Feb. 18, 1969 A. MICHELSON 3,427,855

MOVABLE BOLSTER FOR PRESSES

Filed Nov. 8, 1967 Sheet 1 of 3

FIG. 1

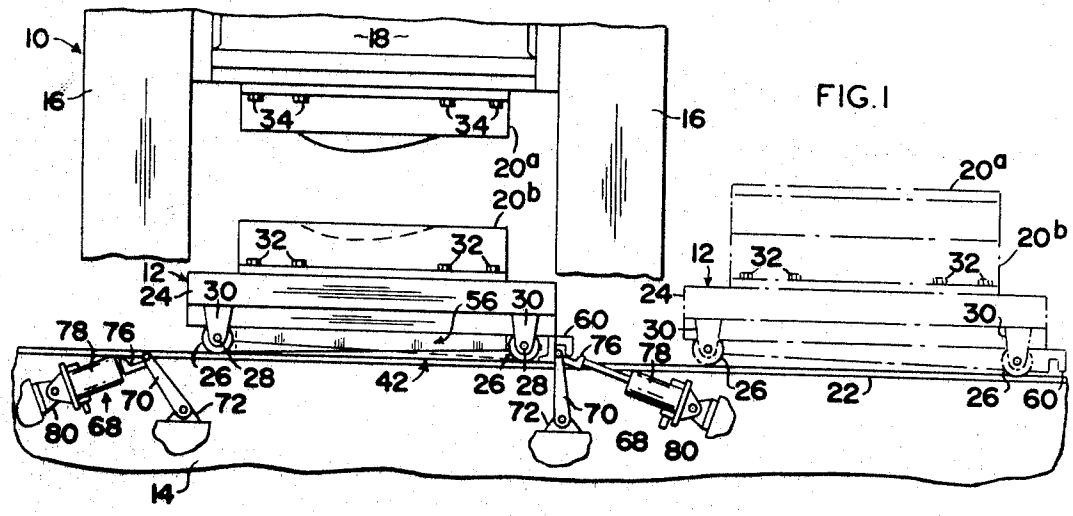


FIG. 2

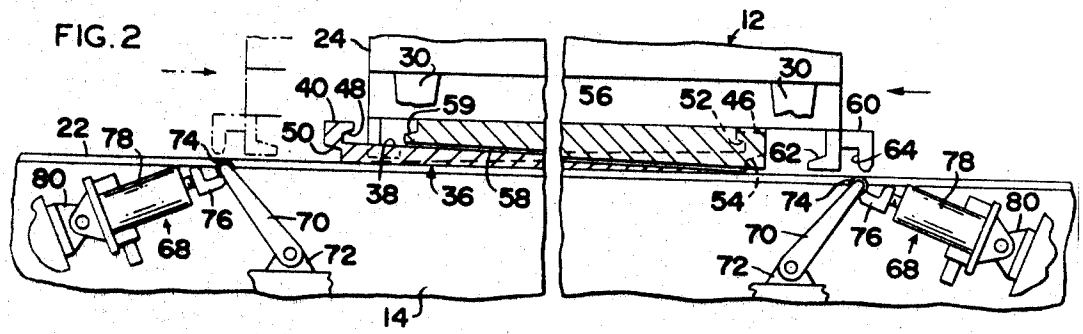
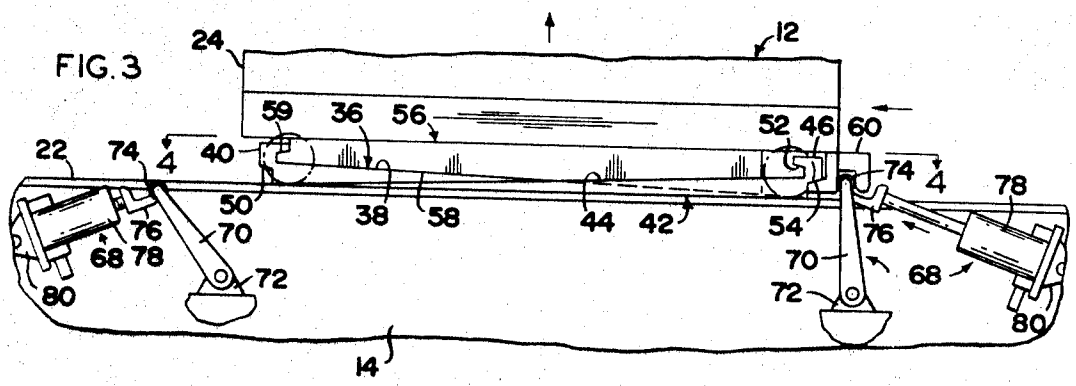


FIG. 3



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Feb. 18, 1969 A. MICHELSON 3,427,855

MOVABLE BOLSTER FOR PRESSES

Filed Nov. 8, 1967 Sheet 2 of 3

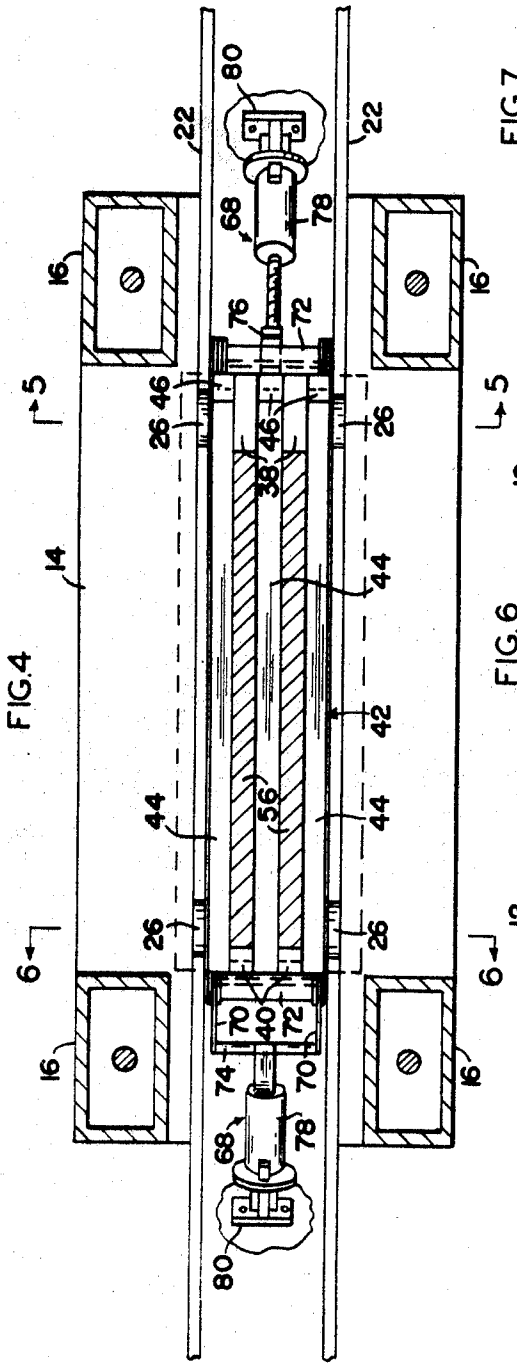


FIG.4

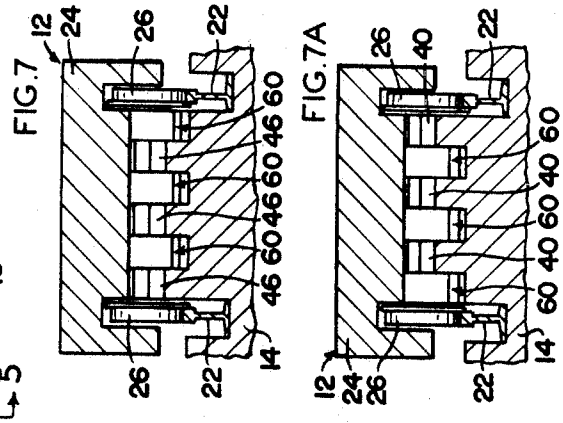


FIG.7

FIG.7A

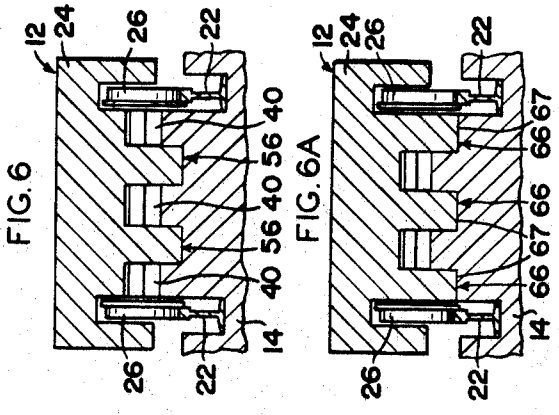


FIG.6

FIG.6A

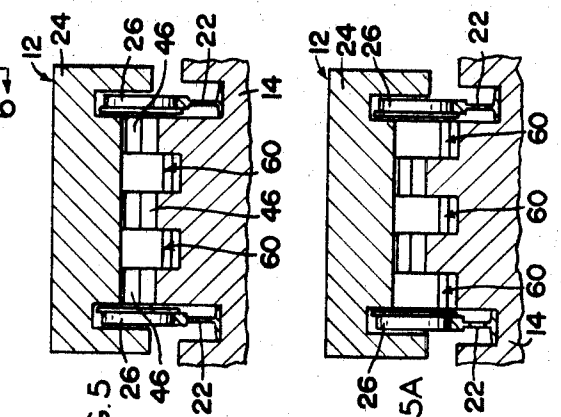


FIG.5

FIG.5A

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Feb. 18, 1969 A. MICHELSON 3,427,855

MOVABLE BOLSTER FOR PRESSES

Filed Nov. 8, 1967 Sheet 3 of 3

FIG. 8

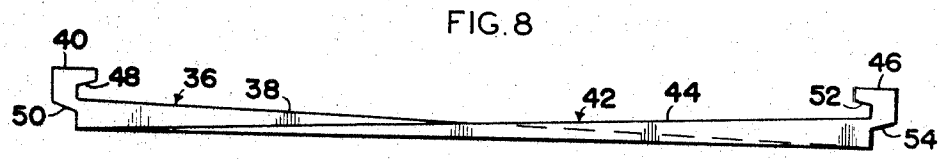


FIG. 9

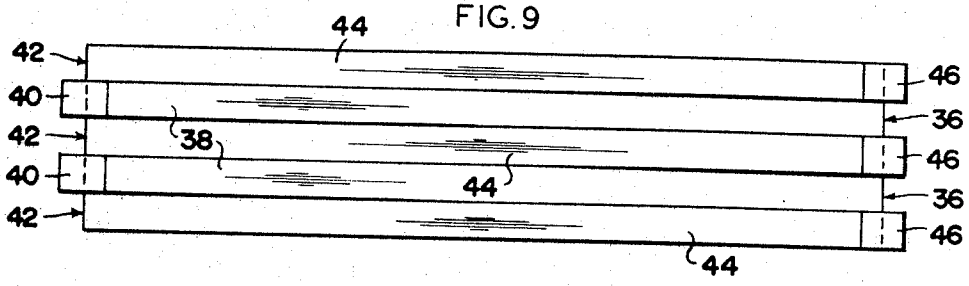


FIG. 10

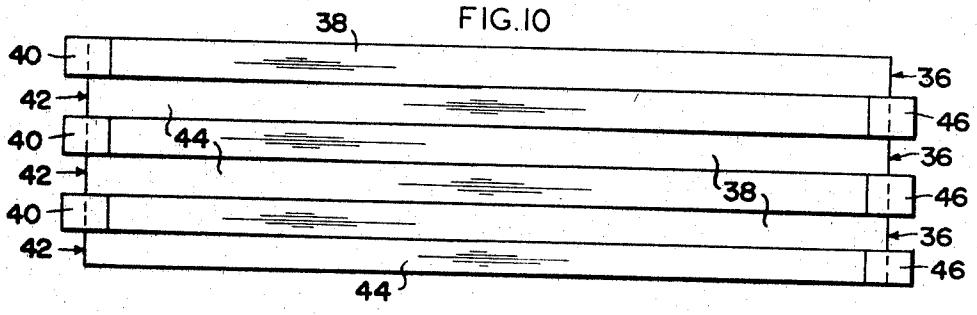


FIG. 11

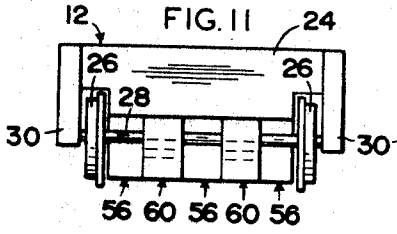


FIG. 12

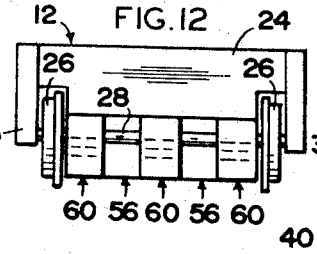


FIG. 13

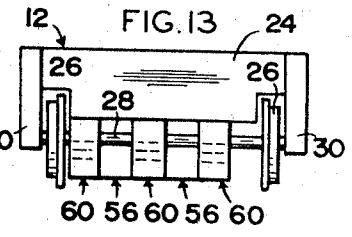


FIG. 14

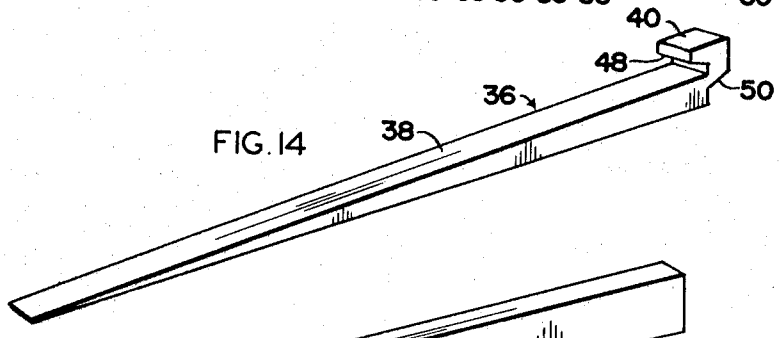
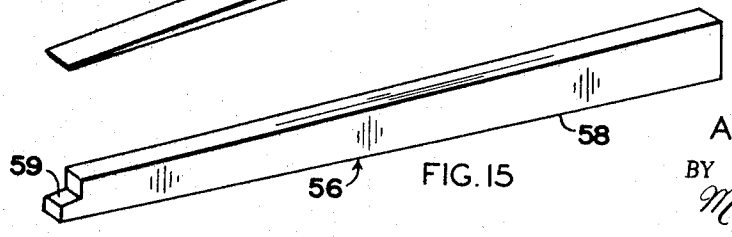


FIG. 15



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3,427,855

MOVABLE BOLSTER FOR PRESSES

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Filed Nov. 8, 1967, Ser. No. 681,474
U.S. Cl. 72—448 18 Claims
Int. Cl. B21j *13/02*; B30b *15/02*

ABSTRACT OF THE DISCLOSURE

A movable press bolster arrangement specially suited for die changing in metalworking presses. The arrangement includes a carrier or bolster provided with wheels which permit the carrier or bolster to be rolled into and out of the press. In order to relieve the load from the wheels and to permit the carrier to remain in the press during the press operation, cooperating inclined surfaces are provided on the carrier and on the press bed. The press bed surfaces are so arranged as to accept a carrier being moved into the press from either side of the press structure. The surfaces are arranged so that as the carrier is moved toward a final position in the press, the surfaces engage and further movement of the carrier causes it to move up the surfaces on the bed to thereby relieve the load from the wheels.

The present invention is directed to the press art and more particularly to an improved movable bolster for a press structure.

The invention is particularly suited for use in changing dies in metal forming presses and it will be described with particular reference thereto; however, it is to be appreciated that the invention is capable of broader applications and could be used wherever it is desired to leave a material or die carrier in position in a press during press operations.

In the press art it is common practice to provide metal working presses with movable bolster arrangements to facilitate changing die sets. The generally known press structures include sets of tracks or guideways extending from a position outside the press into and across the press bed. A wheeled carrier is usually mounted for movement into and out of the press on the tracks or guideways. When desired or necessary to move a die set into position in the press, the die set is mounted on the carrier while the carrier is located outside of the press and the carrier is then rolled along the tracks into position in the press. Once in the press, suitable mechanism must be provided to bring the bottom of the carrier into engagement with the press bed, so that during subsequent press operations the impact load on the dies will not act on the wheels of the carrier, but rather will be transmitted directly from the carrier to the bed. In addition, mechanism must be provided to firmly clamp the carrier in proper position in the press bed.

In the past, two different arrangements have been utilized for bringing the bottom of the carrier into engagement with the press bed. The first of these arrangements provides means for lowering the tracks, or track sections, in the press bed, thus disengaging the tracks or track sections from the carrier wheels. The carrier is rolled into the press and the tracks lowered, thereby bringing the carrier down against the bed. A second arrangement provides the carrier with wheels that are movable between raised and lowered positions, such that when the carrier is positioned in the press, the wheels may be actuated to a raised position, thus permitting the carrier to lower against the bed. However, both of these arrangements are quite complex, requiring a considerable amount of mechanism to be built into the press bed, or the carrier, and are extremely complicated and combersome in their manufacture, assembly and operation. Furthermore, separate clamping mechanisms are required to be built into the press bed in order to securely clamp the carrier in place in the press. As a consequence, initial cost, as well as maintenance costs on presses using such arrangements, is extremely high. Accordingly, there has been an ever-present demand for a means and apparatus to bring a carrier into contact with the press bed in a simple and efficient manner, that would allow a substantial reduction in the materials required and that would allow a reduction in the maintenance costs on presses using such arrangements.

The present invention provides a highly simplified movable bolster arrangement which does not require complex track lowering or wheel raising mechanism, and which is applicable to a bolster or carrier entering the press from either direction. Additionally, the means for clamping the carrier in the press are extremely simplified.

In accordance with the present invention, an improved movable carrier arrangement is provided for a power press having a bed, a ram movable vertically toward and away from the bed, and a carrier having supporting members on which it is supported for movement from a position outside the press to a position inside the press. Means are provided for moving the carrier to a final position, wherein the weight of the carrier is relieved from the supporting members and the carrier is securely locked in place. Such means include a plurality of inclined surfaces on the bed, a plurality of engaging inclined surfaces of the carrier, and power means for applying a force to the carrier to thereby move the carrier up the inclined surfaces and thus relieve the load from the support members.

In accordance with another aspect of the present invention, the press bed is provided with upwardly inclined spaced surfaces and the carrier is provided with downwardly inclined spaced surfaces, the surfaces being engageable upon movement of the carrier into the press, and clamp means at the ends of the surfaces to securely engage the carrier in the press upon movement into final position by power means.

In accordance with a further aspect of the present invention, there is provided movable bolster engagement and clamping means wherein such clamping means include wedge surfaces adjacent the ends of the inclined surfaces for engagement and securement of the carrier in the press bed when the carrier is moved to its final position therein.

In accordance with yet another aspect of the present invention, movable carrier receiving and clamping means are provided in a press bed to accommodate a carrier approaching the press from either direction, such clamping means cooperating to secure and retain the carrier in its final position.

The primary object of the present invention is to provide a highly simplified movable bolster arrangement to receive a movable bolster or carrier from either side of the press.

Another object of the present invention is to provide a movable bolster arrangement in which the final positioning of the bolster is accomplished by a single power means.

Yet another object of the present invention is the provision of a movable bolster arrangement in which the clamping and locating of the bolster is accomplished simultaneously with the movement of the bolster into a final position in the press.

Still another object of the present invention is the provision of a movable bolster arrangement in which inclined surfaces are provided in the press bed to co-

operatively accept and clamp a movable bolster in a final position in the press.

These and other objects and advantages will become apparent from the following description used to illustrate the preferred embodiment of the present invention as read in connection with the accompanying drawings in which:

FIGURE 1 is an elevational view, partly schematic, of a press having a movable bolster arrangement constructed in accordance with the present invention;

FIGURE 2 is an enlarged elevational view of a portion of the press and movable bolster arrangement illustrated in FIGURE 1, with parts broken away and in section to show the movable bolster being moved toward its final position in the press;

FIGURE 3 is an enlarged elevational view of a portion of the structure illustrated in FIGURE 1, showing the movable bolster located in its final position in the press;

FIGURE 4 is a cross-sectional view of the structure illustrated in FIGURE 3, taken substantially along the line **4—4** of FIGURE 3 and looking in the direction of the arrows;

FIGURE 5 is a cross-sectional view of a portion of the structure illustrated in FIGURE 4, taken substantially along the line **5—5** of FIGURE 4 and looking in the direction of the arrows;

FIGURE 5A is a cross-sectional view similar to FIGURE 5 showing a bolster moved into the press from the opposite direction as that illustrated in FIGURE 5;

FIGURE 6 is a cross-sectional view of a portion of the structure illustrated in FIGURE 4, taken substantially along the line **6—6** of FIGURE 4 and looking in the direction of the arrows;

FIGURE 6A is a cross-sectional view similar to FIGURE 6 showing a bolster moved into the press from the opposite direction as that illustrated in FIGURE 6;

FIGURE 7 is a cross-sectional view similar to FIGURES 5 and 6 of a modification of the structure illustrated in FIGURES 1–4;

FIGURE 7A is a cross-sectional view similar to FIGURE 7 showing a bolster moved into the press from the opposite sides as that illustrated in FIGURE 7;

FIGURE 8 is an enlarged elevational view of a portion of the press bed illustrated in FIGURES 1–4;

FIGURE 9 is a plan view of a portion of the press bed illustrated in FIGURES 1–4;

FIGURE 10 is a plan view of a portion of a modified press bed;

FIGURE 11 is a rear end view of a movable bolster positionable in the press of FIGURES 1–4 from one direction;

FIGURE 12 is a rear end view of a movable bolster positionable in the press of FIGURES 1–4 from another direction;

FIGURE 13 is a rear end view of a modified form or a movable bolster receivable in a press having a bed structure such as illustrated in FIGURE 10;

FIGURE 14 is a perspective view of a portion of the bed structure of the press illustrated in FIGURES 1–4; and

FIGURE 15 is a perspective view of a portion of the movable bolster receivable in the press illustrated in FIGURES 1–4.

Referring now to the drawings, wherein the showings are for the purpose of illustrating preferred embodiments of the invention only and not for the purpose of limiting same, FIGURES 1–4 best illustrate the overall arrangement of a metal working press, indicated generally by the numeral **10**, provided with a movable bolster assembly, indicated generally by the numeral **12**, constructed in accordance with a preferred embodiment of the present invention.

The precise arrangement and construction of the press **10** is not important to the present invention. However,

as shown in FIGURE 1, the press comprises a bed **14** having vertically extending uprights **16** to carry an upper ram assembly **18**, mounted for vertical reciprocation toward and away from the bed **14**. Drive means, not shown, are provided to drive the ram **18** in the manner well known in the art. Mounted on the ram assembly **18** is the upper half **20***a* of a die set, the lower half **20***b* being secured in a movable bolster or carrier **12**, as will become hereinafter more particularly apparent. Extending longitudinally across the bed **14** and through the press **10** are guideways, in the form of tracks **22**, to provide means for guiding the movement of the bolster or carrier **12** into and out of the press **10**.

The movable bolster **12** includes a main frame **24**, provided with support members shown in the form of wheels **26** mounted on axles **28** which are journalled in brackets **30**. As illustrated in FIGURE 1, the bolster **12** and the die set **20** are adapted to be moved from a position outside of the press **10**, such as shown in dashed and dotted lines in FIGURE 1, to a fixed located position within the press **10** and beneath the ram **18**. This permits the die set **20** to be positioned in mated relation on the carrier while it is outside the press, the lower half of the die **20***b* being connected to the carrier in any suitable manner as by bolts **32**, and then moved into the press **10** to a position beneath the ram **18**. At this time, the ram **18** can be actuated downwardly and the upper die half **20***a* connected thereto in any suitable manner as by bolts **34**.

In order to support the carrier **12** within the press during the press operation, means are provided to relieve the load, transmitted by the ram assembly during press operation, from the wheels of the carrier. Located on the press bed **14** and within the press structure **10** are a plurality of strips, indicated generally by the numeral **36**, equally spaced apart across the press bed **14** and between the tracks **22**. Strips **36** are provided with upwardly inclined surfaces **38** which terminate at their upward extension in clamp members **40**, the purpose for which will become hereinafter more apparent. The plurality of strips **36** are inclined upwardly from the lowermost point at the right, as viewed in FIGURES 1–4 of the drawings. Disposed between the strips **36** are a plurality of like strips, indicated generally by the numeral **42**, also provided with upwardly inclined surfaces **44** and terminating in clamp members **46**. Strips **42** are upwardly inclined from their lowermost point at the left, as viewed in FIGURES 1–4 of the drawings. Strips **36** are adapted to receive a carrier approaching the press from the right, and strips **42** are adapted to receive a carrier approaching from the left, as will become hereinafter more particularly described. Clamp members **40** include inner wedge surfaces **48** and outer wedge surfaces **50**. Similarly, clamp members **46** include inner wedge surfaces **52** and outer wedge surfaces **54**.

Formed on the underside of carrier **12** are a plurality of downwardly extending members, indicated generally by the numeral **56**, having downwardly inclined surfaces **58**, the angle of inclination being the same as the upward angle of inclination of the surfaces **38** and **44**. Members **56** may be integrally formed from the carrier **12** or may be separate members secured thereto in any suitable manner. At the forward and upward terminus of the surfaces **58** are wedge surfaces **59**, the purpose for which will become hereinafter more particularly apparent. Members **56** are disposed in laterally spaced relation beneath the carrier **12** and aligned with the press bed strips **36**, so that upon approaching the press from the right, as viewed in FIGURES 1–4 of the drawings, the members **56** will override and engage the surfaces **38** of the press bed strips **36**.

Extending downwardly from the rear of the carrier **12** are a plurality of clamp members, indicated generally by the numeral **60**, which are disposed rearwardly of the members **56** and laterally spaced therefrom so as to

be aligned with the spaces between the members **56** across the bottom of the carrier **12**. Clamp members **60** include wedge surfaces **62**, the purpose for which will become hereinafter more apparent. Clamp members **60** include upwardly extending slots **64** to receive the power means in a manner to be hereinafter described.

It will now be apparent that as the carrier **12** is wheeled into the press assembly **10** from the right of the support wheels **26**, the carrier members **56** will engage the upwardly inclined surfaces **38** of the press bed strips **36**. Similarly, a carrier approaching the press structure from the left, and having a plurality of downwardly extending members **66** as indicated in FIGURE 6A, and having inclined surfaces **67** in the opposite direction of inclination as the surfaces **58** of members **56**, such strips **66** will override and engage the surfaces **44** of the press bed strips **42**. In either event, with the press bed strips **36** or **42**, the assembly will accomodate carriers from either side of the press structure.

The members **36** and **56**, and their inclined surfaces **38** and **58**, are so arranged and so dimensioned that the carrier **12** will approach its final position on the support wheels **26**, but will require further movement in order to relieve the wheels **26** from the load of the press operation. To accomplish this purpose, power means, indicated generally by the numeral **68**, are provided. Power means **68** include a pair of arms **70** secured to the press bed **14** in any suitable manner, as by brackets **72**, and having a roller or the like **74** extending therebetween. Roller **74** is received in the slots **64** of the clamp members **60**, and the roller **74** is suitably connected to a screw shaft **76** extending outwardly from a screw jack **78** mounted in the press bed **14** in any suitable manner, as by bracket **80**. It will be apparent that as the member **56** engages the member **36**, and thus stops forward movement of the carrier **12** on the support wheels **26**, the jack **78** may be actuated to swing the arms **70** toward the left, as viewed in FIGURES 1–4 of the drawings, to engage the roller **74** in the slots **64** in the clamp members **60**. Continued movement toward the left will drive the carrier **12** along the upwardly inclined surfaces **38**. At such time, the wedge surface **59** on the member **56** seats itself in the inner wedge surface **48** on the clamp portion **40** of the member **36**, and at the same time, the wedge surface **62** on the rearward clamp member **60** seats itself on the outer wedge surface **54** of the clamp portion **46** on the member **42**. Thus, the carrier **12** will be securely wedged and mounted in place under the ram assembly **18**, and the carrier **12** will be raised slightly from its rolling position to take the load off the support wheels **26**.

Similar structure is provided at the opposite side of the press assembly **10** for powering a carrier approaching the press from the left, as viewed in FIGURES 1–4 of the drawings. The structure is the same as hereinbefore described, and like reference numerals relate to like parts.

Although it is apparent that the angle of inclination of surfaces **38, 44, 58** and **66** could theoretically be at substantially any angle, it is apparent that the larger the angle the greater will be the component of force acting to move the carrier in response to contact by the press ram **18**. For this reason, the angle of inclination of the surfaces **38, 44, 58** and **66** is preferably substantially below the magnitude of the friction angle for the combination of materials used for forming these members. Thus, the surfaces act as horizontal surfaces, and no effective horizontal component of force is generated by the ram **18**. In the preferred embodiment of the invention, members **36, 42, 56** and **66** are formed of steel, and the surfaces **38, 44, 58** and **67** are relatively smooth and well polished. For a combination of steel and steel, the friction angle will be in the range of from 6° to 8°, and the angle of inclination of the surfaces would preferably be in the range of from 1.5° to 2°. It is understood, of course, that the most desirable angles would vary substantially, depending on the particular materials used and the surface finishes thereof.

As has been heretofore described, the location of the strip members **36** and **42** laterally of the press bed **14** is such that two of such strips are disposed inclined upwardly toward the left, and three of such strips **42** are inclined upwardly toward the right, as viewed in FIGURES 1–4. Under such circumstances, a carrier **12** approaching from the right contains two such members **56**, and a carrier approaching from the left will contain three such members **66**, properly spaced relative to the cooperating members of the press bed. It will be apparent that additional strips **36** and **42** and additional members **56** and **66** may be provided as necessary, such an alternative arrangement being illustrated in FIGURES 7, 10 and 13, where a like number of strips **36** and **42** are disposed in adjacent array, and an equal number of carrier members **56** extend downwardly from the carrier **12** to be properly aligned with the strips **36** or **42**, depending upon the direction of approach. In other words, and with reference to FIGURES 10 and 13, FIGURE 13 is a rear view of a carrier adapted to approach the press bed strip array of FIGURE 10 from either the right or the left, wherein the carrier clamp members **60** will engage the clamp members **46** of the strips **42** and the carrier members **56** will engage the upwardly inclined surfaces **38** of the strips **36**. The same carrier configuration can be utilized to approach from the left of FIGURE 10, so long as the carrier is oriented such that the representation of FIGURE 13 is the rear view of the carrier.

As can be seen, the bolster assembly of the present invention is extremely simple in construction and permits a single power applicator to move the bolster into position, and simultaneously exerts the necessary clamping force. The construction is such as to easily adapt to a carrier approaching the press assembly from either direction, and the configuration of the press bed receiving the carrier provides a unique interlocking and cooperation of the various parts with the members on the carrier to securely lock the carrier in position for press operation.

The present invention has been described in connection with certain structural embodiments; however, it is to be appreciated that various changes may be made in the structural embodiments without departing from the spirit and scope of the present invention as defined by the appended claims.

Having thus described my invention, I claim:

1. In a power press having a bed, a ram vertically moveable toward and away from said bed and a carrier having support members and moveable from a position outside said press to a position inside said press, said improvement comprising a plurality of spaced first surfaces on said press bed, said first surfaces being upwardly inclined in one direction, a plurality of spaced second surfaces on said press bed, said second surfaces being disposed between said first surfaces and being upwardly inclined in the opposite direction relative to said first surfaces, and a plurality of spaced third surfaces on the underside of said carrier, said third surfaces being downwardly inclined at substantially the same angle as the upward inclination of said first and second surfaces, said third surfaces being spaced apart the same distance as said first surfaces and said second surfaces and being arranged to come into engagement with either said first surfaces or said second surfaces depending upon which side of said press said carrier is located in said position outside of said press, and power means for applying to said carrier a force having a component acting in the direction of movement of said carrier from said position outside said press to said position inside said press to move said carrier up said first surfaces or said second surfaces to thereby relieve the load of said carrier from said support members.

2. The improvement defined in claim **1** and further

including first clamp means on said bed and adjacent said first surfaces, second clamp means on said bed and adjacent said second surfaces, and clamp means on said carrier engageable with said first and second clamp means on said bed when said carrier moves to a final position within said press.

3. The improvement defined in claim 2 wherein said clamp means on said bed and said clamp means on said carrier comprise cooperating wedge members.

4. The improvement defined in claim 2 wherein said clamp means on said bed and said clamp means on said carrier comprise cooperating wedge members located at the upward terminations of said first and second surfaces and wedge members located at the forward terminations of said third surfaces and rearwardly and laterally spaced from the rearward terminations of said third surfaces such that when said forward wedge members on said carrier are engaged in said wedge members at said upward termination of said first surfaces said rearward wedge members on said carrier engage said wedge members at the upward termination of said second surfaces.

5. The improvement defined in claim 2 wherein said clamp means on said bed and said clamp means on said carrier comprise first clamp members at the upward termination of said first surfaces and having inner and outer wedge surfaces, second clamp members at the upward termination of said second surfaces and having inner and outer wedge surfaces, first wedge means on said carrier and at the forward termination of said third surfaces selectively engageable with said inner wedge surfaces of one of said first and second clamp members, and second wedge means on said carrier and laterally spaced from said third surfaces and selectively engageably with said outer wedge surfaces of the other of said first and second clamp members.

6. The improvement defined in claim 1 wherein said first surfaces and said second surfaces are inclined from the horizontal by an angle less than the friction angle for the material from which they are formed.

7. The improvement defined in claim 6 wherein said angle is less than ten degrees.

8. The improvement defined in claim 1 wherein said plurality of first surfaces are one more in number than said plurality of said second surfaces.

9. The improvement defined in claim 1 wherein said plurality of first surfaces are equal in number to said plurality of second surfaces.

10. In a power press having a bed, a ram vertically moveable toward and away from said bed, a first carrier having support members and being moveable from a position outside said press to a position inside said press and a second carrier having support members and being moveable from a position outside and on the opposite side of said press from said first carrier to a position inside said press, said improvement comprising a plurality of upwardly inclined first surfaces in said bed, said surfaces being equally spaced from each other, a plurality of second surfaces spaced equally apart and disposed between said first surfaces, said second surfaces being upwardly inclined in a direction opposite to the direction of inclination of said first surfaces, a plurality of third surfaces on the underside of said first carrier and being equal in number to the number of said first surfaces in said bed, said third surfaces being downwardly inclined at the same angle of upward inclination as said first surfaces, a plurality of fourth surfaces on the underside of said second carrier and being equal in number to the number of said second surfaces in said bed, said fourth surfaces being downwardly inclined at the same angle of inclination as said second surfaces, said third surfaces being arranged to come into engagement with said first surfaces when said first carrier is moved from said position outside said press to said position inside said press, and said fourth surfaces being arranged to come into engagement with said second surfaces when said second carrier is moved from said position outside said press to said position inside said press, and first and second power means for applying to said first and second carriers respectively a force having a component acting in the direction of movement of said first and second carriers respectively to move said first and second carriers up said first and second surfaces respectively to thereby relieve the load of said carriers from their respective support members.

11. The improvement defined in claim 10 and further including clamp means on said bed and adjacent said first surfaces, clamp means on said bed and adjacent said second surfaces, and clamp means on said first and second carriers and engageable with said clamp means adjacent said surfaces with which each of said carriers is in engagement when each of said carriers moves to a final position inside said press.

12. The improvement defined in claim 11 wherein said clamp means on said bed and said clamp means on said carriers comprise cooperating wedge members.

13. The improvement set forth in claim 11 wherein said clamp means on said bed and said clamp means on said carriers comprise cooperating wedge members located at the upward terminations of said first and second surfaces and forward wedge members located at the forward terminations of said third and fourth surfaces and rearward wedge members on said carriers rearwardly and laterally spaced from the rearward terminations of said third and fourth surfaces such that when said forward wedge members on said first carrier are engaged with said wedge members at the upward termination of said first surfaces said wedge members rearward of said third surfaces engage said wedge members at the upward termination of said second surfaces and when said forward wedge members on said second carrier engage said wedge members at the upward termination of said second surfaces said rearward wedge members rearward of said fourth surfaces engage said wedge members at the upward termination of said first surfaces.

14. The improvement defined in claim 11 wherein said clamp means on said bed and said clamp means on said carriers comprise first clamp members at the upward termination of said first surfaces and having inner and outer wedge surfaces, second clamp members at the upward termination of said second surfaces and having inner and outer wedge surfaces, first wedge means on said first carrier and at the forward termination of said third surfaces, second wedge means on said second carrier and at the forward termination of said fourth surfaces, third clamp members on said first carrier rearwardly and laterally spaced from the rearward termination of said third surfaces, and fourth clamp members on said second carrier rearwardly and laterally spaced from the rearward termination of said fourth surfaces, said first wedge means engaging said inner wedge surfaces of said first clamp members and said third clamp members engaging said outer wedge surfaces of said second clamp members when said first carrier is in final position on said press, and said second wedge means engaging said inner wedge surfaces of said second clamp members and said fourth clamp members engaging said outer wedge surfaces of said first clamp members when said second carrier is in final position in said press.

15. The improvement defined in claim 10 wherein said first surfaces and said second surfaces are inclined from the horizontal by an angle less than the friction angle for the material from which they are formed.

16. The improvement defined in claim 15 wherein said angle is less than ten degrees.

17. The improvement defined in claim 10 wherein said plurality of first surfaces are one more in number than said plurality of second surfaces.

18. The improvement defined in claim 10 wherein said

plurality of first surfaces are equal in number to said plurality of second surfaces.

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