

Sept. 21, 1965

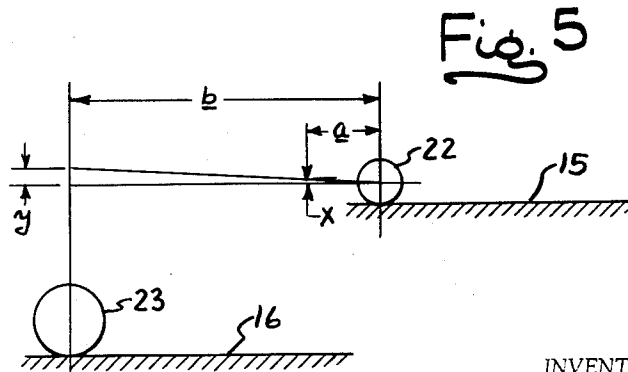
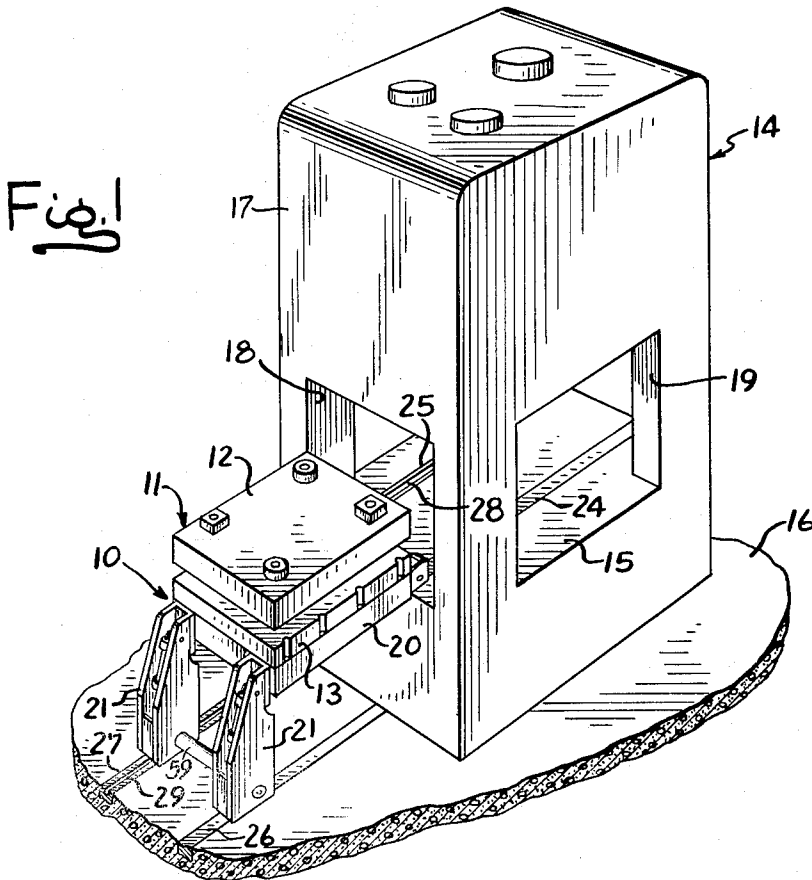
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QUICK DIE CHANGING MECHANISM

Filed Dec. 6, 1963

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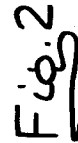


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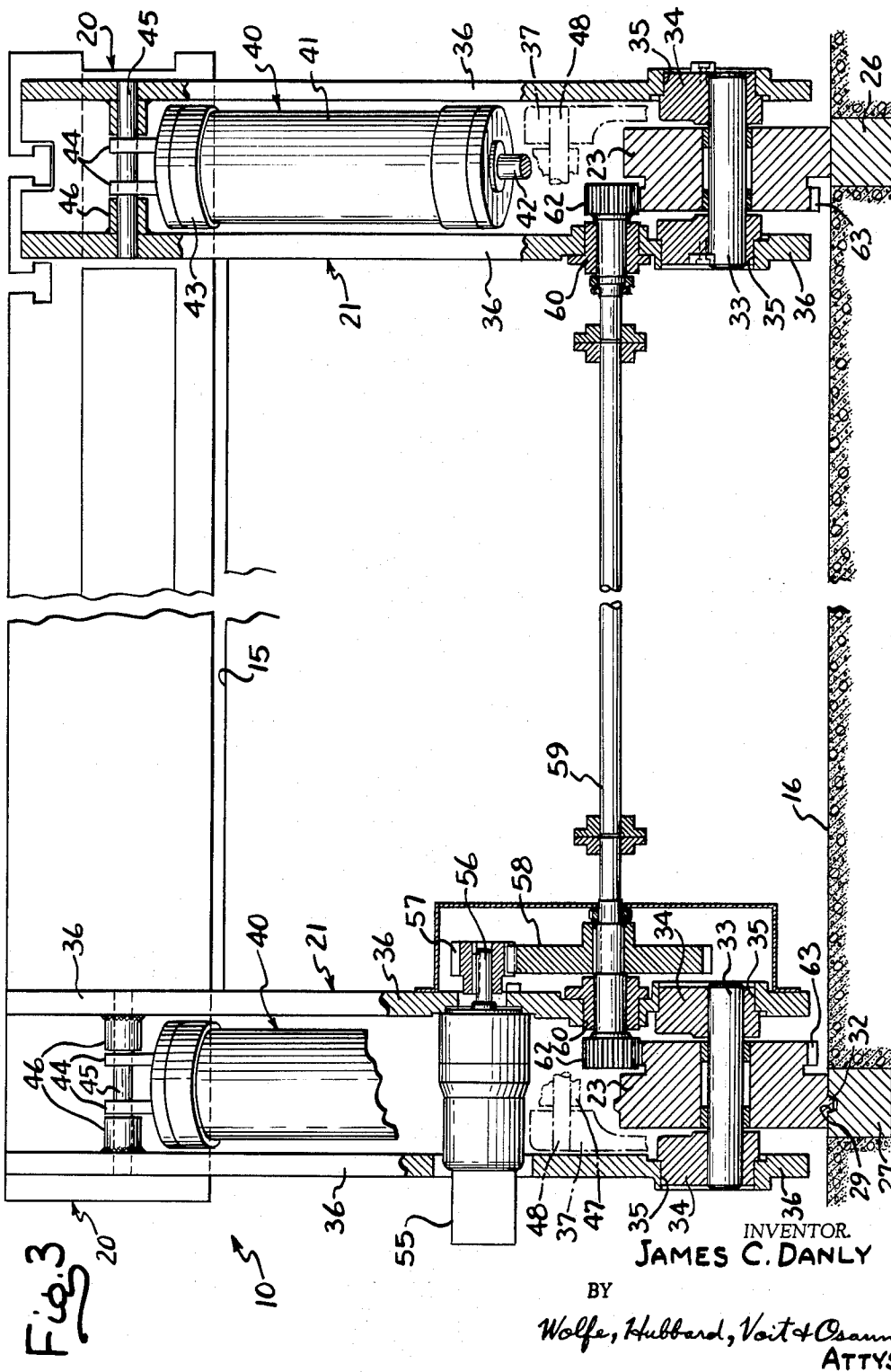
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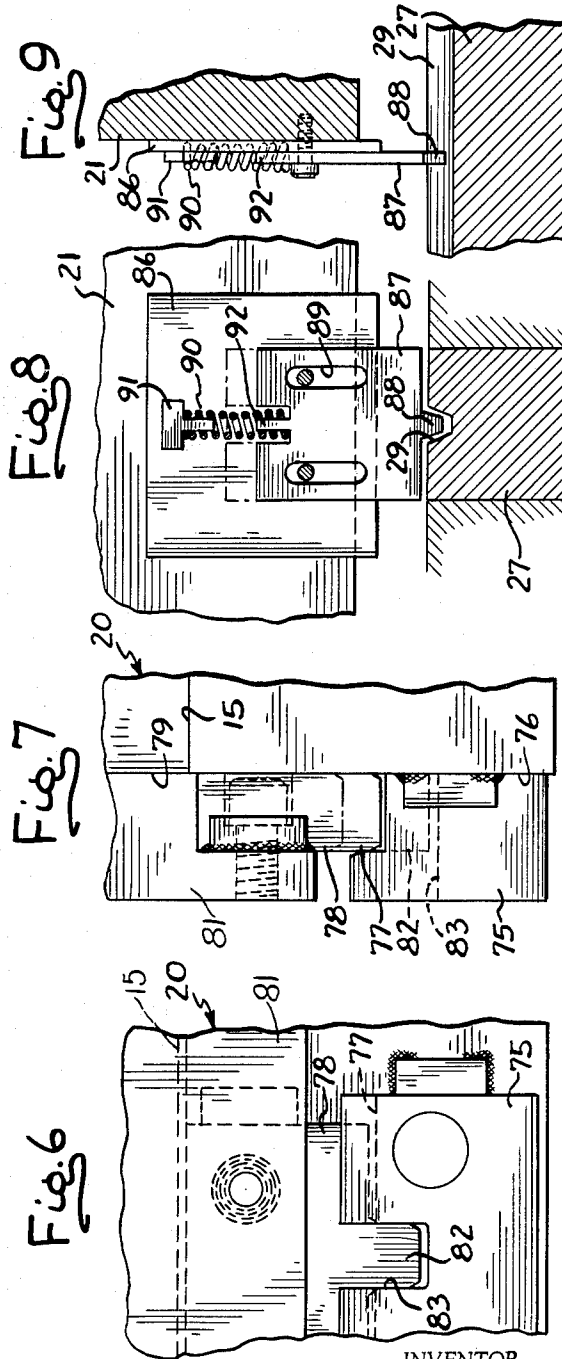
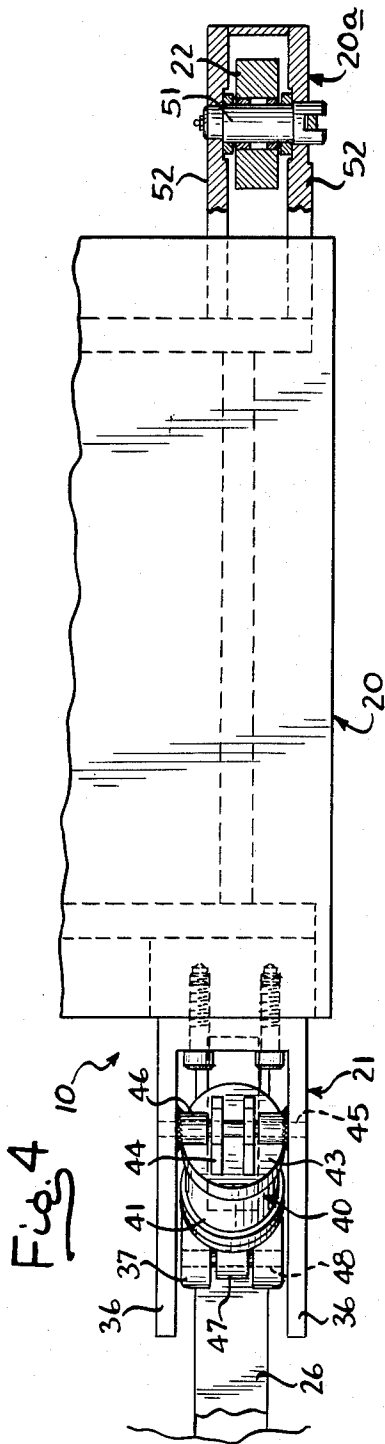
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3,207,065

QUICK DIE CHANGING MECHANISM

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7 Claims. (Cl. 100—229)

The present invention relates generally to power presses, and more particularly concerns a quick die changing mechanism for such presses.

As power presses have continued to increase in size and capacity, the dies for use in such presses have also increased both in size and weight, and many of these dies are now so large and unwieldy that much time and energy must be expended when the dies in a particular press are changed to accommodate a different product. In order to reduce both the amount of down time for such a large power press, and also the cost of labor of the highly paid pressroom workers during the changeover from one set of dies to another, manufacturers have long sought to mechanize this die changing operation.

In the past, overhead cranes have frequently been used to make changing the dies in power presses more rapid and efficient. While these cranes do save a considerable amount of time and energy in moving the dies from their storing place to the press, they do not satisfactorily solve the problem of properly centering and locating the large dies on the press bed. To overcome this problem, wheeled carriages or dollies have been constructed to roll the heavy dies directly into the press bed. An exemplary arrangement of this type is shown in Patent No. 2,996,025, issued August 15, 1961, to Vasil Georgeff and assigned to the same assignee as the present invention.

However, many large presses are formed with the press bed located a substantial distance above the pressroom floor, and for these presses the prior art die carrying dollies have been unsatisfactory. This is largely due to the fact that in many instances it is not practical or feasible to build the necessary supporting tracks for the die carriage above the floor adjacent the raised press bed.

Accordingly, it is the primary aim of the present invention to provide a quick die changing mechanism for use with power presses in which the press bed is located a substantial distance above the pressroom floor.

It is a more particular object to provide a quick die changing arrangement for a power press which does not require the construction of a high supporting track extending out from the press bed and over the adjacent pressroom floor.

A further object of the invention is to provide a quick die changing mechanism of the above type that is partially supported on the press bed and partially supported on the pressroom floor and which is movable into and out of the press so as to selectively locate a set of dies over or away from the press bed. It is a more detailed object to provide means for altering the supporting structure of such a quick die changing mechanism with respect to the pressroom floor so as to bottom a set of dies on the press bed.

It is also an object to provide a quick die changing mechanism for locating a set of dies on a power press bed which includes latching means to prevent shifting of the mechanism when it is bottomed on the press bed.

Other objects and advantages of the invention will become apparent upon reading the following detailed description and upon reference to the drawings in which:

FIGURE 1 is a perspective view of a power press and a quick die changing mechanism embodying the present invention;

FIG. 2 is a side elevation, partially in section, with

certain portions broken away of the die changing mechanism shown in FIG. 1;

FIG. 3 is a rear elevation of the mechanism shown in FIG. 2 with certain portions broken away to show cross sectional views of the wheels and driving mechanism;

FIG. 4 is a fragmentary plan view of the mechanism shown in FIGS. 2 and 3;

FIG. 5 is a schematic illustration of the die changing mechanism with one wheel located on the press bed and the other wheel located on the pressroom floor;

FIGS. 6 and 7 are, respectively, enlarged fragmentary rear and side elevational views of the means for securing the die changing mechanism to the press bed; and

FIGS. 8 and 9 are, respectively, enlarged fragmentary rear and side elevational views of a rail clearing device installed on the die changing carriage.

While the invention will be described in connection with a preferred embodiment, it will be understood that I do not intend to limit the invention to that embodiment. On the contrary, I intend to cover all alternatives, modifications and equivalents as may be included within the spirit and scope of the invention as defined by the appended claims.

Turning now to the drawings, there is shown in FIGURE 1 a quick die changing mechanism indicated generally at 10 for selectively locating a die set 11, comprising an upper die 12 and a lower die 13, in a large power press 14 having a bed 15 located substantially above the pressroom floor 16. To permit movement of the die changing mechanism 10 and the die set 11 into and out of the press 14, one wall 17 of the press defines an entrance opening 18 extending upwardly from the press bed 15. The press 14 may also be provided with another opening 19 adjacent the press bed 15 for insertion and removal of the work piece on which the press operates.

For the sake of simplicity and clarity, the invention will be herein described in connection with a single quick die changing mechanism 10 which is selectively movable into and out of the opening 18 defined in the press wall 17. However, it will be understood that in some instances a second die changing mechanism may be utilized adjacent the opposite side of the press. In that case, when one die changing mechanism 10 is moved into the press, the other die changing mechanism, of course, extends outwardly from the press bed substantially as shown in FIG. 1.

Pursuant to the present invention, the quick die changing mechanism 10 forms a die supporting carriage having a generally rectangular bolster 20 for carrying the die set 11, and includes a pair of spaced apart legs 21 secured to the rear edge of the bolster so as to extend downwardly therefrom toward the pressroom floor 16. As shown in FIG. 2, the die carriage 10 is preferably constructed with a generally L-shaped profile, the bolster 20 forming one leg disposed generally parallel to both the pressroom floor 16 and press bed 15, and the depending legs 21 disposed generally normal to the floor and the press bed. To permit movement of the die carriage 10 into and out of the press 14, a pair of wheels 22 are respectively journaled in spaced apart projections 20a extending outwardly from the leading edge of the bolster 20, and a second pair of wheels 23 are journaled adjacent the lower portion of the legs 21 for rolling movement on the pressroom floor 16. In this way, the quick die changing mechanism 10 may be easily moved into and out of the press 14 in order to locate a set of dies 11 on the press bed 15.

For supporting the wheels 22 on the press bed 15, a pair of spaced apart rails 24 and 25 are preferably installed on the press bed. Similarly, for supporting the wheels 23 on the pressroom floor 16, another pair of spaced apart

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rails 26 and 27 are preferably installed on the pressroom floor 16 so as to extend outwardly away from the press 14. In order to more accurately guide the die carriage 10 in its movement into and out of the press 14, one of the upper rails 25 and one of the lower rails 27 are preferably grooved as indicated at 28 and 29 and one each of the wheels 22 and 23 are formed with groove engaging rims 31 and 32, respectively.

In accordance with the present invention, the floor engaging wheels 23 of the quick die changing mechanism 10 are vertically adjustable with respect to the legs 21 between a lowered position where the bolster 20 is supported above the press bed and a raised position where the bolster is bottomed on the press bed. As shown in FIG. 3 wheels 23 are preferably journaled on axes 33 carried by eccentric bearing blocks 34 rotatably mounted in openings 35 formed in a pair of spaced apart side walls 36 of each of the legs 21. In the illustrated embodiment, a crank arm 37 is secured to each of the bearing blocks 34 in order to provide the necessary leverage for rotating the eccentric blocks.

To vertically adjust each of the wheels 23 in the present instance, a hydraulic actuator 40 provides the means for rotating the cranks 37 and thus the eccentric blocks 34. The hydraulic actuator 40 includes a double acting cylinder 41 enclosing a movable piston (not shown) to which a piston rod 42 is secured. Desirably, the hydraulic actuator 40 is enclosed between the side walls 36 of each of the legs 21. As shown in FIGS. 2 and 3, the cylinder 41 includes an enlarged end portion 43 having a pair of outwardly projecting flanges 44 adapted to receive a connecting pin 45 extending transversely between the side plates 36 of the legs 21. To maintain the cylinder 41 in a centered position between the legs 36 and to help stiffen the pin 45, reinforced collars 46 are rigidly secured to the inner surface of each of the plates 36 for carrying the pin 45.

At the lower end of the hydraulic actuator 40, the piston rod 42 carries a connecting portion 47 suitably apertured for receiving a transverse pin 48. The pin 48 is received in openings formed in the outer ends of the spaced apart cranks 37 secured to the eccentric blocks 34 of one of the wheels 23. Thus, it will be apparent that when hydraulic fluid is supplied to the lower end of the cylinder 41 from a suitable source (not shown), the piston and piston rod 42 are urged upwardly thereby rotating the cranks 37 to their raised position as shown in the upper dash lines in FIG. 2. Upward rotation of the cranks 37 also rotates the eccentric bearing blocks 34 so as to lower the wheel 23 to its lowered position where the bolster 20 is supported above the press bed 15. Conversely, when hydraulic fluid is supplied to the upper end of the cylinder 41, the piston and piston rod 42 are urged downwardly rotating the crank arms 37 to the lower dash line position shown in FIG. 2. In this case, the bearing blocks 34 are rotated so as to raise the wheel 23 with respect to the leg 21 and thus decrease the effective length of the leg 21 so as to bottom the bolster 20 on the press bed.

As shown in more detail in FIGS. 2 and 4 the upper wheels 22 of the die changing mechanism 10 are journaled on transverse axes 51 carried by a pair of plates 52 forming the side walls of the bolster extensions 20a. In the preferred embodiment the axes 51 are located in the plates 52 so that the running periphery of the wheels 22 are generally tangential to a plane extending forwardly from the lower surface of the bolster 20. This relationship insures that the lower surface of the bolster will be firmly bottomed on the press bed 15 when the wheels 23 are raised by the actuator 40 with respect to the legs 21. It will be understood, of course, that when the wheels 23 are lowered so as to raise the bolster 20 above the press bed 15, the distance indicated at x in FIG. 2 is only sufficient to provide running clearance for the die carriage 10 to move into and out of the press 14.

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In FIG. 5 the relationship of the bolster 20 with respect to the press bed 15 is shown diagrammatically. Thus, a indicates the distance from the running periphery of the wheel 22 to the forward edge of the bolster 20, x indicates the clearance distance between the forward edge bolster and the press bed, b indicates the horizontal distance from the forward edge of the bolster 20 to the running periphery of the floor engaging wheel 23 and y indicates the vertical adjustment of the wheel 23. In terms of an equation this relationship may be stated as:

$$\frac{x}{a} = \frac{y}{b}$$

In practice it has been found for one embodiment of the present invention where the horizontal distance between the wheel axes (b) is 62.5 inches and the distance from the leading edge of the bolster 20 to the axis of the wheel 22 (a) is 7 inches that a clearance distance x of .084 inch is sufficient. Thus, by substituting the appropriate values into the above equation the distance y may be calculated as follows:

$$\frac{.084}{7} = \frac{y}{62.5}$$

or y=.75.

In further accordance with the present invention, means are provided for driving the novel die changing mechanism 10 into and out of the press 14. In the preferred embodiment, a reversible drive motor 55 is mounted on one leg 21 of the die carriage 10. The motor 55 has a drive shaft 56 which carries a drive gear 57 engaging a driven gear 58 secured to a cross drive shaft 59. The cross shaft 59 is journaled in suitable bearings 60 mounted in the inner side plates 36 of each of the legs 21. A gear 62 adjacent each end of the shaft 59 engages a ring gear 63 secured to the inner face of each of the floor engaging wheels 23. Thus, when the motor 55 is energized in one direction, each of the wheels 23 are driven by the gears 57, 58, 62 and 63. Conversely, when the reversible motor 55 is driven in the opposite direction, the wheels 23 are rotated in the reverse direction. From the above, it will now be appreciated that the reversible motor 55 may be selectively energized to drive the novel die changing mechanism 10 into and out of the press 14.

In order to accurately center the bolster 20 on the press bed 15 and to prevent shifting of the die set 11 and bolster incident to operation of the press 14, means are provided for securely latching the bolster to the press bed. In the present instance, the latching means includes a latch bar 75 secured on the outer face 76 of the press bed 15. As shown in FIGS. 6 and 7, the latch bar 75 is formed with an upwardly opening latch groove 77 extending generally parallel to the face 76 of the press bed. For engagement with the latch bar 75, a cooperating catch 78 is secured to the outer surface 79 of the bolster 20 by means of a retaining bracket 81. Thus, after the die carriage 10 has been moved into the press 14 so as to locate the die set 11 over the press bed 15, the wheels 23 are raised with respect to the legs 21 so as to bottom the bolster 20 on the press bed and the catch 78 enters the cooperating groove 77 of the latch bar 75. In this way, the die set and bolster are not only accurately positioned axially within the press 14, but also restrained from axial shifting during press operation.

To insure accurate lateral alignment of the bolster and die set in the press 14, the catch bar 78 is provided with an alignment lug 82 which is positioned so as to cooperate with a complementary slot 83 formed in the latch bar 75 as the bolster is rolled into the press. In the preferred embodiment, the lug 82 projects downwardly from the bar 78, and is transversely dimensioned so as to fit into the slot 83 only when properly aligned

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therewith. As shown in FIG. 2 and in the solid line representation in FIG. 7, the lug 82 extends downwardly from the bar 78 sufficiently far so as to engage the slot 83 even when the wheels 23 are lowered to raise the bolster 20 away from the press bed 15. Thus, in order to move the bolster 20 completely into the press 14, the lug 82 must be aligned with the slot 83 thereby insuring proper lateral alignment of the bolster on the press bed 15.

So that the wheel guiding grooves 28, 29 in the rails 25, 27 do not become clogged with dirt or debris, the novel die changing mechanism 10 includes a plurality of rail clearing assemblies 85. As shown in FIG. 2, two of the rail clearing assemblies are mounted on one of the depending legs 21, and a third assembly is mounted on one of the forwardly projecting bolster extensions 20a. Since all of the assemblies 85 are identical, it will be sufficient to describe only one assembly in detail.

Turning to the enlarged views shown in FIGS. 8 and 9, it will be seen that this rail clearing assembly 85 is secured to the face of the leg 21 by means of a mounting plate 86 rigidly secured to the leg. A scraper blade 87 is slidably mounted on the plate 86 and projects downwardly therefrom so that a tongue 88 enters the groove 29. In the preferred embodiment the scraper blade 87 is secured to the mounting plate by a pair of cap screws inserted through vertical slots 89 formed in the blade.

To maintain the tongue 88 in the groove 29, especially when the wheel 23 is vertically adjusted, the blade 87 is biased downwardly by a compression spring 90. The spring 90 is suitably anchored at its upper end on a bracket 91 secured to the plate 86. The lower end of the spring is adapted to encircle an integral tang 92 formed in the upper edge of the scraper blade.

It will now be apparent that when the die changing carriage 10 is rolled into or out of the press 14, the tongues 88 of the rail clearing assemblies 85 scrape the dirt and debris out of the grooves 28, 29. This insures that the rimmed wheels 22, 23 cannot accidentally ride out of engagement with the rails 25, 27 and thus proper lateral alignment of the carriage 10 with the press 14 is maintained. It will also be understood that while the other two rails 24 and 26 have been shown herein as having flat supporting surfaces, these rails may also be grooved if desired. In this case, groove engaging rims would be provided for the other wheels 22, 23 and additional rail clearing assemblies 85 would be installed.

From the foregoing it will be seen that the novel die changing carriage 10 provides a simple, yet efficient mechanism for quickly moving a die set 11 into and out of a power press 14 in which the press bed 15 is located substantially above the pressroom floor. The wheels 23 on the depending legs 21 are reversibly driven by the motor 55 so as to roll the carriage 10 into and out of the press. Furthermore, the wheels 23 are vertically adjustable with respect to the legs 21 so that the die set 11 can be conveniently and accurately located on the press bed 15. In addition, the die changing mechanism 10 includes a latching and aligning means for guiding the carriage into the press bed and to restrain it from shifting during operation of the press.

I claim as my invention:

1. A quick die changing mechanism for locating a set of dies on a press bed disposed substantially above the floor of a pressroom comprising, in combination, a generally L-shaped die carriage having a generally flat upper surface for carrying a set of dies, said die carriage having a wheel mounted adjacent each of the ends thereof, one of said wheels disposed for rolling movement on the press bed, the other of said wheels disposed for movement on the pressroom floor, reversible drive means coupled to said other wheel for alternately rotating said wheel to respectively position said carriage over and away from said press bed, said other wheel being jour-

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nalled in eccentrically mounted bearings on said carriage, and means for rotating said eccentric bearings so as to vertically adjust said wheel with respect to said carriage to selectively locate said die set on the press bed when said carriage is positioned over said bed.

2. A quick die changing mechanism for locating a set of dies on a press bed disposed substantially above the floor of a pressroom comprising, in combination, a die carriage including a generally rectangular bolster having a generally flat upper surface for carrying a set of dies, a first pair of spaced-apart wheels journaled outwardly from the leading edge of said bolster for movement on the press bed, said first pair of wheels arranged with the running peripheries thereof generally tangential to a plane extending forwardly from the lower surface of said bolster, a pair of spaced-apart legs secured to the rear edge of said bolster and extending downwardly therefrom toward the pressroom floor, a second pair of wheels mounted one each on said legs for rolling movement on the pressroom floor, said second pair of wheels being vertically adjustable with respect to said legs between a lowered position whereby running clearance is provided between said lower surface of said bolster and said press bed and a raised position whereby said lower surface of said bolster is bottomed on said press bed, and means for selectively adjusting said wheels between said raised and lowered positions.

3. A quick die changing mechanism for locating a set of dies on a press bed disposed substantially above the floor of a pressroom, comprising, in combination, a die carriage including a generally rectangular bolster having a generally flat upper surface for carrying a set of dies, said bolster journaled a pair of wheels adjacent the forward edge thereof for movement on the press bed, a pair of spaced-apart legs secured to said bolster adjacent the rear edge thereof and extending downwardly toward the pressroom floor, a wheel mounted on each of said legs for rolling movement on the pressroom floor, means for reversibly driving said latter wheels for alternately moving the bolster over and away from the press bed respectively, said latter wheels being vertically adjustable with respect to said legs between a lowered position where the bolster is supported above the press bed and a raised position where the bolster is bottomed on the press bed, and means including a hydraulic actuator for shifting said wheels between said two positions.

4. A quick die changing mechanism for locating a set of dies on a press bed disposed substantially above the floor of a pressroom comprising, in combination, a die carriage including a generally rectangular bolster having a generally flat upper surface for carrying a set of dies, said bolster journaled a pair of wheels adjacent the forward edge thereof for movement on the press bed, a pair of spaced-apart legs secured to said bolster adjacent the rear edge thereof and extending downwardly toward the pressroom floor, means defining an open latch on the edge of said press bed adjacent said legs, means defining a cooperating catch secured to the rear edge of said bolster, a wheel mounted on each of said legs for rolling movement on the pressroom floor, said latter wheels being vertically adjustable between a lowered position whereby the bolster is supported above the press bed and a raised position whereby the bolster is bottomed on the press bed with said catch engaged in said latch to prevent shifting of said bolster on said bed, and means for vertically adjusting said latter wheels.

5. For use in a power press having a bed located substantially above the pressroom floor, a quick die changing mechanism comprising, in combination, a bolster having a generally flat upper surface for carrying a set of upper and lower dies into the press on the press bed, said bolster having a first pair of rail engaging wheels journaled adjacent the forward edge thereof, a first pair of spaced-apart rails secured to the press bed adjacent opposite sides thereof for supporting said wheels, a pair

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of bolster support legs secured to said bolster adjacent the rear edge thereof, said support legs extending downwardly from said bolster toward the pressroom floor, a second wheel journaled in an eccentrically mounted bearing on each of said bolster legs, a second pair of spaced-apart rails secured to the pressroom floor for supporting said second wheels, means for reversibly driving said second wheels for alternately moving said bolster over and away from the press bed respectively, and means for rotating each of said eccentric bearings whereby said bolster is selectively raised and lowered with respect to said press bed.

6. The combination defined in claim 5 wherein at least one of each of the first and second rails defines a guiding groove therein and at least one each of the first and second wheels is formed with a peripheral flange adapted to mate with said respective grooves.

7. The combination defined in claim 6 wherein scraper means are mounted adjacent each of the peripherally flanged wheels to clear dirt and debris out of the grooves in advance of the flanged wheels, at least one of said

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scraper means being resiliently mounted on one of said bolster support legs.

References Cited by the Examiner

UNITED STATES PATENTS

279,695	6/83	Boschert	100—224
316,981	5/85	Krueger	280—34.1
1,348,903	8/20	Simpson	214—26
1,910,267	5/33	Smith et al.	214—26
1,990,029	2/35	Isabella	104—279 X
2,576,776	11/51	Cavagnaro	100—229 X
2,667,985	2/54	Woughter	214—670
3,059,274	10/62	Fassero et al.	18—18
3,111,100	11/63	Georgeff	113—49

FOREIGN PATENTS

349,398	3/22	Germany.
444,008	5/27	Germany.
257,240	2/28	Italy.
475,797	11/52	Italy.

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