Jan. 21, 1969 C. C. COUNTESS, JR., ET AL 3,422,660

MOVABLE BOLSTER LOWERING ARRANGEMENT

Filed April 27, 1967 Sheet 1 of 2

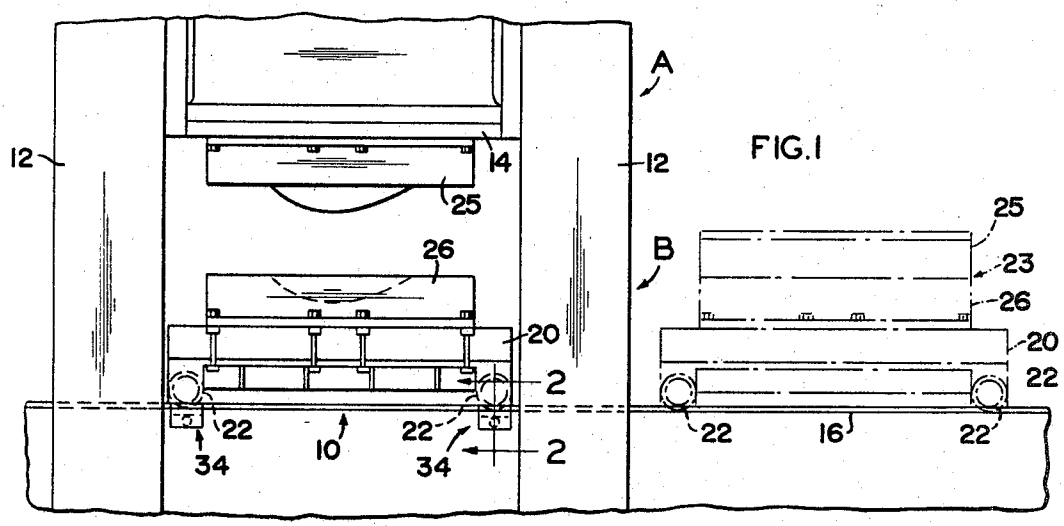


FIG. 1

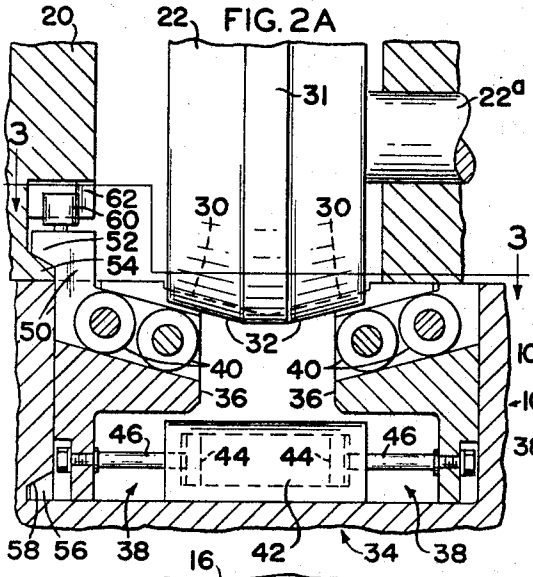


FIG. 2A

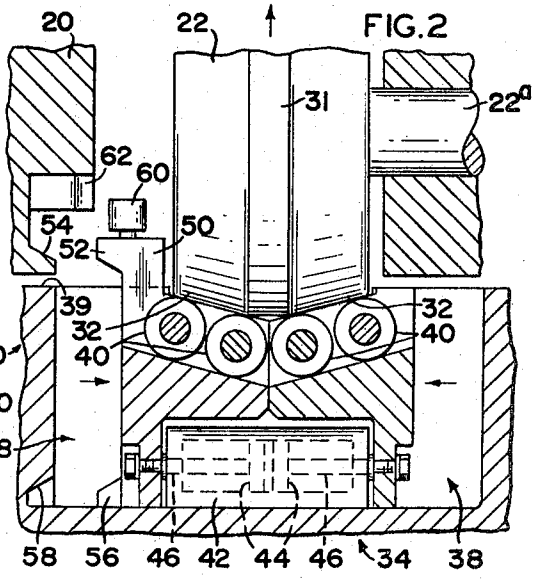


FIG. 2

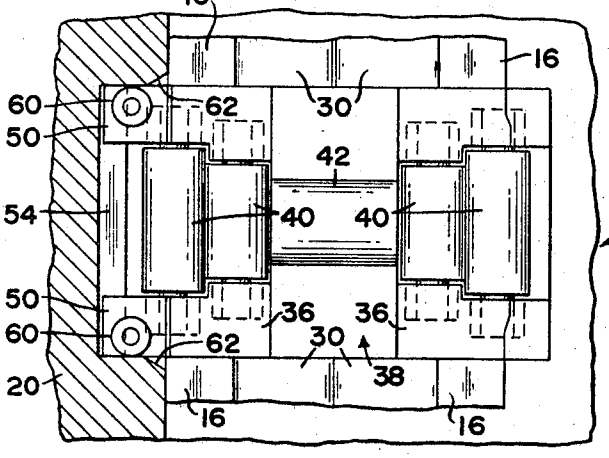


FIG. 3

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Jan. 21, 1969 C. C. COUNTESS, JR., ET AL 3,422,660

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Filed April 27, 1967 Sheet 2 of 2

FIG.4

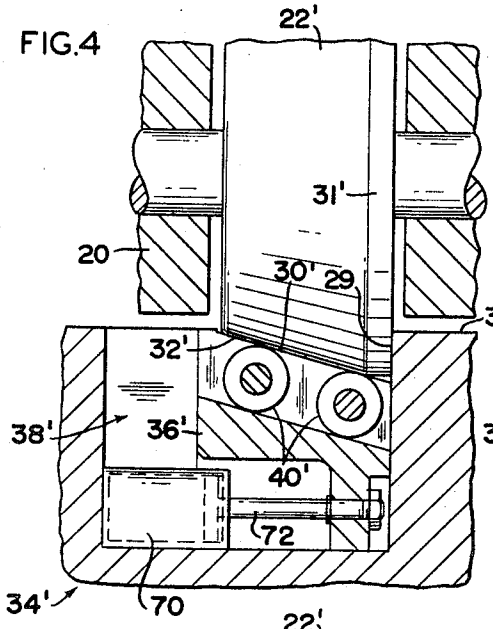


FIG.4A

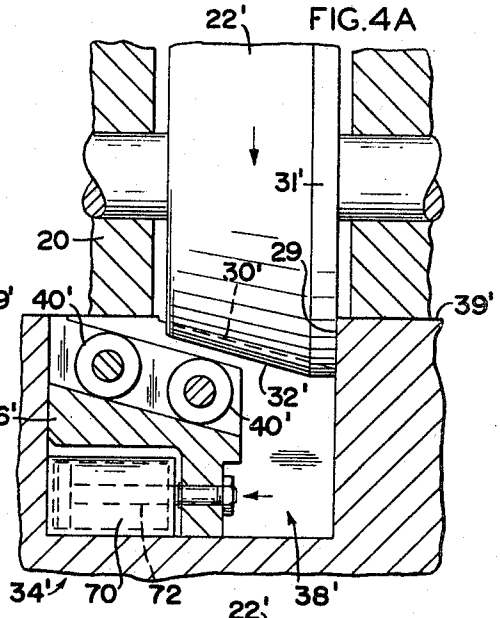
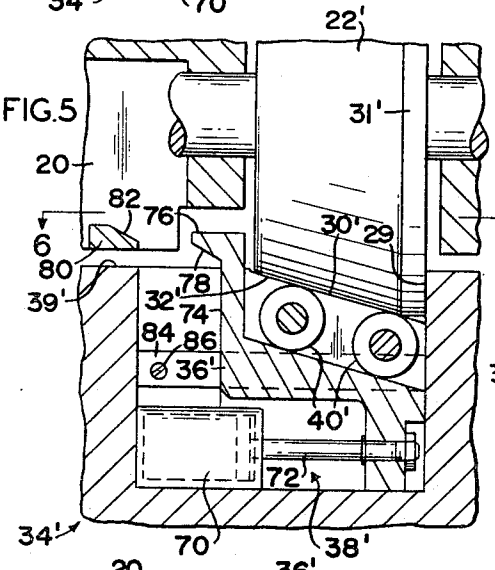


FIG.5



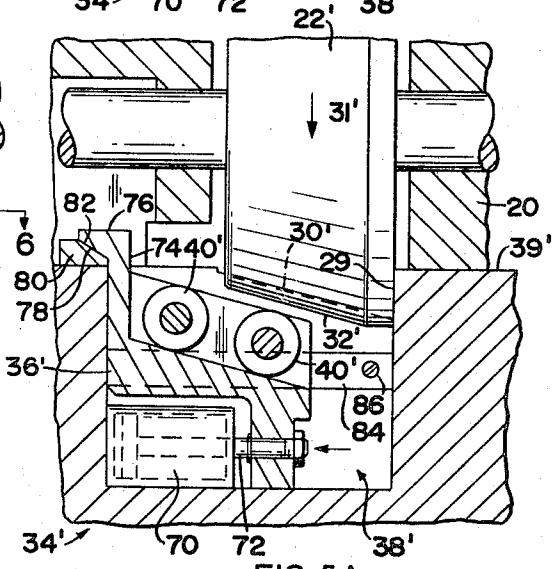


FIG.5A

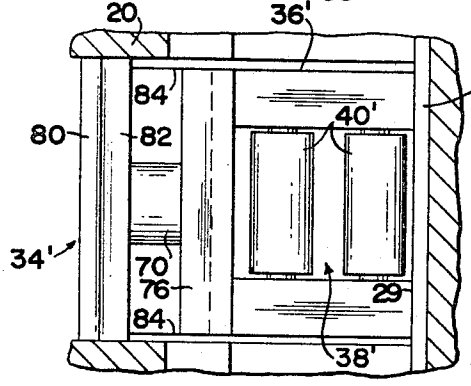


FIG.6

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MOVABLE BOLSTER LOWERING ARRANGEMENT

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U.S. Cl. 72—448 6 Claims

Int. Cl. B21j *13/04;* B30b *15/06*

ABSTRACT OF THE DISCLOSURE

Improved carrier lowering mechanism for a press having a bed, a frame, a ram carried by the frame and movable vertically toward and away from the bed, tracks extending in a first direction from a position exterior of the press into and across the bed, and a carrier having wheels engageable with the tracks for guiding the carrier therealong from a first position exteriorly of the press to a second position in the press and beneath the ram. The mechanism includes first track forming members having upwardly facing surfaces downwardly inclined in a direction perpendicular to the first direction. The track forming members are positioned in the bed at locations corresponding to the locations of the wheels when the carrier is in the second position to thus support the wheels on the upwardly facing surfaces. Selectively operable power means are provided for moving the track forming members horizontally in the second direction away from the wheels to permit the wheels and the carrier to be lowered.

The present invention is directed to the press art and more particularly to an improved movable bolster lowering arrangement.

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

It is common practice in the press art to provide metal working presses with movable bolster arrangements to facilitate changing die sets. One of the most commonly used arrangements comprised a wheeled bolster or die carrier which was guided on tracks that extended from a position outside the press into and across the press bed. When it was desired to move a die set into the press, the lower die of the set was bolted or clamped to the carrier and the upper die positioned in mated relationship on the lower die. The carrier was then rolled into the press and the press ram actuated downwardly into engagement with the top surface of the upper die connected thereto.

In order to provide a firm foundation for the lower die and carrier, and also, to relieve the impact load from the carrier wheels during press operation, the tracks in the press bed were arranged to be lowered. This allowed the bottom of the carrier to be brought into engagement with the press bed. Further, mechanism was provided to clamp the lowered carrier to the bed to avoid shifting during press operation.

Generally, the above-mentioned track lowering and carrier clamping mechanism took the form of vertically arranged hydraulic or pneumatic cylinders mounted in the press bed and connected to the tracks and clamps. Because of the substantial weight of the dies and the

die carrier, the cylinders were quite large. This necessitated the provision of large openings in the press bed and eliminated space otherwise needed for knock-out cylinders, etc. Additionally, because the cylinders were positioned a substantial distance down in the bed, problems were encountered in performing necessary maintenance and repair.

The present invention overcomes the above problems and provides a bolster lowering and clamping mechanism which is arranged for mounting adjacent the top surface of the press bed and eliminates the need for vertically positioned actuating mechanism extending down into the bed. Additionally, the invention permits lowering, locating and clamping of the bolster to be accomplished simultaneously with a single mechanism.

In accordance with the present invention an improved carrier lowering mechanism is provided for a press having a bed, a frame, a ram carried by the frame and movable vertically toward and away from the bed, tracks extending in a first direction from a position exterior of the press into and across the bed, and a carrier having wheels engageable with the tracks for guiding the carrier therealong from a first position exteriorly of the press to a second position in the press and beneath the ram. The improved means comprise means operable when the carrier is in the second position for lowering the carrier against the bed and relieving the weight of the carrier from the wheels. The means include first track forming members having upwardly facing surfaces downwardly inclined in a direction perpendicular to the first direction. The track forming members are positioned in the bed at locations corresponding to the locations of the wheels when the carrier is in the second position to thus support the wheels on the upwardly facing surfaces. Selectively operable power means are provided for moving the track forming members horizontally in the second direction away from the wheels to permit the wheels and the carrier to be lowered.

Because the movement of the track forming members is always horizontal, the actuating or power means can readily be positioned in a horizontal position adjacent the top surface of the press bed. This eliminates the problems previously encountered with vertically mounted actuating means. Further, because the movement of the track forming members is horizontal, it is a simple matter to include both locating and clamping elements on the track forming members.

Accordingly, it is a primary object of the present invention to provide a bolster or carrier lowering mechanism wherein all movements of the elements comprising the mechanism are in a horizontal direction.

Another object of the present invention is to provide a bolster lowering mechanism wherein the lowering locating, and clamping of the bolster are accomplished by a single mechanism.

A further object is the provision of a bolster lowering mechanism wherein all parts of the mechanism are located adjacent the top surface of the press bed.

These and other objects and advantages will become apparent from the following description used to illustrate preferred embodiments of the invention when read in connection with the accompanying drawings wherein:

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

FIGURES 2 and 2A are cross-sectional views taken on

line 2—2 of FIGURE 1 and showing the bolster lowering mechanism in its bolster raised and bolster lowered positions respectively;

FIGURE 3 is a view taken on line 3—3 of FIGURE 2A;

FIGURES 4 and 4A are cross-sectional views similar to FIGURES 2 and 2A showing a modified form of bolster lowering mechanism constructed in accordance with the present invention;

FIGURE 5 is a cross-sectional view showing the manner in which a clamp can be included on the modification of FIGURE 4; and,

FIGURE 6 is a view taken on line 6—6 of FIGURE 5.

Referring now to the drawings wherein the showings are for the purpose of illustrating a preferred embodiment of the invention only and not for the purpose of limiting same, FIGURE 1 shows the overall arrangement of a metal working press A provided with a movable bolster assembly B constructed in accordance with a preferred embodiment of the present invention.

The precise arrangement and construction of press A is not important to the present invention. However, as shown in FIGURE 1, the press comprises a bed **10** provided with four vertically extending uprights **12** which carry an upper ram **14** mounted for vertical reciprocation toward and away from the bed **10**. Although only two uprights **12** are shown, it will be understood that a second pair of uprights are positioned directly behind the pair shown and spaced a distance therefrom sufficient to allow bolster assembly B to be rolled therebetween into position in the press.

A pair of transversely spaced guideways in the form of tracks **16** extend from a position exteriorly of the press into and across the press bed. Tracks **16** provide means for guiding the movement of bolster assembly B from an exterior position shown dotted in FIGURE 1, to a located position within the press and beneath the press ram as shown in solid lines in FIGURE 1.

Bolster assembly B includes a main frame **20** provided with support means shown in the form of wheels **22** rotatably mounted on axles **22***a* and adapted to ride on tracks **16**. This permits the carrier to be easily rolled into and out of the press so that a die set **23** can be brought to working position within the press.

As shown in FIGURE 1, the die set would normally include an upper die half **25** and a lower die half **26**. The dies are positioned on the carrier while it is outside the press as shown in dotted lines in FIGURE 1. The lower die half **26** is clamped or bolted to the top of the frame **20** and the upper die half **25** positioned in mated relation thereon. The carrier is then rolled along tracks **16** to the located position within the press. At this time, means function to lower the bottom of the carrier into engagement with the top surface of the bed to thereby relieve the load from the wheels and firmly position the carrier. Subsequent to the lowering of the carrier the ram **14** is moved downwardly into engagement with the top surface of upper die half **25** and clamped or bolted thereto. The press is then ready for operation.

Of particular importance to the present invention are the means provided to perform the function of lowering the carrier into engagement with the bed of the press. As shown in FIGURES 2, 2A and 3, tracks **16** are formed with a generally V-shaped groove so as to provide a pair of upwardly facing downwardly inclined carrier support surfaces **30**. The outer periphery of wheels **22** are provided with a generally V-shaped configuration so as to provide a pair of surfaces **32** adapted to ride on the track surfaces **30**. Preferably, a narrow center band of the outer periphery of wheels **22** is flat as shown at **31**. This permits the carrier to ride on a simple flat surface or tracks in the form of a channel having a flat bottom surface, without subjecting the surface to high point loads as would result from a pointed periphery.

As shown in FIGURE 1, mounted in the press bed at locations corresponding to the locations of wheels **22** when the carrier is in the located position under the ram, are lowering assemblies **34**. Each of these lowering assemblies **34** comprise a pair of track forming members **36** which are mounted in openings **38** formed in the top surface of the press bed **10**. Members **36** are arranged so that when they are in the position shown in FIGURE 2 their top surface defines a continuation of surfaces **30** of tracks **16** and thus support the carrier above the press bed. However, when members **36** are reciprocated apart to the position shown in FIGURE 2A, their top surfaces are moved horizontally away from surfaces **32** of wheels **22** and the carrier permitted to lower until its bottom **39** engages the top surface of bed **10**. Conversely, when the members **36** are reciprocated from the position of FIGURE 2A, inwardly to the position shown in FIGURE 2, the top surfaces of the members **36** engage the inclined surfaces **32** of the periphery of wheel **22** and through a wedging action lift the wheel and carrier to the position at which it can be freely rolled along tracks **16**.

Although it is apparent that the top surfaces of members **36** could be formed as a simple machined surface, the surfaces are preferably defined by horizontally positioned rollers **40** mounted with their axes of rotation extending parallel to the direction of the track. This reduces the frictional forces acting between the wheels and the track forming members and reduces the force required to reciprocate the members.

A variety of types of power means or actuators, such as motor driven screws or air cylinders, could be utilized for selectively reciprocating members **36** to raise and lower the bolster assembly B. However, according to the preferred embodiment the means utilized comprise hydraulic cylinders **42** fixedly mounted in the bottom of each opening **38**. Each of the cylinders has a pair of pistons **44** each connected to a piston rod **46** which extends through the end walls of cylinder **42** into engagement with the bottom portion of one of the track forming members **36**. Hydraulic lines (not shown) are provided to supply hydraulic fluid under pressure between pistons **44** to move them apart and thus, move the track forming members **36** to the carrier lowered position shown in FIGURE 2A. Additionally, hydraulic lines are connected to the space between the pistons **44** and the end walls of the cylinder so that hydraulic fluid under pressure can be supplied to drive the piston to the position shown in FIGURE 2 to move the track forming members **36** to the carrier raised position. Various automatic control means could obviously be provided to control the supply of hydraulic fluid to the cylinders.

With the lowering mechanism constructed in the manner described, the problems of vertically positioned actuating mechanisms are eliminated. Further, the present arrangement permits locating and clamping of the carrier to be accomplished by the same mechanism. As shown in FIGURES 1–3 the left track forming member **36** is provided with a pair of upwardly extending portions **50** having a laterally extending wedge clamp member **52** formed thereon. A corresponding wedge clamp member **54** is formed on the undersurface of carrier frame **20**. Additionally, laterally extending clamp members **56** are formed on the bottom of member **36** and arranged to be received in an opening **58** formed in the left wall of bed opening **38**. As is apparent from FIGURES 2 and 2A, the final movement of left track forming member **36** to the left causes clamp members **52** and **56** to engage carrier clamp member **54** and opening **58** respectively. This securely clamps the carrier to the bed.

The invention also permits final locating of the carrier to be accomplished by the same lowering mechanism. As shown, small rollers **60** having their axes extending vertically are mounted on the top surfaces of members

50. Carrier frame 20 is provided with vertically extending surfaces 62 arranged as shown in FIGURE 3. Consequently, if the carrier is not precisely located prior to lowering, initial movement of the track forming member to the left causes one of the rollers 60 to engage the corresponding surface 62 and move the carrier to the proper position longitudinally of the track. In this manner, locating is accomplished simultaneously with lowering.

A second modification of the present invention is shown in FIGURES 4 and 4A. According to this modification, the tracks 16 are formed so as to provide a single downwardly inclined upper carrier support surface 30' and an upwardly extending flange 29. The wheels 22' are in the form of truncated cones to provide an outer periphery having a corresponding inclined surface 32'. Additionally, a narrow cylindrical band 31' is provided to permit the wheels to be used on a flat surface if desired.

Each of the lowering assemblies 34' are located in the press bed in the manner described above with reference to the FIGURE 2 embodiment and assemblies 34' include a track forming member 36' having an upper surface which forms a continuation of track surface 30'. Preferably the upper surface is defined by a pair of rollers 40' arranged in the manner described with reference to the FIGURE 2 embodiment.

As is apparent from FIGURES 4 and 4A, movement of track forming member 36' to the left permits the wheel 22' and the carrier to be lowered into engagement with the top of press bed 10. Conversely, movement to the right lifts the carrier.

A variety of power means could be utilized for moving track forming member 34'; however, the means preferably comprise a double acting hydraulic cylinder 70 having its piston rod 72 connected to the lower portion of track forming member 36' in the same manner as described above with reference to the FIGURE 2 modification.

FIGURES 5, 5A and 6 show an arrangement which provides for simultaneously lowering and clamping of the carrier. Although this modification has been shown with particular reference to a lowering assembly of the type shown in FIGURE 4A, as will become apparent, the same clamping arrangement can be utilized with either the FIGURE 2 or FIGURE 4 embodiments. The modification shown in FIGURE 5 is generally similar in all respect to the FIGURE 4 embodiment. However, to provide for clamping of the carrier after it has been brought into engagement with the press bed, a clamping member 74 extends vertically upward from the top of track forming member 36'. Member 74 is provided with a laterally extending wedge shaped portion 76 which provides a downwardly facing inclined clamp surface 78. A second clamp member 80 is connected to the frame 20 of the carrier. Member 80 is provided with an upwardly facing inclined clamp surface 82 which is arranged to be engaged by surface 78 of clamp member 74. Additionally, in order to permit the track forming member 36' to resist vertically directed forces, the member is retained in opening 38' by a pair of bars or retaining guides 84 connected to opposite walls of opening 38' by screws 86. The portion of member 36' below guides 84 extends under each of the guides and is thereby retained in the opening. As shown in FIGURE 5A, as track forming member 36' is moved to the left to lower the carrier, the surface 78 comes into engagement with surface 82 and firmly clamps the carrier to the bed. This arrangement eliminates the necessity of providing separate clamp actuating means in the press bed.

Although certain specific embodiments have been described in detail, it is apparent that many modifications and alterations of the described embodiments can be made without departing from the invention as set forth in the appended claims. For example, either of the embodiments of FIGURES 4 or 5 could be provided with locating means as shown in FIGURE 2. Likewise, the FIGURE 2 embodiment could be utilized without the clamping or locating means. Additionally, in any one press installation any number of the lowering assemblies could be provided with locating and clamping means. These and other modifications of the preferred embodiments will occur to others upon a reading and understanding of the specification and it is our intention to include all such modifications and alterations as part of our invention insofar as they come within the scope of the appended claims.

Having thus described our invention, we claim:

1. In a press having a bed, a ram movable toward and away from said bed, guideway forming means having an upwardly facing support surface extending in a first horizontal direction from a position exterior of said press into and across said bed, a carrier having a frame including support members extending into engagement with said upwardly facing support surface of guideway forming means for supporting said frame thereabove for guided movement therealong from a first position exterior of said press to a second position within said press and beneath said ram, the improvement comprising: lowering means for lowering the frame of said carrier into engagement with said bed and relieving the weight of said carrier from said support members when said carrier is in said second position; said lowering means including: at least the portions of said upwardly facing support surface of said guideway forming means that are in engagement with said support members when said carrier is in said second position being downwardly inclined in a second direction perpendicular to said first direction; and selectively operable power means for producing relative movement in said second direction between said support members and said downwardly inclined portions of said support surface to thereby permit said support members to move down said inclined portion of said support surface to bring said frame into engagement with said bed.

2. In a press having a bed, a frame, a ram carried by said frame and movable vertically toward and away from said bed, tracks extending in a first direction from a position exterior of said press into and across said bed, a carrier having wheels engageable with said tracks for guiding said carrier therealong from a first position exterior of said press to a second position within said press and beneath said ram, the improvement comprising: means operable when said carrier is in said second position for lowering said carrier against said bed and relieving the weight of said carrier from said wheels; said means including first track forming members having upwardly facing surfaces downwardly inclined in a direction perpendicular to said first direction, said track forming members being positioned in said bed at locations corresponding to the location of said wheels when said carrier is in said second position for supporting said wheels on said upwardly facing surfaces; and selectively operable power means for moving said track forming members horizontally in said second direction away from said wheels to permit said wheels and said carrier to be lowered.

3. The improvement as defined in claim 2 wherein said wheels have an outer periphery which is inclined in a direction corresponding to the incline of said upwardly facing surfaces of said track forming members.

4. The improvement as defined in claim 2 wherein at least some of said track forming members include transversely extending clamp members adapted to engage said carrier as said track forming members are moved away from said wheels.

5. The improvement as defined in claim 2 wherein at least some of said track forming members include locating means adapted to engage said carrier as said track forming members are moved away from said wheels.

6. The improvement as defined in claim 2 wherein said wheels have a V-shaped outer periphery, and a pair of

said track forming sections are positioned at each location corresponding to the locations of said wheels when said carrier is in said second position.

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100—224, 229, 299

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