July 22, 1969 A. ZEITLIN 3,456,481

DIE CHANGING APPARATUS

Filed Jan. 11, 1968 2 Sheets-Sheet 1

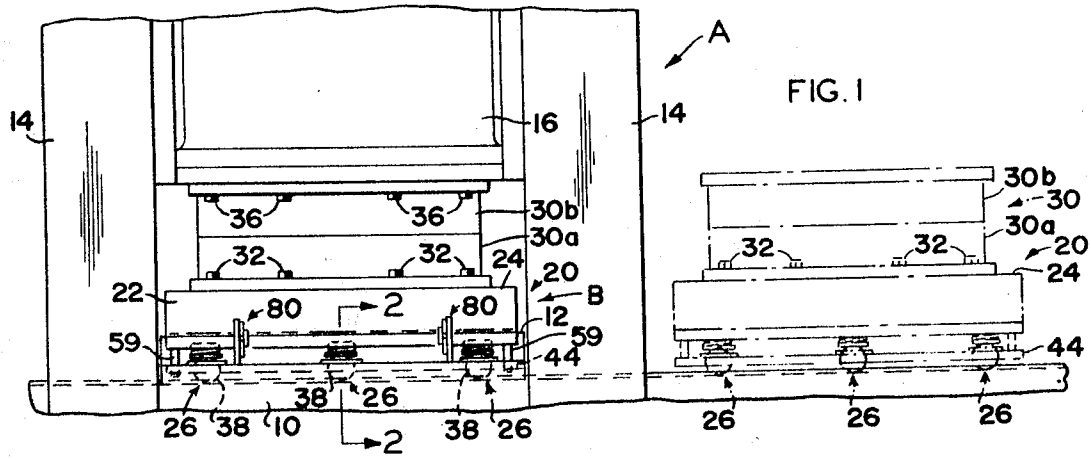


FIG. 1

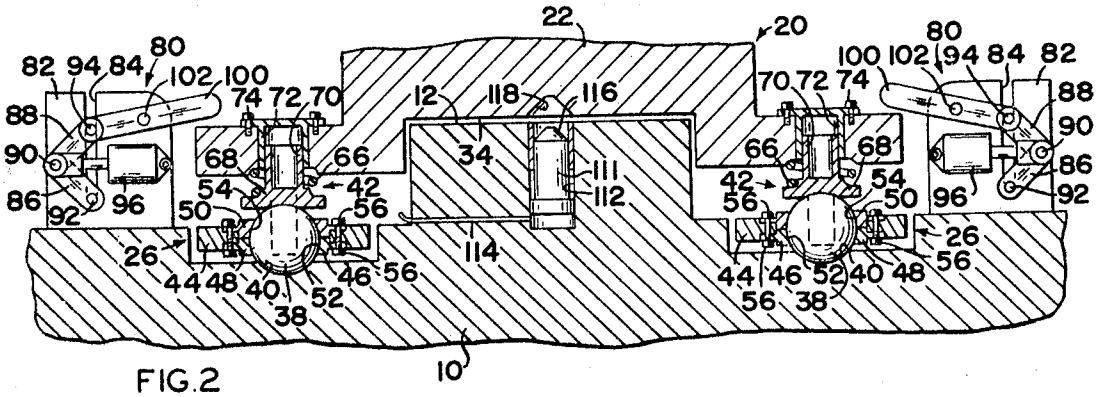


FIG. 2

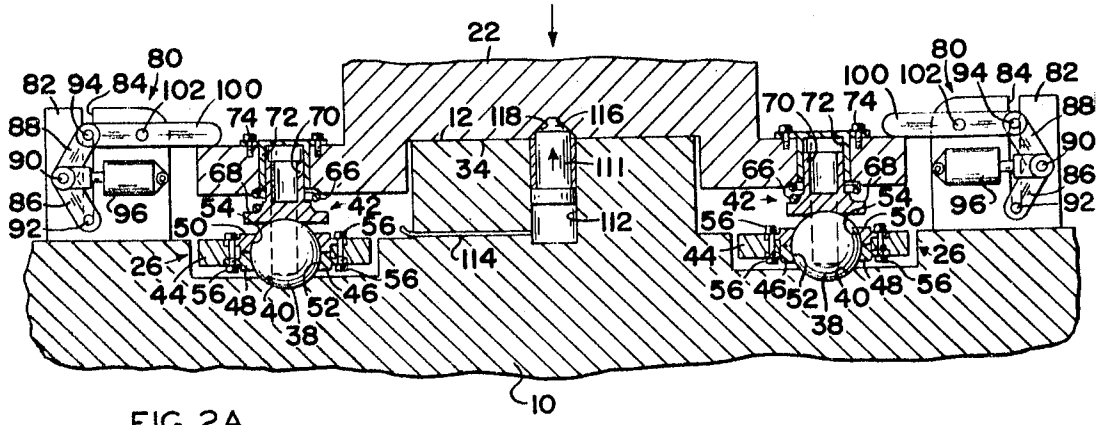


FIG. 2A

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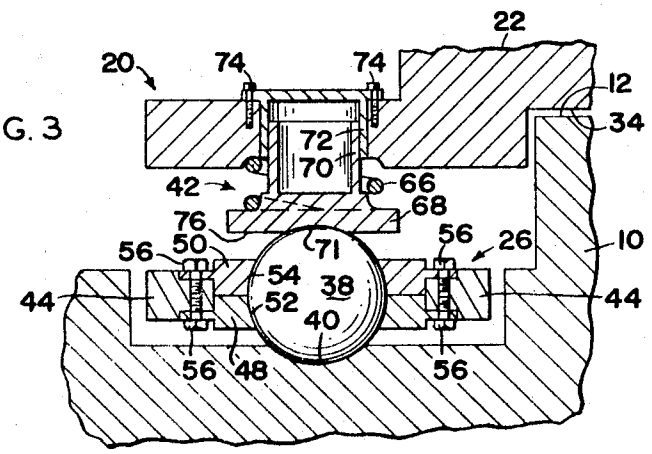
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FIG. 3



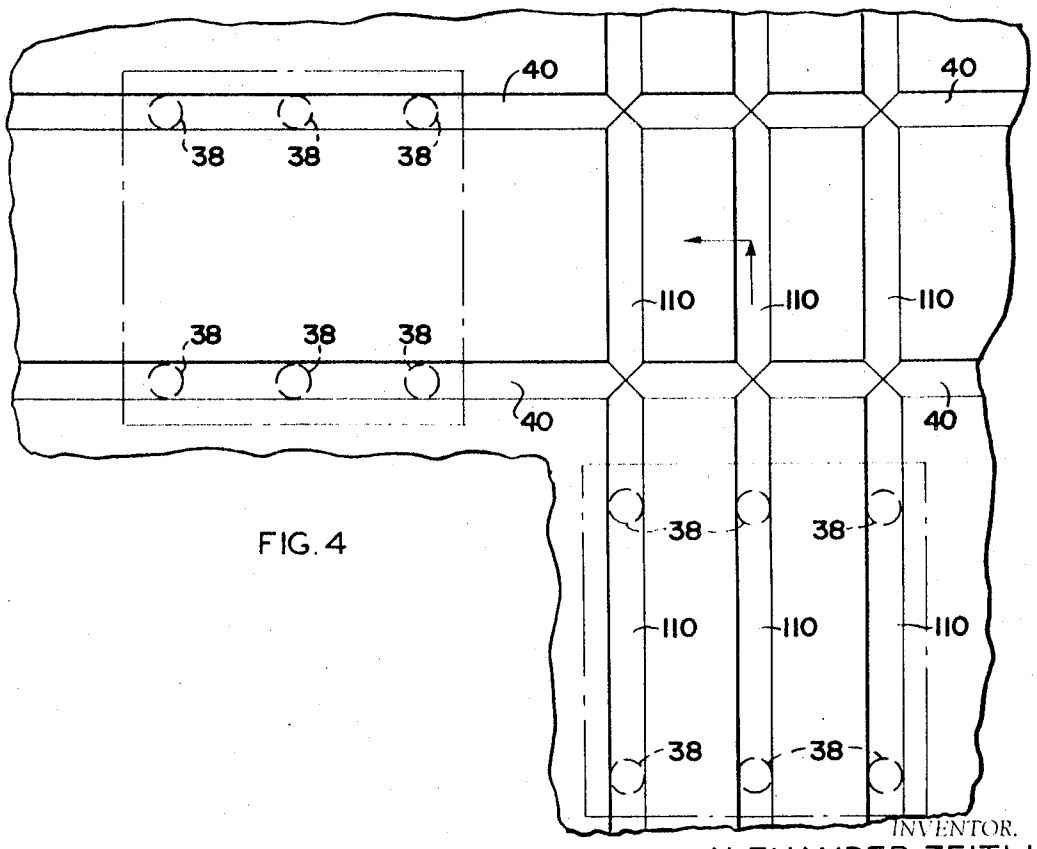


FIG. 4

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DIE CHANGING APPARATUS

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U.S. Cl. 72—446 6 Claims

ABSTRACT OF THE DISCLOSURE

An improved die changing apparatus for a press of the type including a bed and a ram mounted for movement toward and away from the bed. The improved apparatus includes guideways extending across the press bed and a die carrier having a lower surface and an upwardly facing die supporting surface, and support means arranged for supporting the carrier on the guideways for movement into and out of the press with the lower surface maintained a pre-determined distance above the bed surface. The support means comprise frames mounted from the carrier and biasing means continually biasing the frames downwardly therefrom. A plurality of ball members are rotatably carried by the frames and have exposed peripheral surfaces extending downwardly from the frames and engaging the guideways. Additionally, power means are arranged for actuation when the carrier is in the press for overcoming the biasing means and moving the lower surface of the carrier into engagement with the upwardly facing bed surface.

The present invention is directed toward the press art, and, more particularly, to an improved apparatus for changing dies in metal working presses.

In the press art it is common practice to facilitate die changing in metal working presses by providing wheeled bolsters or die carriers which are movable along tracks extending between the die storage area and the presses. These carriers function to transfer the die sets to and from the presses and, normally, means are provided for permitting the carriers to remain in the press during operation. In the past, these means have included lowerable tracks within the press which could be actuated down to lower the bottom of the carrier into engagement with the top surface of the press bed. Thus, the carrier wheels were relieved of the impact loads produced during press operation and, a firm foundation was provided for the lower die half. Alternately, the same results were accomplished by providing apparatus which allowed the carrier wheels to be selectively raised and lowered relative to the carrier. By raising the wheels when the carrier was in position beneath the ram the lower surface of the carrier was brought into engagement with the upwardly facing surface of the press bed and the weights of the carrier and die set and the impact loads of the press were transmitted directly through the carrier frame to the press bed.

In general, the prior arrangements are satisfactory in all respects; however, they do have the disadvantage of requiring complex mechanisms for performing the wheel or track raising and lowering. Further, in installations where one die storage area serves a line of presses additional apparatus must be provided for allowing the carriers to be moved between tracks crossing at right angles. This normally entails additional wheels on the carrier arranged at right angles to the remaining wheels and additional mechanism for raising and lowering the additional wheels.

The present invention provides an arrangement which eliminates the need for complicated track or wheel raising and lowering mechanisms and permits both the press and the carrier to be of simple construction. Additionally, die

carriers constructed in accordance with the invention can be readily shifted between tracks or guideways crossing at right angles without the use of special mechanisms.

In accordance with the present invention at press of the type including a bed and a ram for movement toward and away from the bed is provided with improved means for moving the die sets into and out of the press. The improved means include guideways extending across the press bed and a die carrier having a lower surface and an upwardly facing die supporting surface, and support means arranged for supporting the carrier on the guideways for movement into and out of the pess with the lower surface maintained a pre-determined distance above the bed surface. The support means comprise frames mounted from the carrier and biasing means continually biasing the frames downwardly therefrom. A plurality of ball members are rotatably carried by the frames and have exposed peripheral surfaces extending downwardly from the frames and engaging the guideways. Additionally, power means are arranged for actuation when the carrier is in the press for overcoming the biasing means and moving the lower surface of the carrier into engagement with the upwardly facing bed surface.

In accordance with a more limited aspect the power means include clamp members which act against the carrier to move it against the force of the biasing means and maintain it clamped into engagement with the bed surface.

A primary object of the present invention is the provision of a simplified die changing apparatus for use in metal working presses.

Another object is the provision of a movable die carrier which is arranged for rolling movement in any direction thus eliminating the need for direction changing wheels or other mechanism.

A further object is the provision of a movable die carrier of the general type described which does not require complicated track or wheel raising and lowering mechanisms.

Yet another object is the provision of apparatus of the type described wherein the die carrier is simultaneously lowered and clamped by the same power-actuated mechanism.

These and other objects and advantages will become apparent from the following description when read in conjunction with the accompanying drawings wherein:

FIGURE 1 is a side elevation, somewhat diagrammatic of a metal working press provided with an improved die changing apparatus formed in accordance with the preferred embodiment of the present invention;

FIGURE 2 is a cross-sectional view taken on line **2—2** of FIGURE 1 and, showing in detail, the die carrier supporting means;

FIGURE 2A is a view similar to FIGURE 2 but showing the carrier in its lowered position with the lower surface of the carrier in engagement with the upper surface of the bed;

FIGURE 3 is an enlarged view of one of the left hand supporting units shown in FIGURES 2 and 2A; and,

FIGURE 4 is a diagrammatic plan view showing a track or guideway lay-out which, when used in conjunction with the die carriers of the present invention, allows the carriers to be shifted between diagonally crossing tracks or guideways.

Referring specifically to FIGURE 1 there is shown the overall arrangement of a press A provided with an improved die changing assembly B formed in accordance with the present invention. As shown, press A includes a bed **10** having an upwardly facing surface **12.** Four uprights **14** extend upwardly from the press bed and support a ram or slide **16** which is mounted in conventional manner for driven movement toward and away from the press bed.

The die changing assembly B includes a die carrier **20** comprising a main elongated horizontal frame **22** having an upwardly facing die supporting surface **24**. The carrier is mounted on support members **26** which will subsequently be described in detail; however, for present purposes it should be noted that the support members **26** support the frame **22** for rolling movement along tracks or guideways which extend from a die storage area exterior of the press into and across the press bed. This arrangement allows a die set **30** to be positioned on the carrier when it is outside the press such as, for example, in the dotted line position shown in FIGURE 1. As shown, the lower die half **30***a* is normally positively connected to the upwardly facing surface **24** of the carrier such as by bolts **32**. The upper die half **30***b* is positioned in mated relationship with the lower die half **30***a* and the carrier **22** rolled into the press to a predetermined position beneath the slide **16**. At this time mechanism is actuated to bring the lower surface **34** of the carrier frame **22** into engagement with the upwardly facing surface **12** of bed **10** so that the load of the carrier and die is removed from the support members and the impact loads of the ram transmitted directly to the bed. Additionally, mechanism is normally provided to clamp the carrier in the lowered position. The ram **16** is then moved downwardly into engagement with the top surface of the upper die half **30***b* and positively connected thereto such as by bolts **36**. At this time, the press is ready for normal metal working operation.

As previously discussed, in the past it has been the practice to provide lowerable track sections in the press bed or, to provide mechanism which can raise and lower the wheels of the carrier relative to the carrier frame. In accordance with the present invention the carrier support members are arranged so that the carrier is lowered simultaneously with the clamping. As shown in FIGURES 1 and 2, in the preferred embodiment each of the support units **26** includes a relatively large diameter hardened ball member **38** which is arranged to ride in a track or groove-type guideway **40** which extends from the die storage area into and across the press bed. The balls are continually biased away from the frame **22** by biasing means **42** which will subsequently be described in detail. The biasing force is selected so that it just overcomes the weight of the die carrier plus the weight of the die set by an amount sufficient to maintain the lower surface **34** of the carrier frame **22** spaced a slight distance above the upwardly facing surface **12** of the press bed **10**.

In the preferred embodiment, the balls **38** are permitted to have free rolling movement while being free to move vertically toward and away from the carrier by being mounted in frame members **44**. Preferably, frame members **44** extend longitudinally of the carrier on opposite sides and receive all of the ball members **38** on that particular side; however, as can be appreciated, separate frame members **44** could be provided for each of the ball units **38**.

Balls **38** are releasably and rotatably mounted in openings **46** which extend vertically through the frame members **44**. The balls **38** are maintained in the openings **46** by a pair of retainer plates **48** and **50** which have central openings provided with spherically shaped inner surfaces **52** and **54**, respectively, which are arranged to engage the outer surfaces of the ball members **38**. The retainer plates **48** and **50** are maintained in the frame in any convenient manner, such as for example, by the use of machine screws **56**.

The frames **44** are arranged so as to be freely movable in a vertical direction relative to the carrier frame while being prevented from moving longitudinally in a horizontal direction. The particular means utilized for guiding the frames in this manner could be of a variety of types; however, as shown in FIGURE 1 the preferred means include pairs of rod members **59** which extend vertically downward in fixed positions on opposite ends of the carrier and pass in sliding relationship through correspondingly shaped openings **60** formed at opposite ends of the frame members **44**. In this manner, the frames **44** are free to move vertically under the influence of the biasing means **42** but are prevented from shifting horizontally.

As previously mentioned, biasing means **42** function to maintain a continuous downward bias on the balls **38** or frame members **44**. As best shown in FIGURE 3, in the preferred embodiment, the biasing means **42** include relatively large diameter coil springs **66** which act between the underside of the bolster and a flange **68** carried on the lower end of a piston member **70**, separate ones of which are provided for each ball **38**. The piston members **70** are each received in a separate one of cylinders **72**. The cylinders **72** are mounted in the carrier frame **22** and connected thereto by, for example, machine screws **74**. The lower face **76** of each of the piston members **70** is concave, as shown at **71**, so as to receive the top surface of its respective ball member **38**. As can be seen, the biasing force of spring **66** is transmitted through the piston member **70** to maintain the balls **38** and frame **44** in the proper location to keep the under surface **34** of the carrier a short distance above the upwardly facing surface **12** of the bed **10**.

Although mechanical biasing means in the form of spring **66** have been shown, it is of course possible to use other types of biasing means. For example, the structure shown could be readily modified for pneumatic or hydraulic biasing simply by connecting a source of air or hydraulic pressure to cylinder **72** so that piston member **70** is biased downwardly.

As can be seen, with the biasing means and support members arranged in the manner described, the carrier can be readily moved along the tracks or guide grooves **40** into a located position in the press. When the carrier with a die set thereon is in located position in the press, means function to actuate carrier downwardly against the bias of the spring **66** to bring its lower surface **34** into engagement with the top surface **12** of the bed. In the particular embodiment under consideration the counterbalancing of the biasing spring is accomplished by clamp-mechanisms **80** positioned on the press bed on opposite sides of the carriers located position. Clamp members **80** each include a vertically extending frame comprised of a plate **82** which is welded or otherwise firmly fixed to the press bed. Each plate **82** has a vertical slot or guideway **84** formed therein. A toggle link mechanism comprising links **86** and **88** pivotally connected by pin **90** is arranged to guided movement in the guideway groove **84**. In particular, the links have transversely extending guide pins **92** and **94** which are arranged for sliding movement in the guideway **84**. A power actuator **96**, shown in the form of a hydraulic cylinder, is pivotally mounted from plate **82** by a pin **98** which extends outwardly from the plate. The outer end of the piston rod of the cylinder is pivotally connected to pin **90**.

The toggle link mechanism is connected via pin **94** to the outer end of a lever clamp arm **100** which is arranged for oscillatory movement about a pivot pin **102** which extends from plate **82**. As best shown in FIGURE 2, when the power actuators **96** are energized to retract their piston rods, the toggle link mechanisms drive the outer ends of the clamp arms **100** upwardly and cause the inner ends to engage the upper side of the carrier frame **22** and apply a downwardly acting clamp force to the carrier. The clamp mechanism is arranged so that the force is sufficient to overcome the biasing force of spring **66**. Accordingly, as shown in FIGURE 2A, the carrier is moved downwardly against the bias of springs **66** and is firmly clamped on the press with its lower surface **34** in engagement with the upper surface **12** of bed **10**.

In most installations the location of the carrier on the press bed must be quite exact so as to provide proper alignment between the die knock-out pin mechanisms and other devices usually associated with the carrier. Many different types of locating mechanisms could be provided. For example, a simple raised boss having inclined surfaces

could be arranged to enter a correspondingly shaped opening in the underside of the carrier as the carrier is lowered. In the preferred embodiment, the locating function is performed by a piston member **110** which is mounted in a cylinder **112** formed in the press bed. A line **114** is arranged to supply air or hydraulic fluid to the underside of the piston **110** to drive it vertically upwardly at the desired times. The upper end of piston **110** is conically shaped as shown at **116**. A correspondingly shaped opening **118** is formed in the under surface of the carrier frame **22**. As can be seen, when the carrier has been moved substantially to the desired position (prior to the actuation of the clamps), the piston **110** can be actuated upwardly. As the piston is moved upwardly, the conically shaped end **116** enters the opening **118**. If the carrier is slightly out of position, the conically shaped end **116** acts against the inclined walls of opening **118** to move the carrier longitudinally to its final position.

FIGURE 4 shows, in plan view, a track or guideway layout which permits the carrier of the subject invention to be moved at right angles. This feature is especially desirable when a single die storage room or supply area is utilized for a line of presses. There is provided a number of guideways **110** formed with a shape corresponding to guideways **48** and corresponding in number and spacing of the ball units on each side of the carrier. The guideways extend, for example, from the die storage area and cross the guideways **48** at a right angle. Accordingly, the carriers can be rolled sideways along guideways **110** and, when they have reached the juncture with guideways **48**, be rolled directly into the press.

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

Having thus described my invention, I claim:

1. In a press of the type including a bed and a ram mounted for movement toward and away from the bed, the improvement comprising improved apparatus for moving die sets into and out of said press, said apparatus including: guideways extending across the press bed, a die carrier having a lower surface and an upwardly facing die supporting surface, support means arranged for supporting the carrier on the guideways for movement into and out of the press with the lower surface maintained on a pre-determined distance above the bed surface, said support means comprising frames mounted from the carrier and biasing means continually biasing the frames downwardly therefrom, a plurality of ball members rotatably carried by the frames and having exposed peripheral surfaces extending downwardly from the frames and engaging the guideways, and power means arranged for actuation when the carrier is in the press for overcoming the biasing means and moving the lower surface of the carrier into engagement with the upwardly facing bed surface.

2. The apparatus as defined in claim **1** wherein said frames are porvided with means for preventing longitudinal movement thereof relative to the carrier.

3. The apparatus as defined in claim **1** wherein said guideways are formed as grooves having an arcuate cross-section.

4. The apparatus as defined in claim **1** wherein said power means comprise clamp members mounted on the press bed.

5. The apparatus as defined in claim **1** wherein each of said frames has a plurality of said ball members mounted therein.

6. The apparatus as defined in claim **5** wherein said frames extend longitudinally of said carrier.

References Cited

UNITED STATES PATENTS

2,988,234	6/1961	Barothy	100—299
3,229,791	1/1966	Soman	100—299
3,368,479	2/1968	Gregorovich	100—299

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U.S. Cl. X.R.

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