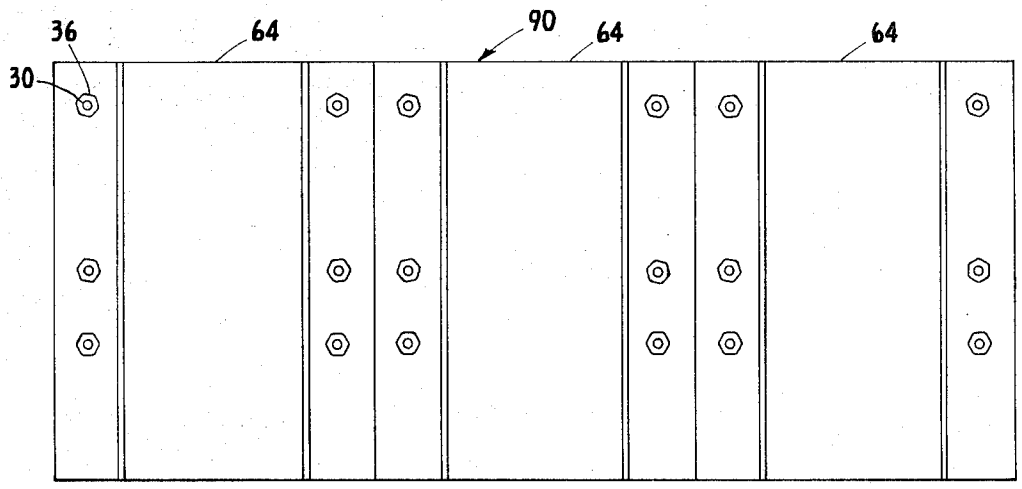


Fig. 11

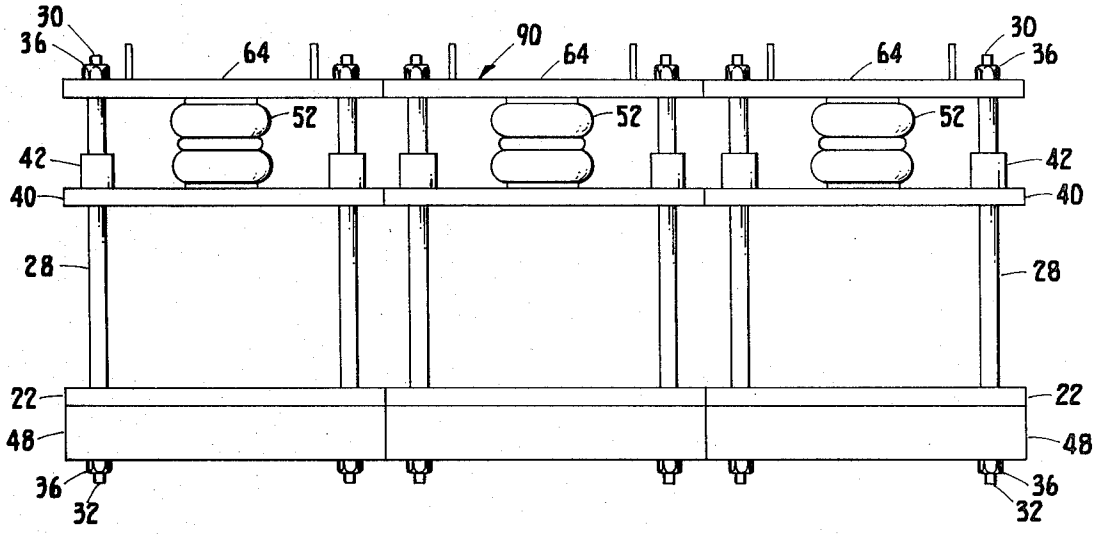


Fig. 12

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INDUSTRIAL MACHINE PRESS HAVING MULTI POST STRUCTURE PROVIDING OPEN WORK AREA FREELY ACCESSIBLE FROM THREE SIDES

BACKGROUND OF INVENTION

Other presses of an open frame design for loading from three sides, during operations have undergone misalignment between the working faces of platens, or they have been built very massive to avoid such deflection or misalignment, or additional structures inclusive of controlled balancing cylinders have been incorporated into a press. The use of balancing cylinders has helped to maintain the pressing platens parallel to one another and to reduce the overall massiveness of presses. However, balancing cylinders or prior equivalent adjustable devices used to avoid deflections have been known to vary sufficiently causing misalignment of platens and bending of press components.

Therefore, this industrial machine press uses multi post structures arranged to provide open work areas freely accessible from three sides, with each post being placed in relation to others so that all posts share the loads substantially equally without assuming any bending stresses and some posts accurately guide the movable platen while the platens remain parallel to one another. As a result of this overall multi-post press structure, the press is designed lighter. Also, preferably, many of the multi-posts are designed alike for production and assembly comvenience, lower cost manufacture, and reduced handling and storage costs of spare parts.

SUMMARY OF INVENTION

An industrial machine press having an unobstructed freely accessible three sided entry for loading and unloading materials to be pressed, utilizes multiple posts secured firmly below and less firmly above. The posts respectively undergo compression or tension loadings without assuming bending stresses. Also they are grouped, as in the six post embodiment, to withstand loadings of approximately similar magnitudes. In addition, some of the posts serve dual purposes by guiding a movable platen while carrying a tension load. Preferably all posts, in a selected embodiment, are made of equal size to reduce manufacturing, assembly, repair, and spare part storage and handling costs. The resultant overall industrial press is, by comparison, not massive and yet maintains the required parallelism between the press platens during the pressing operations.

DRAWING OF PREFERRED EMBODIMENTS

FIG. **1** is a perspective view of a multi-post industrial machine press using shouldered posts with some portions removed to clarify the construction and arrangement;

FIGS. **2** and **3**, are schematic side views of the frame members, with some portions removed, and material to be and being compressed, to indicate the design of one embodiment such as the six post embodiment, showing respectively, positions before and after the compressing force has been applied;

FIGS. **4** and **5**, are schematic side views of the frame members, with some portions removed, and material to be and being compressed to indicate the design of another embodiment such as the four post embodiment, showing, respectively, positions before and after the compressing force has been applied;

FIG. **6** is a perspective view of another embodiment of a multi-post industrial machine press using spacing members about the posts, with some portions removed to clarify the construction and arrangement;

FIGS. **7** and **8**, are schematic side views of the frame members with some portions removed, and material to be and being compressed to indicate further the design of the embodiment shown in FIG. **6**, suitable for utilizing six posts, showing, respectively, positions before and after the compressing force has been applied;

FIGS. **9** and **10**, are schematic side views of the frame members with some portions removed and material to be and being compressed to indicate another embodiment, suitable for utilizing four posts, having another individual post design, showing, respectively, positions before and after the compressing force has been applied; and

FIGS. **11** and **12**, illustrate respectively in a top view and a front view how each embodiment is extended to increase the side by side freely accessible working spaces when longer work pieces must be accommodated showing an enlarged overall press resulting from a side by side arrangement of smaller presses to obtain a larger overall industrial machine press which may be bolted together or made integral.

DESCRIPTION OF VARIOUS EMBODIMENTS OF THE INVENTION

Introduction to All Embodiments

The illustrated industrial machine presses to receive work freely from three directions are designed, with respect to all embodiments, to utilize strategically placed posts preferably of a common size and secured to take either compression or tension loads without assuming any bending stresses. In each embodiment of the press, some of the posts serve a dual purpose by guiding a movable platen. When doing so, they are always sustaining tension forces. Although these guide posts are substantially sized in outward appearance like all the other posts, they are, for their dual purpose of guiding, often case hardened, ground, and chrome plated. For example, in one embodiment they are chrome plated to a depth of one thousandth of an inch to improve the accuracy of the overall industrial machine press and also to extend the overall operational period during which such accuracy is maintained.

In all embodiments, the source of the compression force and the compression force actuator are both located directly over the working locale of the press where the production materials are to be compressed. Such arrangement coupled with the positioning of the posts and their mounting below in a long tight joint and their mounting above in a shorter somewhat flexible joint, results in the maintenance of a parallel relationship between the platens contacting the materials undergoing compression and the avoidance of any bending stresses in the posts.

The overall structure of each embodiment of this industrial machine press, resulting from always considering these design objectives, is provided at lower initial cost while gaining the accuracy desired. Also the follow on operating and repair costs are substantially lower. Moreover, the unit source of the compression energy may be mechanical, hydraulic, or pneumatic and always mounted directly above working locale of each press.

Embodiment Shown in FIGS. **1**, **2**, and **3**

In FIGS. 1, 2, and 3, a preferred embodiment 20 of the industrial machine press is illustrated utilizing six posts, the front four posts 26, 28 arranged to withstand tension loadings without bending and the back two posts 26 to sustain compression loadings without bending. Two posts 28 of the front four tension posts also serve as guide posts 28 are often case hardened, ground, and chrome plated. During operation of this press embodiment 20, the stresses sustained, in pounds per square inch, are of similar magnitude in all six posts.

The compressed materials 44, enter freely from any one of three optional directions into the press 20. Then they are compressed between the lower stationary platen 22 and the upper movable platen 40, as these platens 22, 40 remain parallel to one another at all times during the compression of the materials or work piece 44.

The upper movable platen 40 is guided by guide posts 28 which with the other support posts 26 secure the upper component positioning structure 24 also referred to as the top frame structure, and its reenforcement rib structure 46, to the lower stationary platen 22 and its reenforcement foundation structure 48, also referred to as the bottom frame structure. The power energy source is not shown for clarity purposes, but conduit leads, incoming 58 and outgoing 60, for air or oil, etc., are indicated in FIG. 1. They are connected to valve 50 which is operated by the two hand movement of the control handle 62 which will not effectively move the valve unless both hands are used to equally advance the respective ends of the control handle 62. The fluid energy, so controlled, causes the expansion of an inflatable bladder assembly 52 confined between the movable platen 40 and the upper positioning structure 24. The contraction is caused by the spring return assemblies 54, each utilizing a spring 55.

Each of the posts, either 26 or 28 in this embodiment have upper and lower shoulders 38 to establish the initial no load spacing of the upper positioning structure 24 and the stationary platen structure 22. Above, all posts beyond shoulder 38 extend for a shorter distance of a somewhat resilient securement, in contrast to a longer extension below beyond a shoulder 38 for a longer distance of rigid securement. During pressing operations, therefore any misalignment which may occur is confined to the upper positioning structure 24, and in contrast, the movable platen 40 remains parallel to the stationary platen 22 insuring the top and bottom of the material or work piece 44, remain parallel before, during, and after pressing. To further enhance the maintenance of this parallel relationship, movable platen 40 is equipped with bearing 42 of substantial axial depth, and, as necessary it is removed for inspection. The confinement of any misalignment and/or distortion to the upper positioning structure 24, also called the top frame structure 24, is illustrated in the schematic FIGS. 2 and 3. It is also shown in other like schematic views dealing with other embodiments, and throughout these schematic views this misalignment and/or distortion of the top frame structures 24 or 64 is always exaggerated. Realizing this is the illustrative purpose, it is then understood the respective top frame structures 24 or 64 are held substantially stationary except for their resilient distortions and/or misalignments occurring during compression of a work piece.

Embodiment shown in FIGS. 4 and 5

The embodiment 62, of the industrial machine press illustrated schematically in FIGS. 4 and 5 is produced using many of the components of the embodiment 20. However, the maximum allowable loading is lower. Often fewer posts are used, some being therefore of the same size but from the stress viewpoint being oversized, as common posts may be installed throughout a product line of several models. In addition, the upper positioning structure 64 is designed differently, with cross-sectional depth, to receive the upper ends of posts 26, 28, permitting more flexure above. Also, resilient washers 56 are used above to further enhance the maintenance of the parallel relationship between the stationary platen and this upper positioning structure 64.

Embodiment shown in FIGS. 6, 7, and 8

In FIGS. 6, 7, and 8, in perspective and schematic views, another embodiment 66 of an industrial machine press is shown. Although many of the components of the other embodiments 20 and 62 are used, the posts are made differently. Instead of using shouldered posts 26, 28, non shouldered or continuous uniform diameter support posts 70 and guide posts 72 are used. Then to serve the needed spacing function, establishing the no load paralleled configuration and assisting in its maintenance, larger hollow spacer columns or separators 74 are used about groups of support posts 70, and sma'ler hollow spacer columns or separators 76 are used about guide posts 72 between the stationary platen 22 and the upper positioning structure 24.

By using the larger hollow spacer columns 74, the compression stresses are carried through them between the upper positioning structure 24 and the stationary platen 22, and the posts 70, they surround undergo a tension loading. Therefore in press operations of this embodiment 66, all posts are sustaining tension loadings.

Embodiment shown in FIGS. 9 and 10

Schematically in FIGS. 9 and 10, another embodiment 82 is shown of an industrial machine press having fewer posts 84 of continuous uniform diameter, each without shoulders but surrounded with hollow spacer columns or separators 86. At the front, the separators 86 preferably have their outer surfaces case hardened, ground, and chrome plated to serve the guiding function for the movable platen 40.

Embodiment shown in FIGS. 11 and 12

In the respective top and front view of FIGS. 11 and 12, an embodiment 90 is illustrated to indicate how each of the embodiments may be extended to increase the side by side working spaces when longer work pieces must be accommodated. Preferably the larger overall press 90, is derived by arranging side by side smaller units of each press embodiment to create the overall larger industrial machine press 90. Such an enlarged press is bolted together or made integrally.

Summary of Principal Advantages

A very accurately operating indistrial machine press is available in various embodiments and respective sizes, all of them being directed to maintaining the parallelism between the pressing platens during the compression operations. This objective is realized and accomplished, while still keeping the production, maintenance, and operating costs at a comparatively low level.

Underlying the fulfillment of this excellent performance of the press is the utilization of posts, secured to sustain well distributed loadings in tension or compres-

sion, while avoiding the assumption of any bending stresses. This is accomplished while keeping the work area freely and continuously accessible from three definite directions.

Throughout each embodiment many components are fabricated from or derived from standard structurally shaped sections or available standard components. Moreover, many parts of the press embodiments are fabricated to be interchangeable among the various models to lower the production costs, and to reduce the cost of maintaining a spare parts inventory.

Although the description has been directed to describing this industrial machine press in conjunction with compressing work pieces, it is used, as described in more general terms, to apply force to work pieces. For example, in addition to regular pressing functions, it is used for other forming operations, such as shearing and blanking.

I claim:

1. An industrial machine press, freely and continuously accessible for loading from three main directions to apply force to work pieces by using compressing platens which remain parallel during compression operations, while held and guided by support posts, which in turn, join top and bottom frame structures of this industrial machine press, as the posts are mounted to remain free of bending stresses, being able only to assume either compression or tension loads, comprising:

a. a bottom frame structure;

b. a lower stationary compressing platen secured to the bottom frame structure;

c. support posts rigidly supported at their lower portions on the bottom frame structure and positioned to receive respectively compression and tension loads;

d. a top frame structure held substantially stationary except for resilient distortions occurring during compression of the work piece as it less rigidly receives and positions the upper portions of the support posts so they will not assume any bending stresses;

e. a movable compressing platen structure guided on and slidably supported along at least two of the support posts which serve the dual functions of sustaining tension loads and guiding this movable compressing platen, said support posts being arranged between the bottom and top frame structure along one side of the compressing platens in respective parallel rows leaving the working area freely and continuously clear on three sides to receive the work piece to be formed and

f. power means secured between the top frame structure and the movable compressing platen to selectively move the movable compressing platen in relation to the lower stationary compressing platen.

2. An industrial machine press, as claimed in claim 1, wherein the support posts arranged between the bottom and top frame structures are in respective rows where all posts in a given row sustain respectively tension loads from the bottom and top frame structures when located near the compressing platens and compression loads when located far enough away from the compressing platens to receive compression forces from the bottom and top frame structures.

3. An industrial machine press, as claimed in claim 2, wherein the support posts are arranged in groups in which each support post of a group sustains like type loading during pressing operations on a work piece, the group located nearest the compressing platens undergoing tension loads and comprising a larger number of support posts to share the overall tension loading at this locale, and the group located farther away from the compressing platens undergoing compression loads and comprising a smaller number of support posts to share the overall compression loading at this locale.

4. An industrial machine press, as claimed in claim 3, wherein all of the support posts are undergoing unit stresses of similar magnitude and are therefore of equal size.

5. An industrial machine press, as claimed in claim 1, wherein the support posts are supported at their lower portions by the bottom frame structure along a greater part of their overall length and at their upper portions by the top frame structure along a lesser part of their overall length to obtain the respective rigid and less rigid supports and thereby eliminate any bending stresses in these support posts.

6. An industrial machine press, as claimed in claim 1, wherein the support posts are shouldered at their upper and lower portions to establish the spacing between the top and bottom frame structures.

7. An industrial machine press, as claimed in claim 6, wherein the support posts are threaded beyond their shouldered portions and extended beyond the top and bottom frame structures where nuts are threaded on them in assembling the press and secured to insure the parallelism of the compressing platens during all the subsequent pressing operations on a work piece.

8. An industrial machine press, as claimed in claim 7, wherein resilient washers are fitted around the support posts, underneath the nuts, and above the top frame structure, to further insure the support posts will not sustain any bending stresses.

9. An industrial machine press, as claimed in claim 1, wherein other industrial machine press units are secured side by side to increase the effective overall length of the compressing platens leaving the working area freely and continuously clear on three sides to receive the work piece to be formed.

10. An industrial machine press, as claimed in claim 1, wherein hollow spacer columns surround the support posts to establish the spacing between the top and bottom frame structures.

11. An industrial machine press, as claimed in claim 1, wherein elongated hollow spacer columns surround a multiple number of support posts to establish the spacing between the top and bottom frame structures.

12. An industrial machine press, as claimed in claim 1, wherein the power means has expanding portions located between the top frame structure and the movable compressing platen directly over where a work piece is to be formed, further assuring the maintenance of parallelism between the compressing platens.

13. An industrial machine press, as claimed in claim 1, wherein the compression power means has a control means requiring operation with both hands of the press operator.

14. An industrial machine press, as claimed in claim 13, wherein the control means for the compression power means has an extended operating bar to be gripped at both ends and advanced uniformly, any pivoting caused by a one hand operation making the advancement of the operating bar ineffective and also therefore, the control means ineffective in operating

the compression power means, and thereby avoiding any injury to a hand of an operator which may fail to clear the otherwise closing compressing platens.

15. An industrial machine press freely and continuously accessible for loading from three major directions to apply force to work pieces by using compressing platens which remain parallel during compressing operations, while held and guided by support posts, which in turn join top and bottom frame structures of this industrial machine press, as the posts are mounted to remain free of bending stresses, being able only to assume either compression or tension loads, comprising:

a. a bottom frame structure;

b. a lower stationary compressing platen secured to the bottom frame structure;

c. six support posts rigidly supported at their lower portions on the bottom frame structure and positioned to receive respectively tension loads in four posts located nearer the upper movable compressing platen and compression loads in two posts located farther away from the upper movable compressing platen;

d. a top frame structure held substantially stationary except for resilient distortions occurring during compression of a work piece as it less rigidly receives and positions the upper portions of the six support posts so they will not assume any bending stresses;

e. a movable compressing platen structure guided on and slidably supported along a least two of the support posts which serve the dual functions of sustaining tension loads and guiding this movable compressing platen; and

f. power means secured between the top frame structure and the movable compressing platen structure to selectively move the movable compressing platen in relation to the lower stationary compressing platen.

16. An industrial machine press, as claimed in claim **15,** wherein the six posts are of equal size and spaced to undergo unit stresses of similar magnitude.

17. An industrial machine press, as claimed in claim **16,** comprising, in addition, a return spring assembly secured between the top frame structure and the movable compressing platen structure to clear this platen from a work piece when the compression power means is no longer energized.

* * * * *