Nov. 24, 1959 C. N. ELLRICH 2,913,946

DIE HANDLING MECHANISM FOR FACILITATING INSERTION AND REMOVAL THEREOF IN PRESSES

Filed Aug. 22, 1956 2 Sheets-Sheet 1

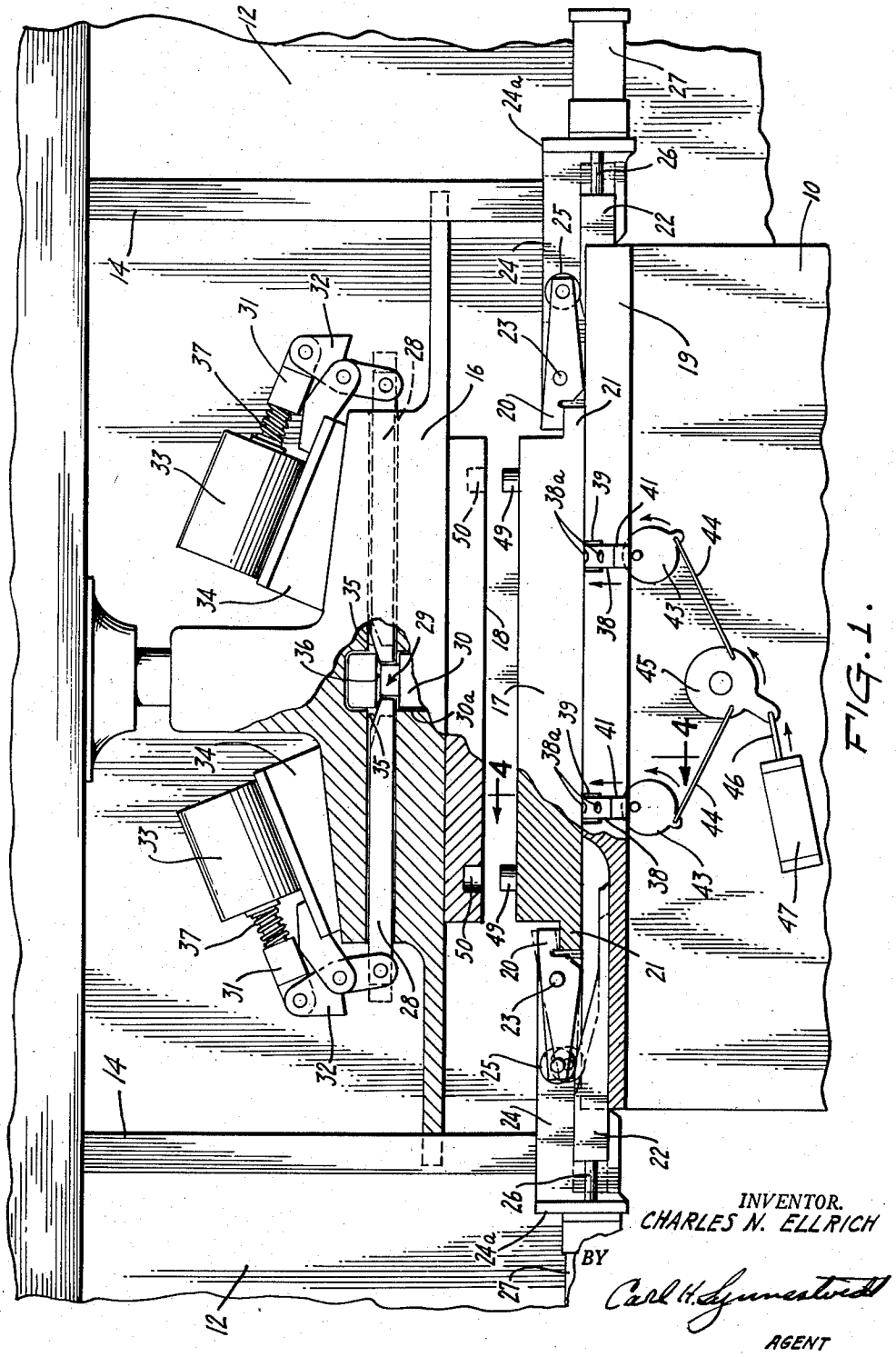


FIG. 1.

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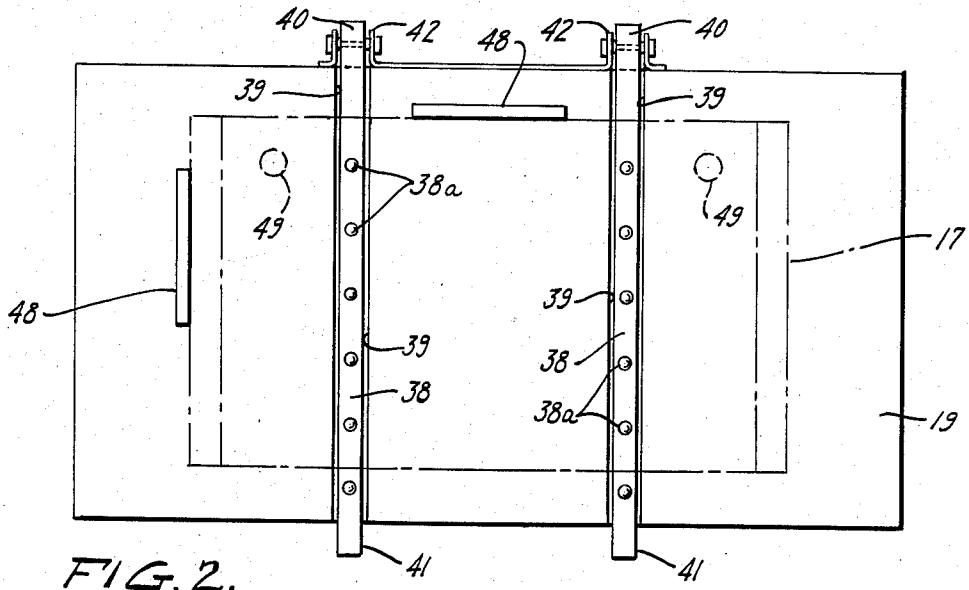


FIG. 2.

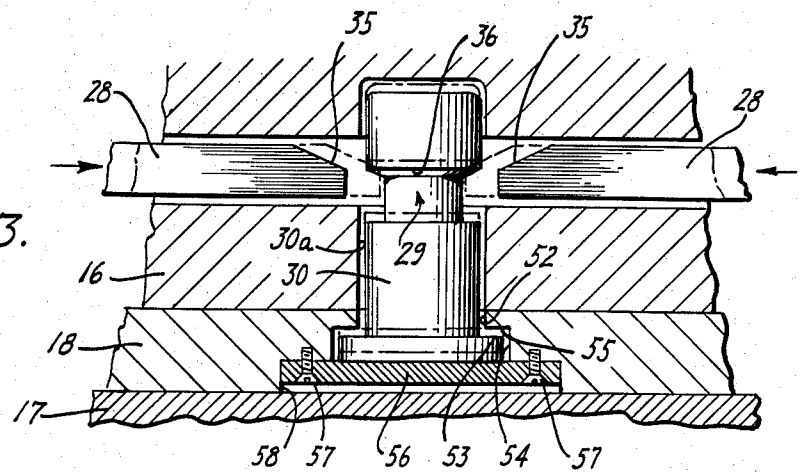


FIG. 3.

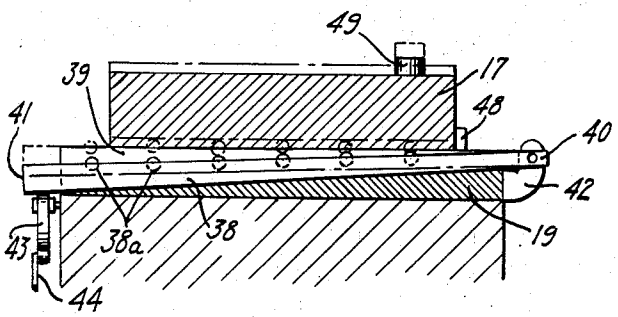


FIG. 4.

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DIE HANDLING MECHANISM FOR FACILITATING INSERTION AND REMOVAL THEREOF IN PRESSES

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9 Claims. (Cl. 83—630)

The invention herein described and claimed relates generally to handling apparatus and pertains more particularly to means for handling metal working dies. Specifically, the invention has to do with mechanisms for effecting easy removal and insertion of dies in power presses.

Changing dies in presses involves technical problems which usually necessitate skillful mechanics trained in setting dies accurately for their proper operation and protection against damage. Moreover, in the type of presses which are provided with bulky and heavy dies, the handling of the dies is difficult and requires laborious manipulations which make it necessary to employ several handlers to move the dies.

It is therefore an object of this invention to overcome the problems and difficulties heretofore encountered in changing and handling heavy dies.

Another object of the invention is to provide mechanisms which can be readily incorporated in a power press to facilitate the changing of dies and which make it possible to set up dies without special skill or technical knowledge.

Still another and more specific object of the invention has to do with improved and simplified means whereby dies are easily disconnected and lifted from the press and whereby dies are likewise easily placed and locked in position within the press.

A characteristic feature of the invention resides in the provision of an arrangement whereby dies are lifted mechanically so that dies can be changed by one machine attendant.

The invention is further characterized in that it utilizes a simplified combination of parts which insure correct and exact alignment of dies within a press and which provides for positive and rigid attachment of the dies to their supporting structures in the press.

Generally stated, the above noted objects and features of the invention are achieved by a novel association and cooperation of elements including means for mechanically lifting companion dies and supporting them to ease their placement in and out of operative position in a power press, means for locating the dies with respect to the bed and ram head of the press, and means for releasably locking the dies in position on the press bed and ram head.

According to a preferred embodiment, mechanically movable rails are mounted for placement in and out of protruding position with respect to the die-supporting surface of the press in order to provide for ease in moving of the dies in and out of the press. Stop devices disposed on said surface determine the position of the dies being inserted in the press, and mechanically actuated latching elements arranged for engagement with the companion dies lock them to parts of the press.

The arrangement contemplated by the present invention may be employed in various types of machines. However, because the principles of the invention are particularly useful when applied to power presses for

handling dies therein, the specific embodiment herein given by way of example is illustrated and will be described in connection with such a press of the type used for punching, stamping and similar forming operations on materials inserted in the press.

In the drawings:

Figure 1 is a fragmentary elevational view, with parts in section, of a portion of a power press embodying the invention;

Figure 2 is a top plan view of the bolster plate and its associated elements, as employed in the press illustrated in Figure 1;

Figure 3 is an enlarged fragmentary sectional view of a portion of the press illustrated in Figure 1, and showing certain features of the preferred embodiment of the invention; and

Figure 4 is a cross-sectional view looking in the direction of arrows 4—4 of Figure 1.

With more particular reference to the drawings, the power press, as illustrated, includes framework having a bed **10** and upstanding posts **12** provided with tracks **14** for guiding a vertically reciprocating ram **16**. Companion lower die **17** and upper die **18** are mounted between the bed **10** and the ram head **16**, the lower die being adapted for clamping to a bolster plate **19** on said bed, and the upper die being adapted for attachment to said ram head for reciprocating movement therewith.

As illustrated in Figure 1 of the drawings, the lower die **17** is removably clamped by means of lever arms **20** which are engageable with lateral flanges **21** on the lower die and which are operated through the intermediary of rectilinearly slidable cam members **22**. As seen in Figure 1, the lever arms are mounted to swing about pivots **23** on supporting brackets **24** and are provided with rollers **25** disposed in riding engagement with the cam members **22** so that the lever arms are caused to move to and from clamping and unclamping positions in response to sliding motion of said cam members **22**. These cam members are activated in unison by means of piston rods **26** working in cylinders **27**. These cylinders are supported on extensions **24***a* of the brackets **24**, and the piston rods are connected to said cams **22** so as to impart reversible sliding motion thereto. Motion of the cams in one direction causes the lever arms to swing in a direction for clampingly engaging the flanges **21** of the lower die, due to the wedging action of said cams, thus locking the lower die on the bolster plate **19**, as is represented in full lines in Figure 1. Motion of the cams in reverse direction allows the lever arms to move in a direction to effect their disengagement from the flanges of the lower die, as is represented in broken line in Figure 1, thus freeing said lower die from said bolster plate.

Also, as seen in Figure 1, the upper die **18** is removably attached to the ram head **16** by means of slidable latching bars **28** which are adapted for engagement within mortice means **29** formed in a shank **30** projecting upwardly from said upper die and received within a bore **30***a* in the ram head **16**. These latching bars are activated in unison by operation of piston rods **31** which are connected to said latching bars through pivotal links **32**, and which are movable in cylinders **33**, said links and cylinder being supported on the ram head **16** by means of brackets **34**. Movement of the piston rods **31** in one direction operates the links **32** to impart sliding motion to the latching bars **28** in a direction to lock the upper die on the ram head, as is represented in full lines in Figure 1, whereas movement of said rods **31** in reverse direction operates said links to impart motion to the latching bars in a direction to release said upper die from the ram head, as is represented in broken lines in Figure 1. In practice, the latching bars and their associated mortice means **29**, have correspondingly shaped wedging surfaces

35 and 36 which cooperate to insure positive and snug engagement between said bars and shank. Also spring elements 37 are provided to react on the piston rods 31 and links 32 so as constantly to urge the latching bars 28 in their positive engagement with said mortice means 29.

There is provided means whereby the dies are readily removed from and placed in position between the bolster plate 19 and the ram head 15. For that purpose, the bolster plate is fitted with rails 38 which extend across the die-supporting surface of said bolster plate and which are placeable in two positions with respect to said surface. When placed in one position, the rails drop with respect to said die supporting surface so that the lower die rests directly on the bolster plate, and when placed in the other position, the rails rise with respect to said surface so that the lower die is lifted off the bolster plate and rests on the rails. In this manner, the lower die when unclamped and the upper die when unlatched and lying on said lower die, can be easily manipulated for readily sliding them in and out of their working position. To overcome sliding friction and thus assist in manipulation of the dies, the rails are conveniently provided with rolling bodies, such as balls 38*a*, on which the dies roll freely.

In the illustrated arrangement, the rails 38 are nested in open ended grooves or channels 39 formed in and facing upwardly of the above mentioned die-supporting surface of the bolster plate 19 and, as seen in Figures 2 and 4, each of said rails is longer than the width of said plate, so that opposite end portions 40 and 41 of the rails protrude beyond the open ends of said grooves or channels. The rearwardly protruding end portions 40 of the rails are pivoted in bearings 42 so that said rails move between their lowered and raised positions as shown in Figure 4. The rails are raised and lowered in unison by operation of disks or cams 43 mounted on the front side of the bed to underlie and engage the underside of the forwardly protruding end portions 41 of said rails. These disks are driven through links 44 connected to a driver 45 which is rotatably mounted on the front side of the machine bed and which is, in turn, driven through a piston rod 46 working in a cylinder 47 supported on said front side of the machine bed.

As seen in Figure 2, proper positioning of the dies in the machine is facilitated and assured by means of stops 48 affixed to the bolster plate 19 and extending upwardly from the top surface thereof. In the arrangement shown in the drawings, these stops are in the form of right-angularly related bars, one being disposed in a predetermined position adjacent the rear edge portion of the bolster plate and the other being disposed in a predetermined position adjacent one side edge portion of said plate. In this manner, the stops cooperate for accurately locating each of the dies in operative positions when manually guided on the rolling bodies of the supporting rails 38.

In order to prevent the mated dies from displacement with respect to each other when moved in or out of the press, said dies are provided with interengageable means, such as pins 49 on one die and recess 50 on the other die, said pins being disposed to register with said recess and enter the same when the dies are brought together.

When it is desired to change dies in a press equipped with the above described die-handling arrangement, the ram head 16 is brought to its lowermost position in which the upper die 18 rests on the lower die 17 and the pins 49 are in engagement within the recesses 50. The piston rods 31 of cylinders 33 are then operated to disengage the latching bars 28 from the shank 30 of the upper die, thus releasing the latter from the ram head. The press is then operated to lift the ram head to an upper position, leaving the upper die 18 on the lower die 17. Thereafter, the piston rods 26 of cylinders 27 are actuated to effect disengagement of the clamping lever arms 20 from the flanges 21 of said lower die. When the interengaged lower and upper dies are free, the piston rod 46 of cylinder 47 and the connected driver 45 and links 44 are actuated to rotate the eccentrically mounted disks 43 so as to raise the rails 38 thereby lifting and supporting said dies off the bolster plate 19. The supported dies resting on the rolling bodies 38*a*, are then readily rolled out of the press and onto a suitable truck or storage rack.

The insertion of dies in the press is also readily and easily accomplished by reversing the above described procedure. Thus, when the rails are in their raised position, the interengaged mated dies are slid on the rails 38 and manually guided on the rolling bodies 38*a* thereof, the mentioned stops 48 serving as positive means to locate the dies in their operative position within the press. When the dies are so located, the piston rod 46 of cylinder 47 is actuated to lower the rails and deposit the dies on the bolster plate. The piston rods 26 of cylinders 27 are then actuated to bring the lever arms 20 in clamping engagement with the flanges 21 of the lower die 17. Thereafter, the ram head is lowered in contact with the upper die, and the piston rods 31 of cylinders 33 are activated to move the latching bars 28 in engagement with the shank 30 of the upper die 18, thus putting the press in condition for operation.

The various piston rods in the several cylinders can be actuated by any suitable known means. In practice, it has been found expedient to actuate these rods by connecting the cylinders to conventional air-compressing means having valves for controlling the flow of compressed air so as to obtain the above recited sequence of operations.

In the preferred embodiment, and as illustrated in Figure 3, the shank 30 is mounted to move freely with respect to the associated upper die 18. For that purpose, the shank passes loosely through a transverse aperture 52 in said upper die, and the lower portion of said shank terminates with an annular flange 53 which fits loosely in an enlargement 54 of said aperture so that said flange lies below a shoulder 55. A captivating plate 56 affixed, as by means of machine screws 57, to the underside of the lower die and seated within a recess 58 therein, serves to close the aperture 52 and the enlargement 54 thereof, to prevent the shank from sliding out of engagement with said die. The hereinbefore mentioned mortice means 29 on the shank 30 is in the forme of an annular groove shaped to provide the wedging surface 36 adapted to cooperate with wedging surface 35 of the sliding bars 28. Because of the above described arrangement, it will be understood that the loosely mounted shank 30 allows for tolerance variations in the alignment of said shank with the bore 30*a*, and that this looseness of the shank is effectively taken up by the wedging action resulting from forced engagement between the wedging surfaces 35 and 36. This wedging action, as represented by the broken lines in Figure 3, results in tightly drawing the flange 53 of the shank 30 against the shoulder 55 so as to effect a rigid connection between the lower die 18 and the ram head 16.

While the arrangement shown and described is presently considered the preferred embodiment, it will be apparent to persons skilled in the art that various changes and modifications in structure and assembly details can be made without departing from the gist of the invention. It is, therefore, contemplated in the subjoined claims to cover those changes and modifications which come within the spirit and scope of the invention as set forth in said claims.

What is claimed is:

1. Apparatus for handling dies in placing them and in removing them from a power press having structure including a bolster plate providing a die-supporting surface, rails carried by said bolster plate for movement to a position for lifting the dies off said surface and for movement to a position for lowering said dies onto

said surface, and cam means for effecting movement of said rails to either of said positions.

2. Apparatus as set forth in claim 1, in which the mentioned bolster plate is provided with channels opening upwardly from the mentioned surface, and in which the mentioned rails are pivotally mounted to move inwardly and outwardly of said channels.

3. A power press comprising a bolster plate providing a die supporting surface, a reciprocating ram head mounted above and for movement toward and away from said plate, superposed lower and upper dies placeable in and removable from operative position between said plate and ram head, means for detachably anchoring the lower die to said plate and over said surface, means for detachably affixing the upper die to said ram head to move therewith, and means for engaging said superposed dies when detached and for lifting and supporting them off said surface to provide for their placement in and removal from said position, said last named means including die-engaging members and mechanism for moving said members with respect to said bolster plate from a position below to a position above said surface.

4. A power press as set forth in claim 3, in which the mentioned bolster plate is provided with stops for locating the mentioned dies in their operative position between said plate and the mentioned ram head.

5. A power press comprising a bolster plate providing a die-supporting surface, a reciprocating ram head mounted above and for movement toward and away from said plate, superposed lower and upper dies placeable in and removable from operative position between said plate and ram head, means for detachably anchoring the lower die to said plate and over said surface, means for detachably affixing the upper die to said ram head, and rail members mounted on said bolster plate to underlie said superposed dies, said rail members being movable with respect to said plate to engage said dies when detached and to lift and support them off said surface to provide for their placement in and removal from said position, said members also being movable to lower and deposit said dies on said surface.

6. A power press as set forth in claim 5, in which the mentioned rail members are provided with rolling bodies on which the mentioned dies rest when lifted by said rails.

7. A power press as set forth in claim 5, in which stop members are carried by the mentioned bolster plate to engage the mentioned dies to locate them in their mentioned position.

8. A power press as set forth in claim 5, in which the mentioned means for detachably anchoring the mentioned lower die to the mentioned plate comprises lever arms and cam members, said lever arms being pivotally supported on said plate and disposed for clamping engagement with the lower die, and said cam members being slidably mounted in said bolster plate and disposed for engagement with said arms to move the same in clamping engagement with said lower die.

9. A power press as set forth in claim 5, in which the mentioned upper die includes a shouldered recess and a floating shank received in said recess and provided with a flange and with mortice means, and in which the mentioned means for detachably affixing said upper die to the mentioned ram head comprises latch members, said latch members and said mortice means having interengageable surfaces to draw said flange of said shank against the shoulder of said recess to tighten said floating shank and to effect a rigid connection between said upper die and the mentioned ram head.

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