May 26, 1964 J. C. DANLY ETAL 3,134,350

CARRIER CLAMP FOR QUICK DIE CHANGE PRESS

Filed May 2, 1961 4 Sheets-Sheet 1

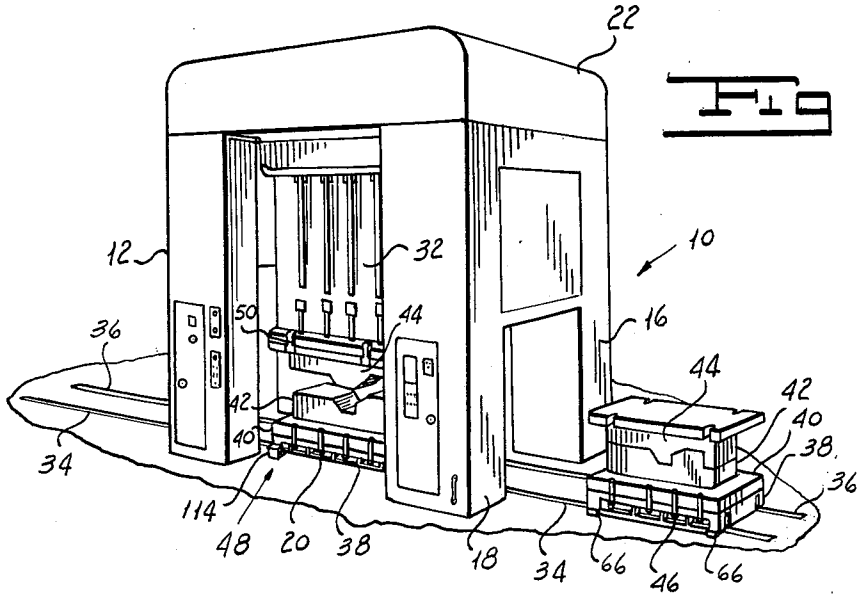

Fig 1

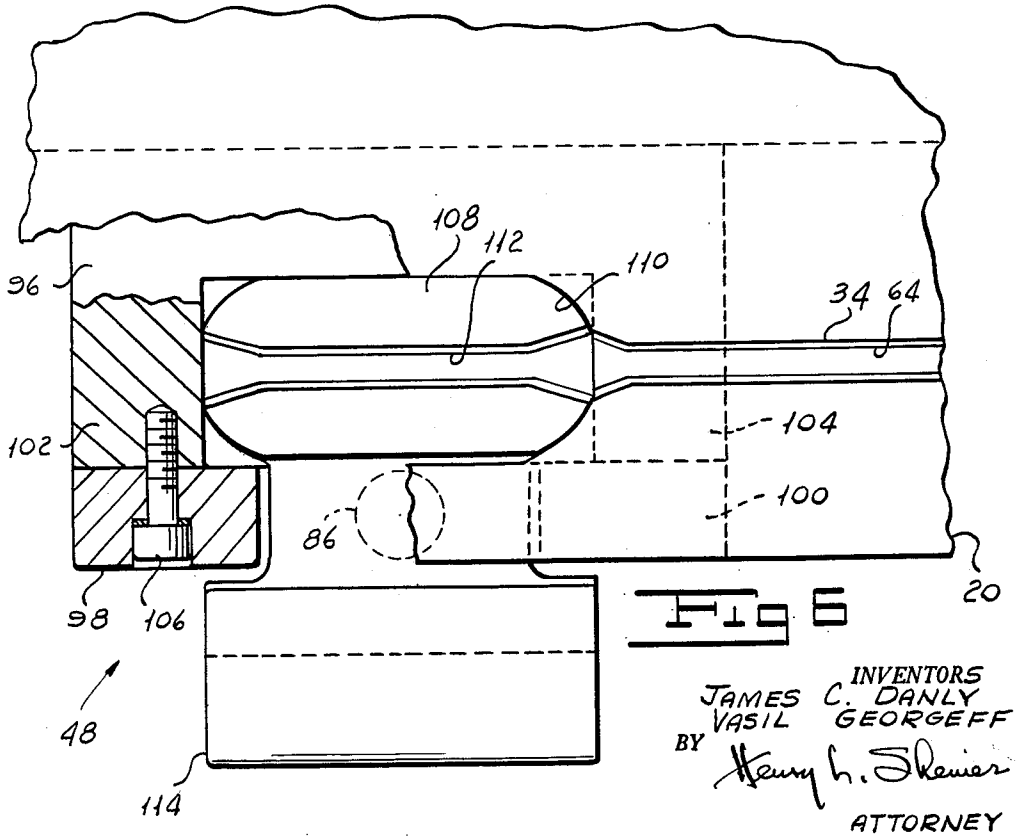

Fig 6

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May 26, 1964 J. C. DANLY ETAL 3,134,350

CARRIER CLAMP FOR QUICK DIE CHANGE PRESS

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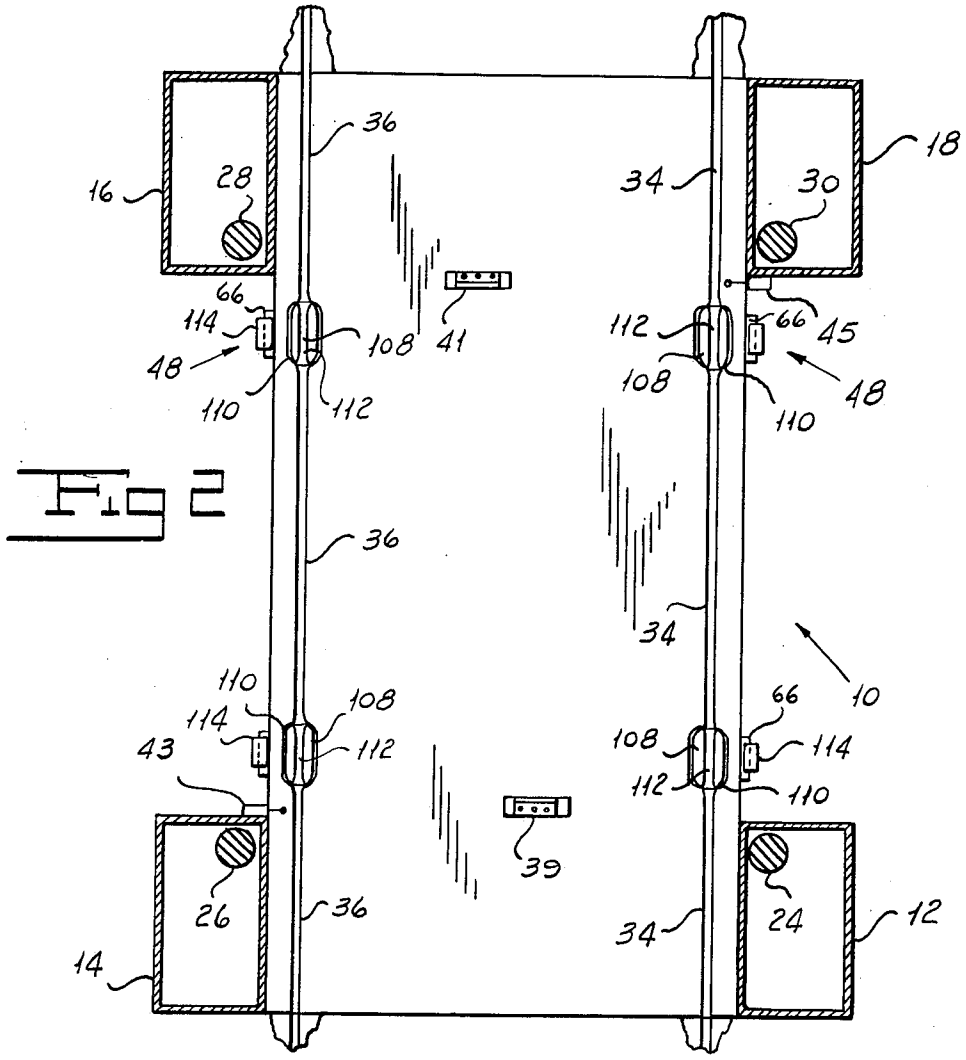

Fig 2

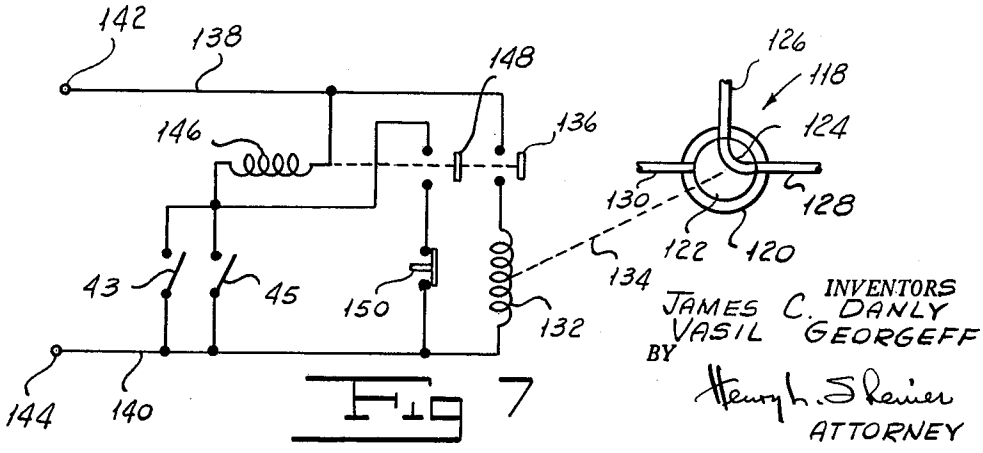

Fig 7

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May 26, 1964 J. C. DANLY ETAL 3,134,350

CARRIER CLAMP FOR QUICK DIE CHANGE PRESS

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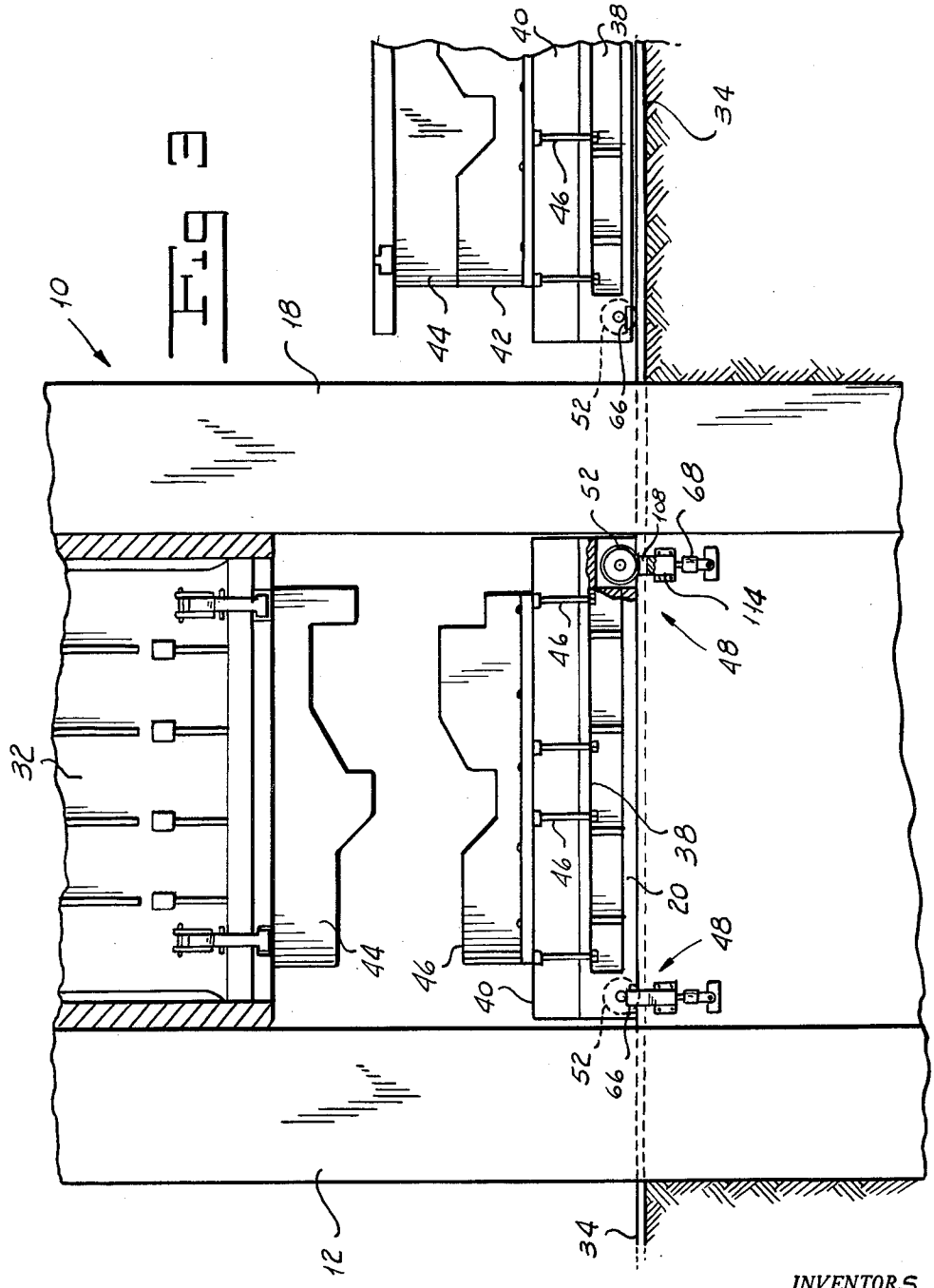

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May 26, 1964 J. C. DANLY ETAL 3,134,350

CARRIER CLAMP FOR QUICK DIE CHANGE PRESS

Filed May 2, 1961 4 Sheets-Sheet 4

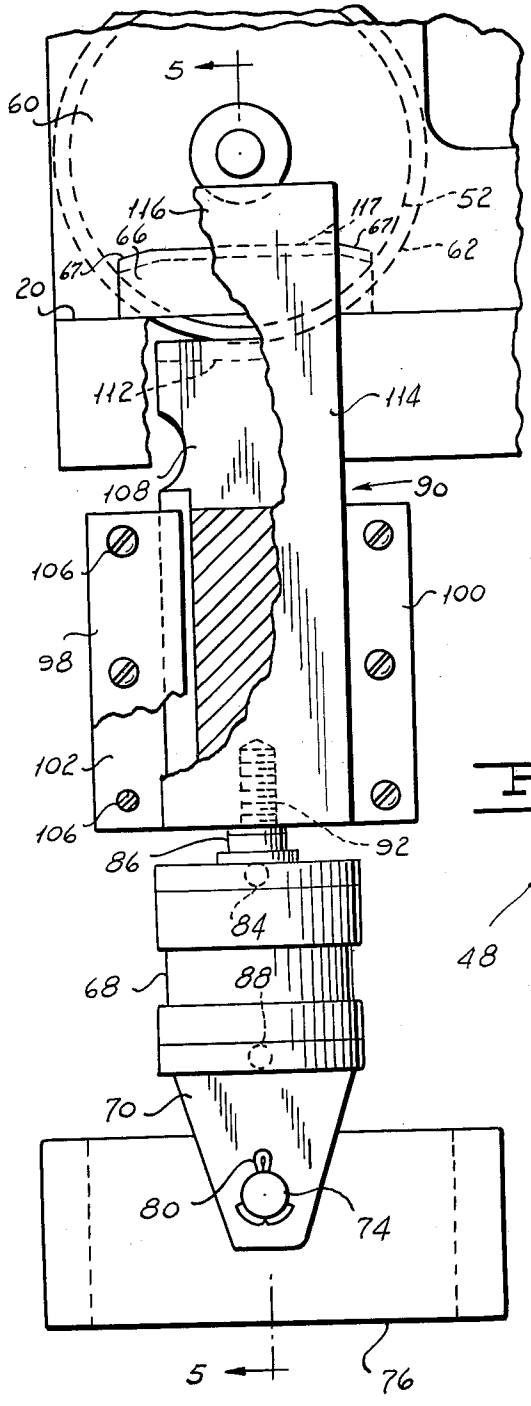

FIG 4

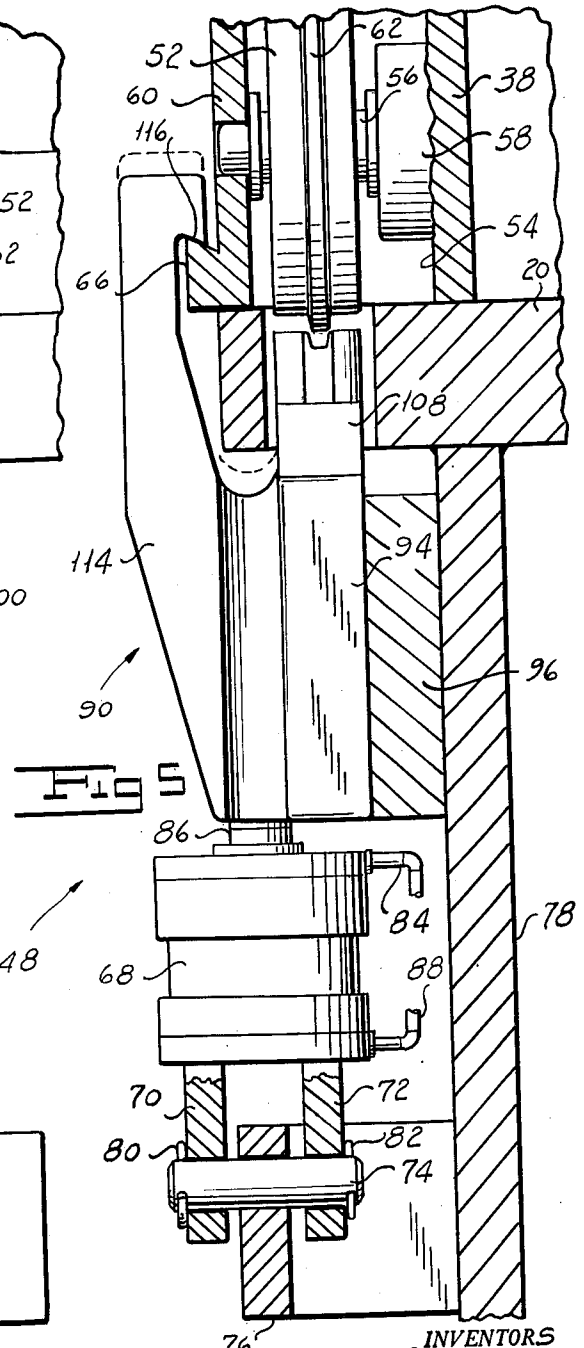

FIG 5

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3,134,350
CARRIER CLAMP FOR QUICK DIE CHANGE PRESS

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Filed May 2, 1961, Ser. No. 107,211
6 Claims. (Cl. 113—49)

Our invention relates to a carrier clamp for a quick die change press and more particularly to an assembly for concomitantly lowering a die set carrier ring to the press bed while clamping the ring to the bed.

The copending application of Vasil Georgeff, Serial No. 604,437 filed August 16, 1956 for a Readily Changeable Die Assembly for Power Presses, now Patent No. 2,996,025, and the copending application of Vasil Georgeff, Serial No. 709,324 filed January 16, 1958 for a Quick Die Change Press, now Patent No. 3,111,100 each shows a power press in which a carrier ring supporting a bolster plate which carries a die set is adapted to be moved from a position outside the press and above the press bed to a position within the press over the bed. When the carrier ring and the die set supported thereby have been moved into position within the press, the carrier ring is lowered to a position at which it rests on the press bed. Means is provided for accurately locating the carrier ring in this position. In order that the press function satisfactorily, means is provided for clamping the carrier ring to the press bed in the position it occupies after having been lowered to the press bed. The means for lowering the carrier ring to the press bed may comprise movable sections of rails on which the carrier wheels ride as the carrier rolls into the press bed. The ring may then be clamped to the press bed by clamps including nuts and bolts which secure the clamps to the bed. Alternately to the movable rail sections for lowering the carrier ring to the press bed, there may be provided in the press bed wheel wells into which the carrier wheels ride and rollers which normally occupy a position at which they support the ring above the press bed and which may be lowered to permit the ring to come to rest on the bed with the wheels disposed in the wheel wells. When the carrier ring has been lowered into the position on the bed, clamps held by nuts and bolts may be employed to secure the carrier ring to the press bed.

In operation of both arrangements described above, it is necessary first to accomplish the carrier ring lowering operation before the clamps are applied to the ring to secure the ring to the bed. After the lowering operation is accomplished, the clamps are applied manually by the use of suitable tools. The operations of thus lowering and clamping the carrier ring satisfactorily achieve the purpose of securing the carrier ring in an accurately located position on the press bed within the press so that the upper die can be secured to the press slide to permit press operations to take place. While the end result of these operations is satisfactory, the operations themselves are tedious and time consuming and thus are not consistent with the primary objects of the inventions set forth in the copending applications referred to above of permitting press dies to be changed in a rapid and expeditious manner.

We have invented a carrier clamp for quick die change presses which permits the carrier ring to be rapidly and

expeditiously secured in an accurately located position on the press bed within the press. Our carrier clamp concomitantly lowers the carrier ring to the press bed while securely fixing the carrier ring to the press bed. In accomplishing its purpose, our carrier clamp makes use of the already existing hydraulic lowering system of the press. Our carrier clamp is simple in its construction and operation for the result achieved thereby.

One object of our invention is to provide a carrier clamp for a quick die change press which rapidly and expeditiously secures the carrier ring in an accurately located position on the press bed within the press.

Another object of our invention is to provide a carrier clamp for a quick die change press which concomitantly lowers the carrier ring to the press bed while securing the ring in position on the bed.

A further object of our invention is to provide a carrier clamp for a quick die change press which makes use of the already existing hydraulic system on the press.

A further object of our invention is the provision of a carrier clamp for a quick die change press which is simple in its construction and operation for the results achieved thereby.

Other and further objects of our invention will appear from the following description.

In general, our invention contemplates the provision of a carrier clamp for a quick die change press in which a carrier ring is supported for movement from a position above the press bed and outside the press to a position within the press over the press bed. When the carrier ring and the die supported thereby have been moved into position within the press, fluid responsive means is actuated to lower the ring to the press bed. We arrange the fluid responsive means to move clamping arms into engagement with lugs on the ring securely to hold the carrier ring into position on the press bed within the press after it is lowered. We may make our carrier clamp responsive to the arrival of the carrier ring in position within the press.

In the accompanying drawings which form part of the instant specification and which are to be read in conjunction therewith and in which like reference numerals are used to indicate like parts in the various views:

FIGURE 1 is a perspective view of a quick die change press provided with our carrier clamp.

FIGURE 2 is a sectional view of the press shown in FIGURE 1 illustrating the location of our carrier clamps with reference to the press bed.

FIGURE 3 is a sectional view of a quick die change press provided with our carrier clamps showing the manner in which the clamps hold the lowered carrier ring to the press bed.

FIGURE 4 is a side elevation of one of our carrier clamps for a quick die change press with parts broken away.

FIGURE 5 is a sectional view of our carrier clamp for quick die change presses taken along the line 5—5 of FIGURE 4.

FIGURE 6 is a top plan view of our carrier clamp for quick die change presses with parts broken away.

FIGURE 7 is a schematic view of a simplified control circuit which may be used to actuate our carrier clamp for quick die change presses.

Referring now to FIGURES 1 and 2 of the drawings, one form of quick die change press with which our car-

rier clamp can be used includes a frame indicated generally by the reference character 10 having four uprights 12, 14, 16 and 18 extending from the bed 20 of the press to the crown 22. Respective tie rods 24, 26, 28 and 30 hold the press assembled in a manner known to the art. Any suitable means known to the art such, for example, as gibs (not shown) support the press slide 32 for vertical reciprocating movement with reference to the press bed.

The form of quick die change press with which our carrier clamp is used as shown in the drawings includes a pair of tracks 34 and 36 which extend from a position outside the press at one side thereof through the press over the bed 20 to a position outside the press at the other side thereof. Tracks 34 and 36 are adapted to support one or two carrier rings 38 to which we secure a bolster plate 40 carrying a die set including a lower die 42 and an upper die 44. We employ any appropriate means such, for example, as bolts 46 or the like for securing the bolster plate 40 to the carrier ring 38.

In FIGURE 1 we have shown one of the rings 38 in a position outside the press and a second ring 38 within the press. The ring 38 within the press is secured to the press bed 20 by a plurality of our carrier clamps one of which is indicated generally by the reference character 48 in FIGURE 1. When the ring has been clamped to the bed 20, slide 32 is lowered to a position at which the upper die 44 can be secured to the slide 32 by any suitable means such as by clamping arms 50 carried by the slide. Any suitable drive means may be employed to move the rings 38 and the die sets carried thereby into and out of the press. They may be independently driven or alternately they may be connected and have a common drive. The structure and arrangement of the ring drive means as well as the bolster plate 40 and the clamping means 50 for securing the upper die 44 to the slide 32 is more fully described in the copending applications referred to hereinabove. Since these elements per se form no part of our invention, they will not be described in detail.

Referring now to FIGURES 4 to 6 each of the carrier rings 38 has a plurality of respective wheels or rollers 52 each of which is supported in a recess 54 adjacent a corner of the ring on a shaft 56 supported in a boss 58 in the recess and in a flange 60 defining the outer wall of the recess. Each of the wheels 52 has an annular flange 62 which rides in the groove 64 of one of the tracks such, for example, as the track 34.

Each recess wall or flange 60 is formed with a lug 66 adapted to be engaged by a clamping arm to be described hereinafter when the clamp is actuated.

Our carrier clamp includes a double acting piston and cylinder assembly 68 formed with a pair of supporting lugs 70 and 72 which receive a pin 74 carried by a bracket 76 secured to a supporting wall 78 extending below the press bed 20 by any suitable means such as by welding. Respective cotter pins 80 and 82 hold the pin 74 in position on the lugs 70 and 72. The assembly 68 is adapted to be supplied with fluid under pressure through a pipe 84 to move the piston rod 86 of the assembly downwardly as viewed in FIGURES 4 and 5. A second pipe 88 is adapted to supply fluid under pressure to the assembly 68 to move the piston of the assembly upwardly as viewed in FIGURES 4 and 5.

Respective stops 39 and 41, offset laterally with respect to each other may be provided to stop the respective rings 38 in position within the die area of the press. Limit switches 43 and 45 may be actuated by the respective rings when in position to operate a suitable control valve to be described hereinafter which supplies fluid under pressure to the cylinder assemblies 68.

We secure the rod 86 to the clamping arm indicated generally by the reference character 90 or our carrier clamp by screwing a threaded end 92 of the rod 86 into the arm 90. We form arm 90 with a sliding block 94

received by a U-shaped guide member 96 secured to support wall 78 by any suitable means such as by welding or the like. Respective retainer plates 98 and 100 are secured to the arms 102 and 104 of the guide 96 by any suitable means such as by machine screws 106. In this manner the arm 90 is supported for vertical sliding movement with respect to the press bed 20.

We form a movable track section 108 on the top of the block 94. This movable track or rail section 108 is adapted to move upwardly into an opening 110 formed in the bed 20. When the section is in this position, a wheel groove 112 formed in section 108 registers with the groove 64 with one of the tracks such as the track 34. As can be seen by reference to FIGURE 6 we widen the portion of the groove 64 leading into the opening 110 and we widen the groove 112 at both ends to ensure that the flange 62 will ride evenly from one groove to the other as it moves back and forth along the track. Arm 90 extends outwardly from the block 94 through the space between the retaining plates 98 and 100 to form the clamping arm portion 114 of the arm 90. This portion 114 extends upwardly to a position over the press bed and has its end formed with a hook 116 adapted to engage one of the lugs 66 on the carrier ring 38. It will be noted that we form the interengaging surfaces of hook 116 and lug 66 so that the clamping arm portion 114 cannot readily spring out of engagement with the lug 66 thus to release the carrier 38. Further, we taper the ends of the engaging surface of lug 66 and of hook 116 to form respective cam surfaces 67 and 117 as shown in FIGURE 4 so that the clamping arm portion 114 will be cammed out of the way in the event that an operator, for any reason, fails to lift the clamp before running a carrier ring into the die area of the press.

We arrange our carrier clamp to hold the ring 38 into engagement with the bed 20 with a pressure which is at least equal to the stripping load which is expected to be encountered. The throw of the piston and cylinder assembly is such that in the event of a failure of hydraulic pressure the ring 38 can lift under the action of the stripping rod only about one-eighth of an inch before the piston of the assembly 68 will strike the top of the cylinder.

Referring now to FIGURE 7, one form of control which may be employed to actuate our clamps 48 includes a control valve indicated generally by the reference character 118 having a housing 120 and a body 122 formed with a passage 124 adapted to provide communication between a pipe 126 leading to a suitable source of fluid under pressure (not shown) and a pipe 128 leading to pipes 83 in a first position of the body and adapted to provide communication between pipe 126 and a pipe 130 leading to pipes 84 in a second position of body 120. Body 120 normally occupies its first position and is adapted to be moved to its second position by energization of a solenoid winding which acts through a linkage 134 to operate the valve.

We connect the winding 132 in series with a normally open relay switch 136 between conductors 138 and 140 connected to the terminals 142 and 144 of a suitable source of control potential. We connect limit switches 43 and 45 in parallel with each other and in series with a relay winding 146 between conductors 138 and 140. When energized, winding 146 closes switch 136 and a second normally open switch 148 which provides a holding circuit for winding 146. We dispose a normally closed push button switch 150 in series with switch 148.

From the circuit just described it will be apparent that as a carrier ring 38 moves into the press it momentarily actuates one of the switches 43 or 45 to energize winding 146 to close switches 136 and 148 to energize winding 132 to move body 120 to the position at which it supplies fluid under pressure to pipes 84 through pipes 130. This causes rods 86 to move down. Winding 146 remains energized until switch 150 is opened which is done when

it is desired to move another carrier ring **38** into the press.

In operation of our carrier clamp for a quick die change press assuming that one set of dies **42** and **44** is in use in the press and it is desired to replace this die set with another set, the upper die **44** is disengaged from the slide **32** by releasing the clamps **50**. Inner slide **32** is then moved up. Push button **150** is operated to de-energize winding **146** and fluid under pressure is supplied to the pipes **88** of the clamping assemblies **48** to move the rods **86** upwardly as viewed in the figures of the drawings. When this occurs, hooks **116** move out of engagement with the lugs **66** to release the carrier ring **38**. Shortly after, the hooks **116** move out of engagement with the lugs **66**, the movable rail sections **108** engage the wheels **52** to lift the ring **38** out of engagement with the press bed **20**. When these operations have been performed, the drive for the carrier ring **38** within the press is energized to move this ring and the die set carried thereby out of the press. After the die set which is being replaced has been removed from the die area, the drive for the carrier ring which was outside the press is energized to move this ring into the press to a position at which its wheels **52** rest on the movable track sections **108**. When the carrier ring moves into position, it engages one of the stops **39** and **41** and momentarily actuates the corresponding switch **43** or **45**. When the carrier ring has stopped in this position, fluid under pressure is released from the pipe **88** and is applied to the pipe **84**. When this is done, all the rods move downwardly to drop the movable rail sections **108** and to move the hooks **116** into engagement with the lugs **66**. The ring **38** first sinks into engagement with the press bed and upon further movement of the rods **86** is clamped to the bed **20** with a force which is at least equal to the expected stripping pressure. After the clamping operation takes place, slide **32** is lowered and clamps **50** are secured to the upper die **44** and the press is ready for operation.

While we have shown movable track sections **108** as a means for lowering the carrier ring to the press bed, it will be understood that we could use other means such, for example, as wheel wells and vertically movable rollers carried by hydraulic cylinders.

It will be seen that we have accomplished the objects of our invention. We have provided a carrier clamp for a quick die change press which concomitantly lowers the carrier ring to the press bed while securing the ring in position on the bed in the die area. Our carrier clamp permits more rapid and expeditious changing of the dies used in the press. It is simple in its construction and operation for the results achieved thereby. Our carrier lends itself to automatic operation.

It will be understood that certain features and subcombinations are of utility and may be employed without reference to other features and subcombinations. This is contemplated by and is within the scope of our claims. It is further obvious that various changes may be made in details within the scope of our claims without departing from the spirit of our invention. It is, therefore, to be understood that our invention is not to be limited to the specific details shown and described.

Having thus described our invention, what we claim is:

1. In a quick die change press having a bed and having a bed and having a slide mounted for reciprocating movement with respect to the bed, a die carrier, means mounting said die carrier for movement from a position outside the press to a position within the press above said bed, means for lowering said carrier into engagement with the press bed, means for clamping the carrier to the bed and means responsive to the arrival of said carrier at said position within the press for actuating said lowering means and said clamping means.

2. In a quick die change press having a bed and having a slide mounted for reciprocating movement with respect to said bed, a die carrier, means supporting said die carrier for movement from a position outside the press to a position within the press over the bed, a clamping arm, means mounting said clamping arm on said bed for movement from a first position to a second position, said supporting means comprising an element movable with said arm from the first position supporting said carrier in a position above the press bed to a second position, interengageable means on said arm and on said carrier for clamping said carrier to the bed in said second position and means for actuating said arm and said movable element.

3. In a quick die change press having a bed and having a slide mounted for reciprocating movement with respect to said bed, a die carrier, means supporting said die carrier for movement from a first location outside the press to a second location within the press over the bed, said supporting means comprising a supporting element, a clamping arm, actuatable means mounting said supporting element and said clamping arm on the press bed for concomitant movement of said element and said arm from a first position of said element at which it supports said carrier above the bed in the second location thereof and from a released position of the arm to a second position of the element at which said carrier is lowered into engagement with the press bed at the second location and to a clamping position of said arm at which it clamps the carrier to the press bed and means for actuating said actuatable means to hold said element in its first position and to hold said arm in its released position when said carrier is out of said second location and to move said supporting element to its second position and to move said arm to its clamping position when said carrier is at said second location concomitantly to lower the carrier into engagement with the press and to clamp the carrier to the press bed.

4. In a quick die change press having a bed and having a slide mounted for reciprocating movement with respect to the bed, a die carrier, means comprising a supporting element supporting said die carrier for movement from a first location outside the press to a second location within the press over the bed, a clamping arm, a guide block, actuatable means comprising a guide block mounting said supporting element and said clamping arm on said bed for concomitant movement from first positions at which said supporting element is adapted to support said carrier above the bed and at which said clamping arm is released to second positions at which said supporting element is adapted to lower the carrier to the press bed and said clamping arm is adapted to engage said carrier to clamp the carrier to the bed, and means for actuating said actuatable means to hold said element and said arm in said first positions when said carrier is out of said second location and to move said element and said arm to said second positions when said carrier is at said second location.

5. In a quick die change press having a bed and having a slide mounted for reciprocating movement with respect to the bed, a die carrier, means comprising a rail formed with a movable section for supporting said die carrier for movement from a first location outside the press to a second location within the press over the bed, a clamping arm, interengageable means on said arm and on said carrier adapted to clamp said carrier to the press bed in its second location, a support, means mounting said clamping arm and said movable rail section on said support for movement therewith, actuatable means mounting said support for movement from a first position at which said movable rail section is adapted to support said carrier above said bed and at which said interengageable means is disengaged to a second position at which said movable rail section lowers said carrier into engagement with the press bed and at which said interengageable means is engaged, and means for actuating said actuatable means to hold said support in said first position when said carrier is out of said second location and to move said support to said second position when said carrier is at said second location.

6. In a quick die change press having a bed and having a slide mounted for reciprocating movement with respect to the bed, a die carrier, means mounting said die carrier for movement from a first position outside the press to a second position within the press under the slide, a clamping arm, a lug mounted on said carrier, interengageable surfaces on said clamping arm and said lug and means mounting said clamping arm for movement on said bed from a released position to a position at which said surfaces engage each other in the second position of said carrier, the ends of each of said surfaces in the direction of movement of said carrier being provided with cam surfaces.

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