Jan. 21, 1969 J. A. GEUSS 3,422,662

MOVABLE BOLSTER

Filed Aug. 1, 1967 Sheet 1 of 2

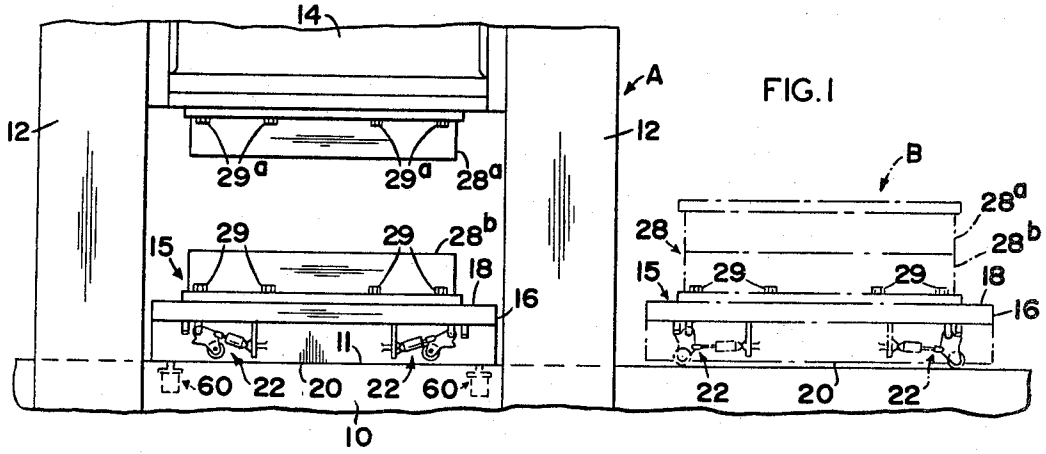

FIG. 1

FIG. 2

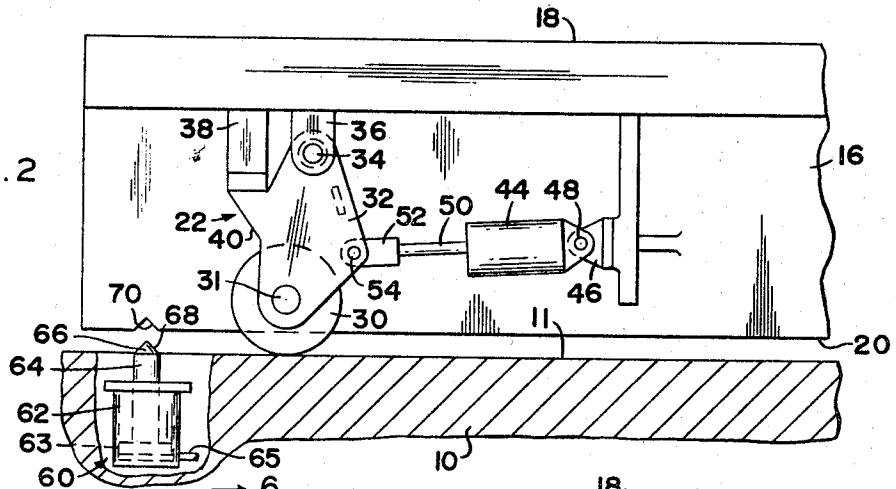

FIG. 3

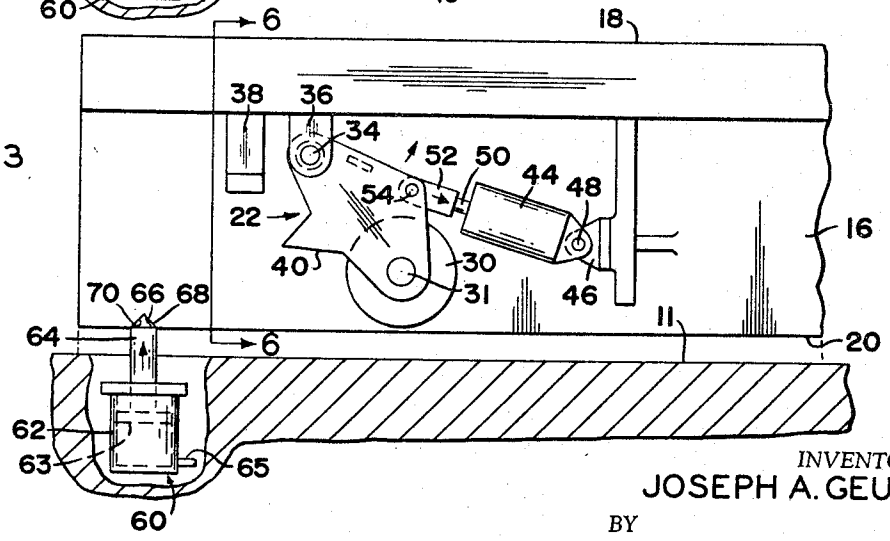

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FIG. 4

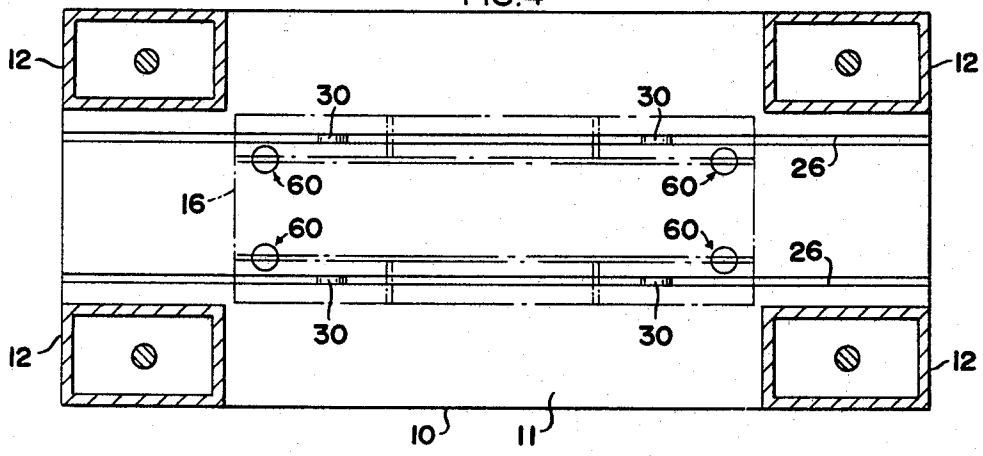
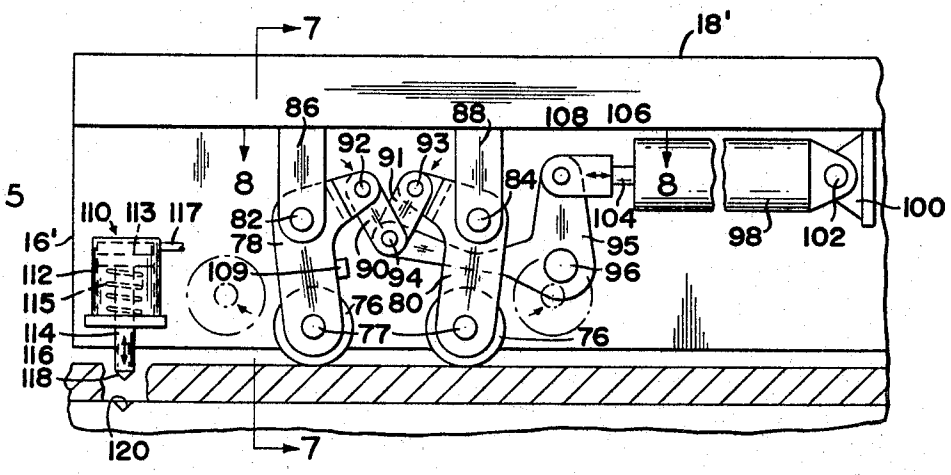


FIG. 5



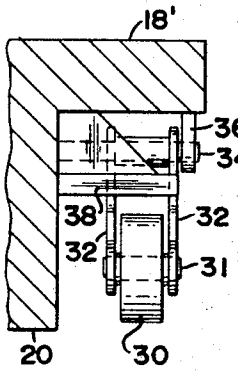


FIG. 6

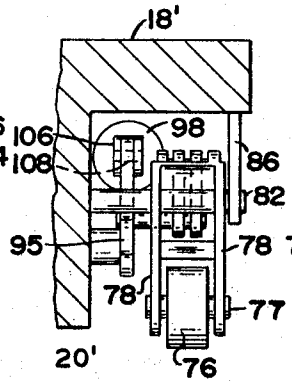


FIG. 7

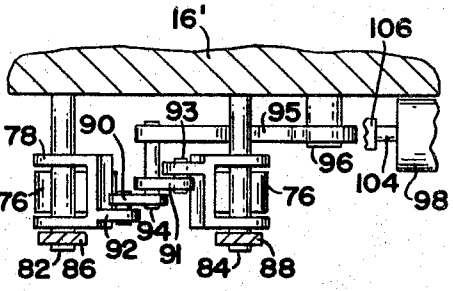


FIG. 8

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MOVABLE BOLSTER

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Int. Cl. B21j *13/00;* B30b *15/06*

ABSTRACT OF THE DISCLOSURE

Apparatus for facilitating die changing in the metal working press including a wheeled bolster or die carrier movable along tracks from a position outside the press to a position on the press bed and beneath the ram. The bolster wheels are arranged to be raised and lowered to permit the bottom of the bolster to be lowered into engagement with the press bed. Additionally, either the bolster or the press are provided with jacks for raising the bolster prior to raising or lowering the wheels so that the wheel raising and lowering mechanism does not have to lift or lower the weight of the bolster and can, thus, be highly simplified.

The present invention is directed toward the art of presses and, more particularly, to an improved die changing apparatus of the movable bolster type.

The invention will be described with particular reference to its use in die changing and metal working presses, however, it will be appreciated that the invention is capable of broader application and could be utilized wherever it is desired to lower a wheeled die or material carrier into engagement with a subjacent surface.

In the press art it is common practice to provide metal working presses with wheeled carriers or bolsters which are utilized to move die sets into and out of the press.

When used for moving die sets into the press, the die set is positioned on the carrier while it is outside the press. The carrier and die set is then rolled, as a unit, into the press to a position beneath the press ram. At this time, mechanism functions to lower the bottom of the carrier into engagement with the press bed and thus relieve the load of the carrier and dies from the wheels and provide a firm foundation for the lower die and carrier during subsequent press operation.

One of the common means utilized for selectively lowering or raising the carrier has been power actuated mechanisms which function to raise and lower the wheels relative to the carrier. Because of the tremendous weight of the carrier and die set, often as much as 50,000 pounds and higher, the wheel raising mechanisms have been ruggedly built and provided with relatively powerful actuators. Additionally, since actuation of all wheels must take place substantially simultaneously to prevent tilting of the carrier, control systems for the actuators or mechanical interconnections between the various wheels were required.

The present invention overcomes these problems and provides a simplified arrangement for raising and lowering the carrier. The mechanism provided allows each wheel raising actuator to be actuated independently without requiring simultaneous actuation of all remaining wheel raising actuators.

In accordance with the present invention a press of the general type described having a wheeled die carrier provided with wheels movable between carrier supporting and non-supporting positions is provided with the improvement comprising jack means operable when the carrier is in the press for lifting the carrier and the wheels sufficiently so that the wheels are not supporting

the carrier and can, thus, be freely moved between their carrier supporting and non-supporting positions.

Because the movement of the wheels between their supporting and non-supporting positions is accomplished with no load on them, they can be moved by a simply constructed and light weight actuating system. If desired, the wheels can even be manually actuated. Additionally, with the jack means mounted in the press bed, no special controls or hydraulic or pneumatic systems need be provided on the carrier.

Accordingly, a primary object of the present invention is the provision of a press having a simplified movable carrier arrangement.

An additional object is the provision of a press having a wheel raising type of movable die carrier arrangement which eliminates the need for simultaneous actuation of the wheel raising mechanisms.

A further object is the provision of a press with a movable die carrier wherein exact locating of the carrier is accomplished by the mechanism used to lower the carrier into engagement with the press bed.

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

FIGURE 1 is an elevational view somewhat diagrammatic of a metal forming press having an improved movable die carrier arrangement constructed in accordance with one embodiment of the present invention;

FIGURES 2 and 3 are detailed views showing an enlargement of one corner of the carrier with the wheel raising mechanism in the carrier supporting and carrier non-supporting positions, respectively;

FIGURE 4 is a plan view of the bed of the press shown in FIGURE 1;

FIGURE 5 is a view similar to FIGURE 2 showing a second embodiment of the invention;

FIGURE 6 is a cross-sectional view taken on line **6—6** of FIGURE 2;

FIGURE 7 is a cross-sectional view taken on line **7—7** of FIGURE 5; and,

FIGURE 8 is a cross-sectional view taken on line **8—8** of FIGURE 5.

Referring now to the drawings wherein the showings are for the purpose of illustrating the preferred embodiments 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 an improved movable bolster assembly B constructed in accordance with the preferred embodiment of the present invention. The press A is shown as a relatively conventional metal working press comprised of a bed **10** having an upwardly facing surface **11** and four vertically extending uprights **12** (see FIGURE 4). A ram **14** is carried by the uprights for vertical movement toward and away from the bed **10**. Although not shown in FIGURE 1, the press would, of course, include the usual drive mechanism for driving ram **14**.

Broadly, die carrier or movable bolster assembly B includes a relatively conventional carrier **15** comprised of a main frame **16** having an upper horizontally extending surface **18** and a lower generally parallel surface **20**. The carrier is provided with four wheel units **22** mounted generally at each corner of frame **16**. The wheel units are adapted to support the carrier for guided movement along tracks or guideways **26** which extend from a position outside the press into and across the press bed. The tracks or guideways could be of a variety of types but are shown as simple grooves adapted to receive the wheels of the wheel units **22**.

The arrangement thus far dscribed is relatively conventional and facilitates moving die sets into and out of the press. As shown in FIGURE 1, with the carrier **15** positioned outside the press a die set including upper and lower die halves **28***a* and **28***b* can be positioned on the upwardly facing surface **18** of the carrier. Normally, the lower die half **28***b* is positively connected to the carrier such as by the use of bolts **29**. The carrier is then rolled into the press to a position beneath the ram **14**, as shown in solid lines in FIGURE 1. With the carrier in position under the ram, the wheels are moved to a raised or non-supporting position to permit the lower surface **20** of the carrier to be brought into engagement with the upper surface **11** of the press bed. This removes the load of the carrier and die set from the wheels and provides a rigid foundation and mounting for the lower die half **28***b* during subsequent press operation. Additionally, the carrier is normally bolted or clamped to the press bed in its lowered position. With the carrier in the lowered position the ram **14** is moved downwardly into engagement with the top surface of the upper die half **28***a* and clamped or otherwise connected thereto, such as, by bolts **29***a*. With the die set thus in position the press is ready for operation. To change die sets the above sequence of operations is reversed and the die set and carrier rolled out of the press and a second die set brought in.

The precise arrangement of the wheel raising mechanisms is not of particular importance to the invention; however, as shown in FIGURES 2 and 3 each of the mechanisms includes a wheel **30** rotatably mounted on a shaft **31** extending between a pair of identical brackets **32**. Brackets **32** are mounted for selective rotation on a shaft **34** which extends outwardly from the side of the carrier and is supported at its outer end by a plate **36** which extends down from the carrier frame. The brackets **32** are prevented from rotating in a clockwise direction beyond the position shown in FIGURE 2 by a bracket arm **38** which extends outwardly from the side of the carrier as best shown in FIGURE 6. Extensions **40** on the sides of the brackets engage the under surface of the arm **38**. However, as shown in FIGURE 3, brackets **32** can be rotated in a counterclockwise direction to move the wheels **30** to a position wherein the lower surface **20** of the carrier can be brought into engagement with the upwardly facing surface **11** of the bed.

Any of a variety of means, power actuated or manual, could be utilized for selectively moving the wheel brackets to their nonsupporting position. The particular means utilized in the preferred embodiment comprise a fluid cylinder **44** which is pivotally connected at one end to a bracket **46** by a pin **48**. The piston rod **50** of the cylinder **44** extends outwardly to a bracket **52** which is pivotally connected to the wheel support bracket by a pin **54**. Consequently, actuation of cylinder **44** causes the wheels to be pivoted about pivot **34** to move them from the position shown in FIGURE 2 to the position shown in FIGURE 3. Preferably, the cylinder **44** would be actuated pneumatically; however, it is apparent that it could equally well be hydraulically actuated. The means for supplying the necessary pressurized fluid are not shown but can be built directly in the carrier or mounted on the press and connected to the carrier by flexible hoses.

As previously discussed this general arrangement can be utilized for directly raising and lowering the carrier through actuation of the wheels; however, in such case the actuators **44** must be relatively strong and provided with means causing all wheels to be actuated simultaneously. According to the present invention these requirements are overcome and the wheel raising mechanisms actuated by relatively small size cylinders which do not have to be jointly controlled.

According to the invention, this is accomplished by providing jack means which function when the carrier is in the press to lift the carrier and wheels upwardly a very slight amount so that the weight of the carrier and the die set is not supported by the wheels. With the carrier thus lifted. the wheels can subsequently be moved to their non-supporting position and the jack means actuated to lower the bottom of the carrier into engagement with the upwardly facing surface **11** of the bed. When it is desired to move the carrier from the press the jack means are actuated to lift the carrier and die set upwardly away from the bed so that the wheels can be swung to their lowered carrier supporting position. The carrier can then be rolled out of the press.

Although a variety of different types of jacks could be provided for performing this function, they preferably comprise hydraulic jacks positioned in the bed at the locations shown in FIGURE 4. As shown in FIGURE 4, four jack means **60** are positioned in the bed at widely spaced locations. Each of the jack means **60** comprise a hydraulic cylinder **62** having a piston **63** slidably mounted therein. A piston rod **64** extends upwardly from the piston. As is apparent, simply by controlling the supply of hydraulic fluid through line **65** to a position under the piston **63**, the movement of piston rod **66** can be controlled to move upwardly against the under side of the carrier frame and lift the carrier upwardly to a position wherein the weight of the carrier is no longer supported by the wheels but is borne by the jacks. The wheel raising mechanisms can then be actuated to move the wheels to the position shown in FIGURE 3, and the carrier subsequently lowered into engagement with the press bed.

The present invention also permits the carrier to be precisely located longitudinally of the track simultaneously with the raising and lowering operation. As shown in FIGURES 2 and 3, the upper end of the piston rod is provided with inclined surfaces **68**. A generally V-shaped opening **70** conforming to the shape of surfaces **68** is provided in the under surface of the carrier and arranged to receive the end of piston rod **66**. As can be seen, if the carrier is slightly out of line longitudinally, one of the inclined surfaces **68** will engage a side of V-shaped opening **70** and, through a wedging action, move the carrier to the exact final position. In this manner the jack means functions to both lift and locate the carrier and eliminates the need for additional locating means.

Although the above-described arrangement is preferred, it is obvious that other arrangements for the wheel raising mechanism and the jacks could be provided. A modified arrangement is shown in FIGURES 5, 7 and 8. According to this embodiment a set of wheels **76** are mounted at each corner of the bolster. Wheels **76** are rotatably connected by axles **77** with bracket arms **78** and **80**. The bracket arms are respectively mounted for oscillation on transversely extending shafts **82** and **84**. The outer ends of the shafts **82** and **84** are supported by extensions **86** and **88** which extend downwardly from the underside of carrier frame **16'**. The upper ends of the bracket arms are connected with links **90** and **91** by pivot pins **92** and **93**. The lower ends of the links are connected through a pivot pin **94** with the end of a lever arm **95**. Lever arm **95** is mounted for oscillation about a shaft **96** extending from the side of the bolster or carrier frame.

The means for oscillating arm **95** include a fluid cylinder **98** pivotally mounted from a bracket **100** by a pin **102**. The cylinder's piston rod **104** is connected through a bracket or clevis **106** and a pin **108** with the upper end of the arm. As can be seen, movement of the piston rod to the left, as viewed in FIGURE 5, causes the wheels to be moved to the dotted line position. Alternately, movement of the rod to the right moves the wheels to their carrier supporting position shown solid. Further movement of the wheels beyond the carrier supporting position is prevented by a stop bar **109** which extends laterally from the side of the carrier frame. As shown, the stop bar is positioned so that the wheels are in what could be termed an overcenter position when they are lowered. Consequently, the weight of the carrier prevents any undesired movement of the wheels while in this position.

The means for raising the carrier so that the wheels may be more readily moved between their raised and lowered position includes a jack means **110** carried by the carrier frame. As noted with regard to the first embodiment, any conventional type of jack means could be utilized; however, as shown, the preferred means include a single acting hydraulic cylinder **112** having a piston **113** carried therein and provided with a vertically extending piston rod **114**. A spring **115** serves to bias piston **113** and piston rod **114** to the position shown in FIGURE 5; however, when hydraulic fluid is supplied through line **117** the piston and rod are moved downwardly until the lower end of the piston rod engages the bed, at which time, further supply of hydraulic fluid causes the carrier to be lifted slightly.

In order to provide exact locating of the carrier simultaneously with the lifting and lowering operation the lower end of piston rod **114** is provided with a pair of inclined surfaces **118**. Additionally, a V-shaped opening **120** is provided in the press bed for receiving the end of the piston. Consequently, this arrangement functions in the same manner as that described with reference to the FIGURES 2 and 3 embodiment, in that, during movement of the piston rod to raise the carrier, the inclined surfaces **118** will engage the sides of the V-shaped opening **120** and any longitudinal misalignment of the carrier be readily corrected.

The invention has been described in great detail sufficient to enable one of ordinary skill in the press art to make and use the same. Obviously, modifications and alterations of the preferred embodiment will occur to others upon a reading and understanding of the specification and it is my intention to include all such alterations and modifications as part of my invention insofar as they come within the scope of the appended claims.

Having thus described by invention, I claim:

1. In a press having a bed with an upwardly facing surface, a ram movable toward and away from said bed surface; a carrier having wheels on which it is supported for movement along guide means from a position outside the press to a position within the press and beneath the ram, said wheels being movable between a first position in which they support the lower surface of the carrier a

spaced distance above the bed surface and a second position in which the lower surface can be brought into engagement with the bed surface, the improvement comprising: jack means operable when said carrier is in said second position for lifting said carrier and said wheels sufficiently so that said wheels are not supporting said carrier and can thus be freely moved between their first and second positions.

2. The improvement as defined in claim **1** wherein said jack means are mounted in said bed.

3. The improvement as defined in claim **1** wherein said jack means are mounted in said carrier.

4. The improvement as defined in claim **1** wherein said jack means include a plurality of power driven reciprocable rods arranged to be driven vertically downwardly from said carrier.

5. The improvement as defined in claim **4** wherein said jack means comprise a plurality of reciprocable rods arranged to be driven vertically upwardly from said bed.

6. The improvement as defined in claim **5** wherein at least some of said rods have tapered end portions, and said carrier has tapered openings arranged to receive said tapered rods when said carrier is in said second position and said rods are driven vertically upwardly.

7. The improvement as defined in claim **1** wherein said jack means comprise a plurality of hydraulic cylinders having vertically extending piston rods adapted to engage said carrier when said cylinders are actuated while said carrier is in said second position.

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U.S. Cl. X.R.

100—224, 229, 299