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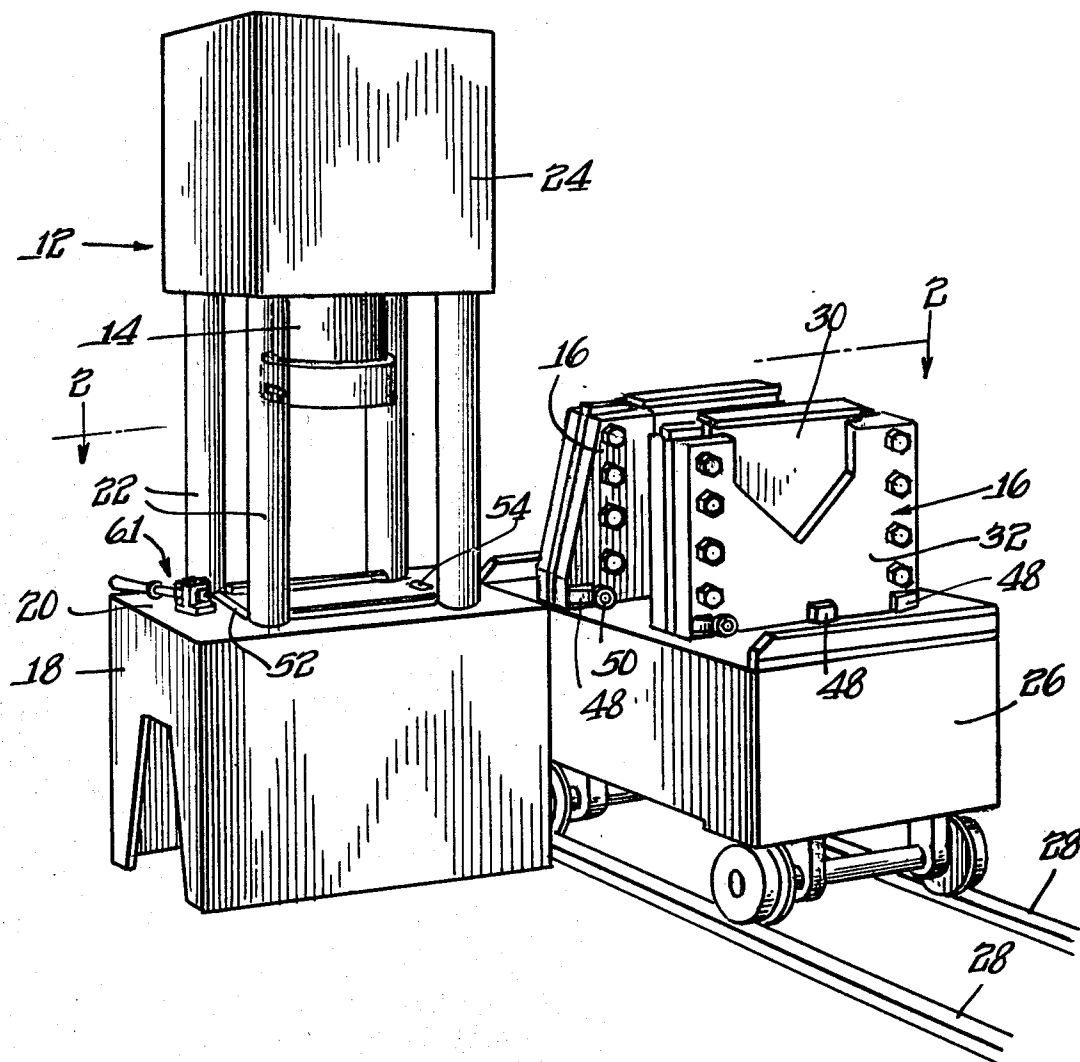
- [54] **INTERCHANGEABLE DIE UNITS FOR
HYDRAULIC PRESSES**
11 Claims, 6 Drawing Figs.

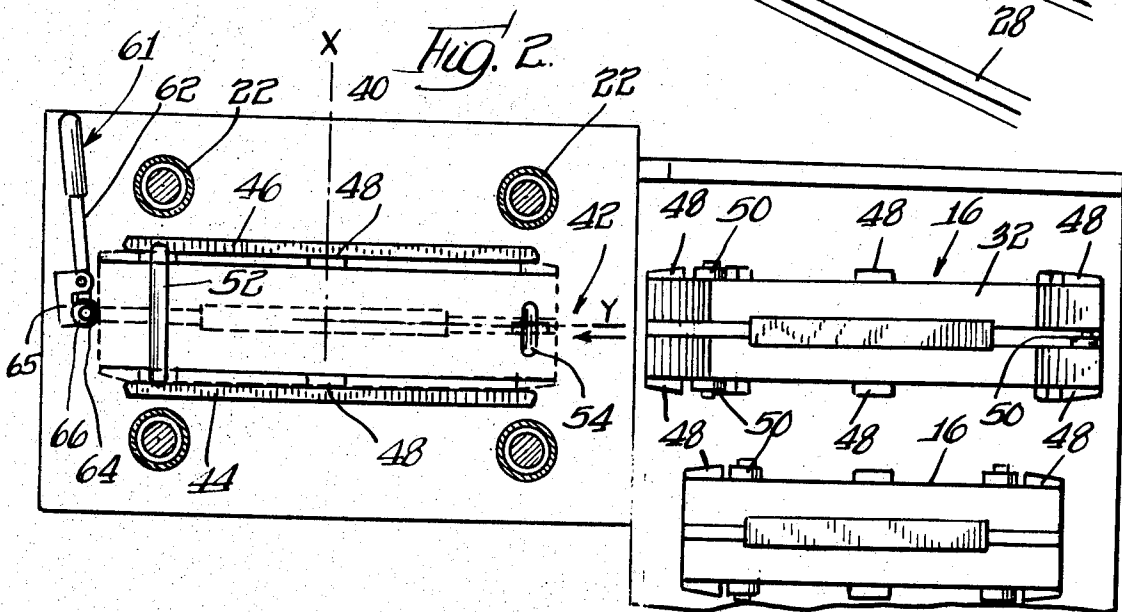
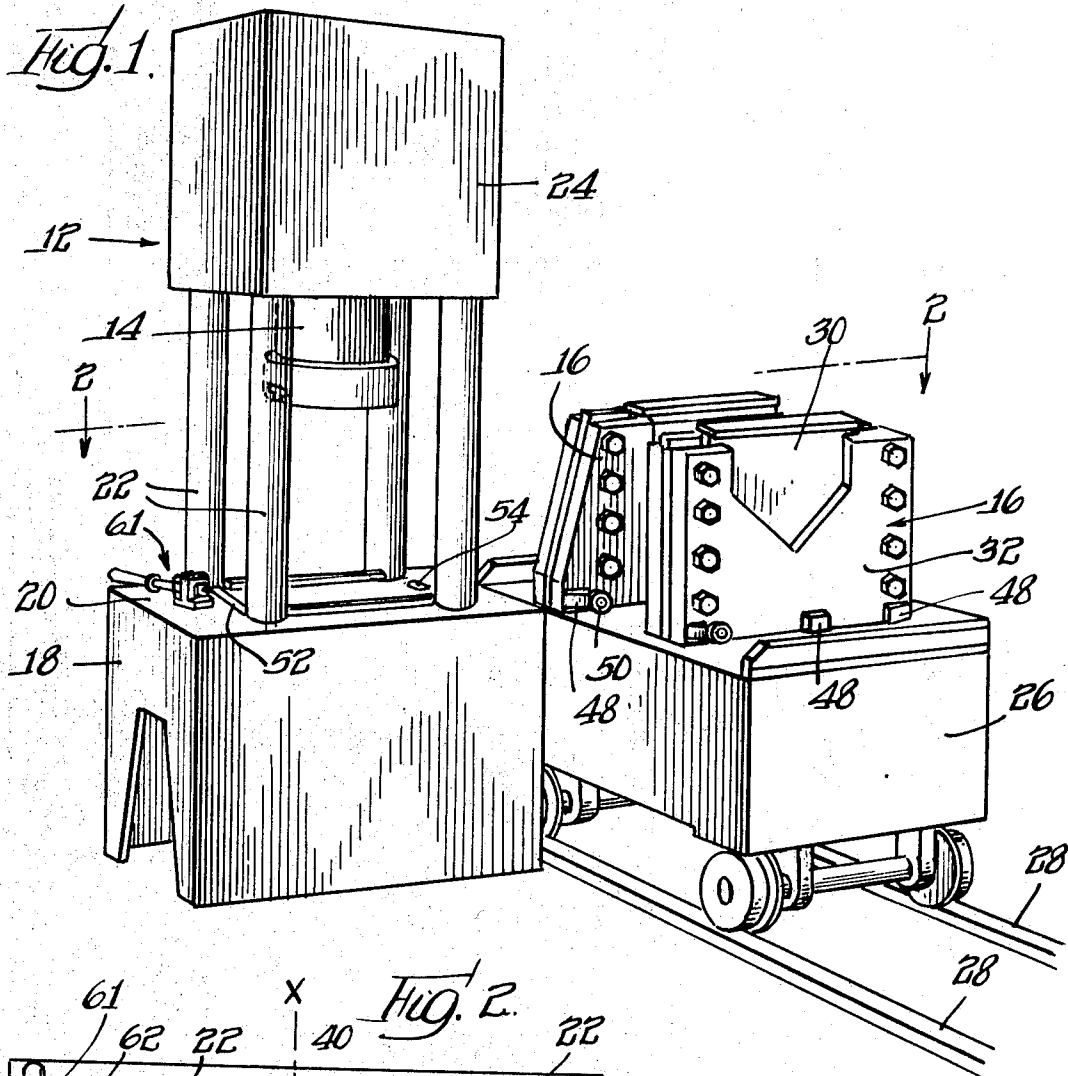
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- [50] **Field of Search**..... 83/698,
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- [56] **References Cited**
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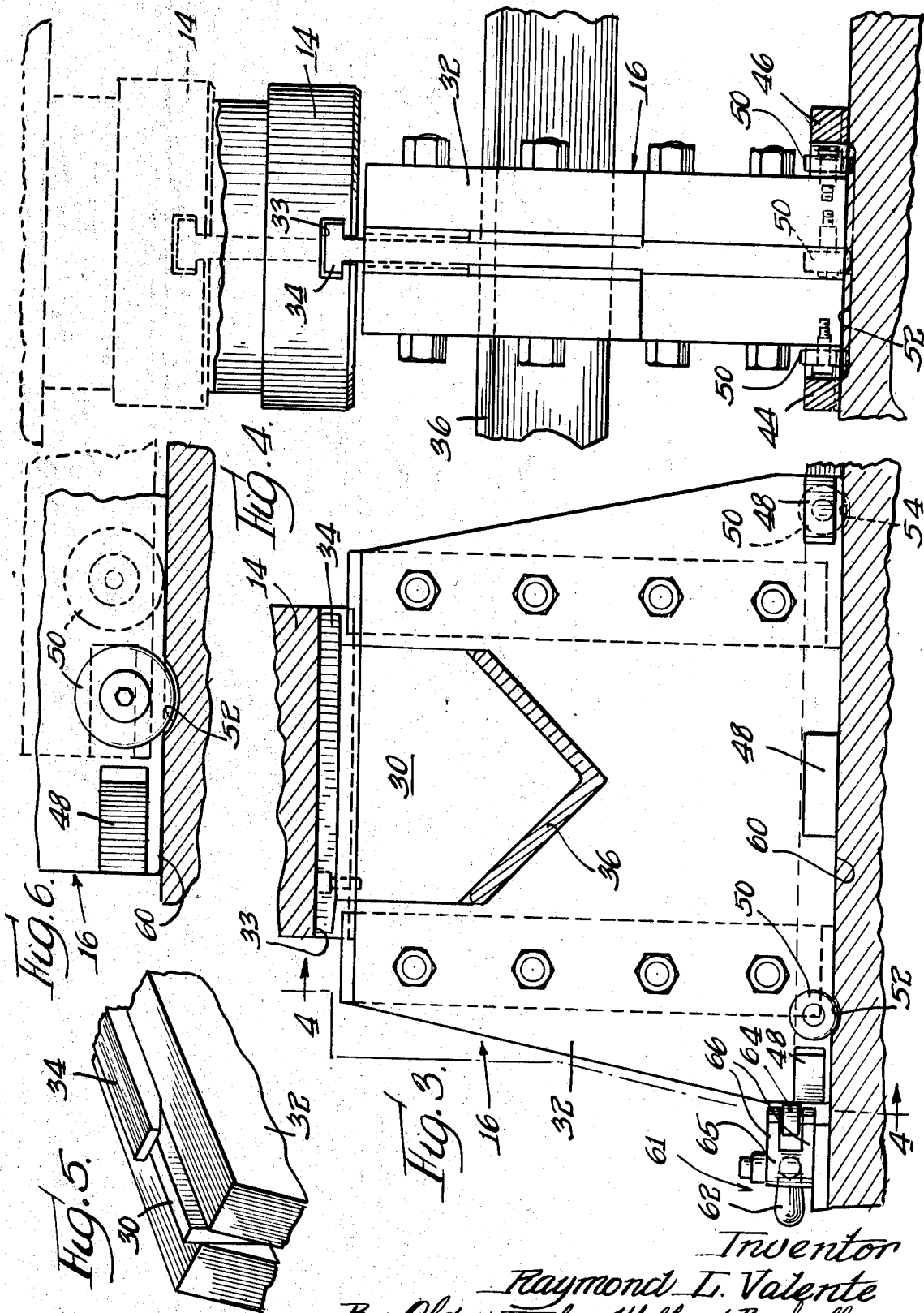
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ABSTRACT: Apparatus of the type which includes a frame having a base portion with a support surface, a ram reciprocally mounted to said frame for movement toward and away from said support surface of the base portion, and a die unit removably positioned on said supporting surface. The die unit is comprised of an anvil arrangement and a blade element slidably and telescopically associated with said anvil arrangement to cooperate therewith for the processing of a work-piece. The die unit is constructed so that the blade element may be releasably connected to said ram whereby interchangeability thereof is attained. In addition, there are provided means to facilitate the proper positioning of said die unit with respect to said ram. Said alignment means include protruding means provided on the underside of said anvil arrangement adapted to cooperate with correspondingly shaped recess means formed in the support surface of said base portion. The recess means are designed to receive said protruding means and thereby properly to position said die unit with respect to said ram along a first axis of alignment. Said alignment means further include additional means to attain proper positioning along a second axis of alignment.





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INTERCHANGEABLE DIE UNITS FOR HYDRAULIC PRESSES

BACKGROUND OF THE INVENTION

The present invention relates to hydraulically operated shearing presses or devices. More specifically, said invention is concerned with the provision of a novel arrangement whereby removable die units may be easily interchanged and accurately positioned with respect to the work surface and the vertically moving ram of said devices.

Hydraulically operated shearing devices of the type to which the present invention relates generally include a frame having a reciprocating ram and removable die units. These presses are employed by metal fabricators for a wide variety of uses. For example, these devices may be used to shear angle or channel irons; flat, round or tubular stock; or for that matter stock material of any size or cross-sectional configuration. In addition, these presses are also adapted to facilitate in various forming operations in that they may be employed to notch, cope, bend, or punch metal sheet stock which eventually may be formed into any desired configuration. Due to the numerous operations which these devices must perform, and the different sizes of stock material that must be accommodated, it is necessary to provide a series or plurality of die units. Generally, these die units are of considerable size, and include an anvil member having a blade element slidably and telescopically associated therewith. The die units are removably associated with the basic press structure, viz., a frame having a work surface and a vertically movable ram, the blade element being adapted to be releasably connected to the ram so that the individual units may be interchanged when needed.

Where long runs, employing but one shearing operation and one size of stock material, are encountered there is no need to change die units, however, this is not the general case in most metal centers. On the contrary, in most metal centers these presses are employed for relatively short runs, with each said run normally requiring a different operation to be performed on stock of varying size. Thus, throughout the day it becomes necessary for the operator to make numerous die changes.

It should be noted that larger shearing presses of this type are often capable of providing a shearing force of approximately 200 tons, with smaller presses operating at capacities upwardly of twenty tons. Accordingly, the die units for the larger presses are of rather a massive construction, and not easily handled by an individual operator, which often leads to difficulty in properly positioning the unit with respect to the ram after said unit is seated on the work surface of the frame. To overcome these problems it is one practice in the art to provide carriages or dollies for transporting said units about the shop, said carriages having a series of rollers upon which the die units rest to facilitate removal of the die units therefrom. However, once the die unit is removed from the carriage and positioned on the supporting surface of the frame there is nothing to facilitate movement of said die unit to the proper position.

Shearing presses of the massive construction alluded to previously and also smaller presses of the type having die units capable of being handled by the individual operator have one problem in common, that is, proper alignment of the die unit with respect to the vertically movable ram in the horizontal plane of the support surface. It can be appreciated that this problem is magnified or increased as the size of the die unit increases.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides alignment means for use with apparatus of the type discussed, whereby the problems alluded to above are obviated. More particularly, the above noted problems are solved and additional advantages realized by the provision of a removable die unit for shearing apparatus of the type having a frame with a horizontal work surface upon which an anvil member of a die unit rests and a reciprocating ram member to which a blade ele-

ment of said die unit is releasably fixed, said removable die unit and work surface having novel cooperating means which permits the die unit to be properly positioned with respect to said ram along a pair of axes which are disposed transverse to each other and in the plane of said horizontal work surface. The said cooperating means on the die unit facilitating movement thereof to and from the operating position

In addition to those mentioned above, various other advantages, objects and desirable features of the present invention will be apparent to one skilled in the art as the detailed description of the embodiment illustrated in the accompanying drawings is evolved hereinafter.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a perspective view showing shearing apparatus incorporating features of the present invention.

FIG. 2 is a plan view taken along the line 2-2 of FIG. 1, in the direction indicated, and illustrating in phantom a die unit positioned on the horizontal work surface of the shearing press.

FIG. 3 is a fragmentary sectional view illustrating a die unit in position on the horizontal work surface of the shearing device.

FIG. 4 is a fragmentary sectional view taken along the line 4-4 of FIG. 3, in the direction indicated, and illustrating in phantom the ram in an elevated position.

FIG. 5 is a fragmentary perspective view of the upper end portion of the die unit of the present invention, and illustrating the means employed to interconnect the blade.

FIG. 6 is a fragmentary sectional view illustrating the forward end of a die unit in the operating position with the lower edge thereof resting firmly on the work surface of the frame, the position of said die unit immediately prior to disposition thereof in the operating position being illustrated in phantom.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now more specifically to the drawings, wherein like parts are designated by the same numerals throughout the various FIGS. a shearing press incorporating features of the present invention is shown in FIG. 1 and designated 10. Said device 10 is comprised generally of a frame 12, a vertically reciprocating ram 14 and a removable die unit 16, a plurality of said die units 16 being illustrated in the disassembled position on a carriage 26. The frame 12 includes a base portion 18 having an upper horizontal supporting or work surface 20 upon which a die unit 16 will rest when placed in operable association with the press. Spaced above the base portion 18 by standards 22 and housing the ram 14 is the head portion 24. It should be noted that in practice the shearing press 10 would be associated with a hydraulic power unit connected to the head portion 24 by means of flexible tubing or the like, whereby fluid under pressure may be supplied to the ram 14.

As is illustrated in phantom in FIG. 2, the individual die units 16 are adapted to be removably positioned on the support surface 20. To facilitate transporting of the die units 16 from a storage area to the press 10, it has become the practice in the art to employ a carriage or dolly 26, this being necessitated by the great weight of said units. These dollies or carriages 26 may or may not ride on rails 28, as seen in FIG. 1.

Each individual die unit 16 includes a first die or blade member 30 and a cooperable anvil member 32 which slidably receives said blade element 30. The blade element 30 and anvil means 32 are assembled and interconnected with each other so that they may be handled as a unit with the blade element 30 designed to be releasably attached or affixed to the ram 14, as shown in FIG. 4. In this regard, ram 14 includes an elongate channel 33 designed to receive the T-shaped upper portion 34 of blade element 30. As can be seen in FIG. 5, the ends of said T-shaped portion 34 are tapered to facilitate engagement. Accordingly, it can be appreciated that it is necessary to properly position or center the die units 16 with respect to the ram, in order to effect assembly of said portion

34 in slot 33 and to achieve proper shearing of the stock material 36.

With reference to FIG. 2, the positioning or centering of the die units 16 with respect to ram 14 will be discussed in relation to its position on the upper planar supporting surface 20 of base portion 18. Thus, for purposes of description, by illustrating the X and Y coordinates of planar surface 20, which are designated 40 and 42, respectively, the position of the die unit 16 can be discussed with relation thereto.

Turning first to the means provided for proper positioning of the die unit 16 with respect to the Y-axis or coordinate 42, attention is invited to FIGS. 2 and 4. In this regard, the planar supporting surface 20 includes a pair of spaced parallel guide members 44 and 46 between which the die unit 16 is received. To facilitate and assure proper positioning between said guides 44 and 46, the die unit 16 is provided with a plurality of accurately sized and machined guide blocks 48 along the elongate parallel sides thereof. To facilitate disposition of said guide units between the respective guide tracks, the guide blocks at the opposite ends of said unit 16 may be tapered, as seen in FIG. 2. Accordingly, with this arrangement upon initial positioning of die unit 16 between the guides 44 and 46 the T-shaped portion 34 on blade 30 will align with the correspondingly shaped slot 33 in ram 14, said T-shaped portion being received therein upon movement of die unit 16 to the operating position.

The means for properly positioning the die unit 16 with respect to the X-axis or coordinate 40, comprises an essential feature of the present invention, and is best viewed with reference to FIGS. 3, 4 and 6. The die unit 16 is provided with protruding means along the lower surface thereof, preferably in the form of bearing means defined by a plurality of rollers 50. The bearing means or rollers 50 in addition to facilitating alignment, as discussed hereinafter, also facilitate movement of the die unit off of the carriage 26, and across the planar support surface 20.

With regard to the alignment function provided by protruding means in the form of rollers 50, the planar support surface 20 includes channel means in the form of spaced parallel channels 52 and 54. The spacing of said channels corresponds to the distance between the rollers or bearing means 50 at the opposite ends of said die unit 16. The channels 52 and 54 are constructed such that the depth thereof is slightly greater than the distance the rollers 50 protrude below the lower surface of die member 16. Accordingly, when said rollers 50 are received in the channels 52 and 54, as illustrated in FIG. 6, the lower surface 60 of said die unit 16 will rest firmly on the upper supporting surface 20, that is to say the rollers 50 preferably do not bottom in their respective channels.

From the preceding, it can be seen that by properly selecting the spacing between the respective channels, and correspondingly by controlling and maintaining a like spacing between the bearing means 50 on each die unit, the individual unit 16 will be properly positioned with respect to the X-axis 40 upon disposition of said bearing means in said channels. In addition to properly aligning the die unit 16, the disposition of rollers 50 in channels 52 and 54 also aids in maintaining said unit in the proper position, once same has been attained. Clamps, or the like, may be provided to further insure or fix said positioning.

Directing attention now to FIG. 2, in the specific, illustrated embodiment of the present invention, it should be noted that the leading end of the die unit 16 is provided with a pair of rollers 50 positioned approximate adjacent corners of said unit, and the channel means 52 is a relatively long elongate channel of sufficient length to receive both said rollers. On the other hand, the bearing means for the opposite end of said die unit is but a single roller 50 disposed between adjacent corners thereof, and received in the relatively short channel 54. Thus, with the illustrated arrangement which is of the type employing relatively large or massive die units, there is no danger of the leading rollers 50 being prematurely disposed in one of said channel means prior to final or proper positioning of the

die unit; said leading rollers 50 spanning the channel 54 upon initial disposition of said unit between the guides 44 and 46.

Where the particular shearing press 10 is of a type that does not employ die units of massive construction, as does the illustrated press 10, whereby said units may be easily handled by the operator, the present invention still may be employed to insure and facilitate proper positioning of the die unit relative to the ram. In this regard, the protruding means may take other forms than rollers 50. For example, ridges or knobs may be used, these being sized for reception in correspondingly shaped recesses or slots which serve the same function as the illustrated channels 52 and 54. In this regard, while said ridges or knobs will not be as efficient in reducing sliding friction as the rollers 50, their smoothness will facilitate sliding movement of the die unit relative to the upper support surface 20 to some degree.

Directing attention now to FIGS. 2 and 3, in order to remove the die unit 16 from the operating position, i.e., with rollers 50 received in channels 52 and 54, there is provided a cam lever arrangement 61. Said arrangement 61 includes a handle 62 and a roller 64 journaled between the bifurcated sections 66 of a pivotally mounted bracket portion 65. Accordingly, when it is desired to remove the die unit 16, the operator need merely grasp the handle 62 and pivot same to bring roller 64 into engagement with the die unit 16. Upon continued movement, the arrangement 61 will operate as a fulcrum-type lever to bias the die unit 16 in the direction indicated by arrow 80, thus moving the rollers 50 out of channels 52 and 54 so that said die unit may be easily removed from between guides 44 and 46 and returned to carriage 26.

While one embodiment of the present invention has been shown and described herein, and various modifications and changes thereto briefly discussed, it is intended that said changes and modifications as well as others which may occur to one skilled in the art be included within the spirit and scope of the present invention as defined by the claims appended hereto.

I claim:

1. In apparatus of the type described comprising: a frame including a base portion having a support surface; a ram reciprocally mounted to said frame for movement toward and away from said support surface of the base portion; and a die unit removably positioned on said supporting surface, said die unit including an anvil arrangement, and a blade element slidably and telescopically associated with said anvil arrangement to cooperate therewith for the processing of a workpiece, said blade element being releasably connected to said ram; the improvement comprising alignment means to facilitate the proper positioning of said die unit with respect to said ram, said alignment means including protuberance means provided on the underside of said anvil arrangement and comprising a pair of protuberances positioned approximate adjacent corners on one end of the anvil arrangement, and a third protuberance carried by the opposite end of the anvil arrangement and positioned intermediate the adjacent corners thereof, and correspondingly shaped and positioned recess means formed in the support surface of said base portion and designed to receive said protuberance means and thereby properly to position said die unit with respect to said ram along a first axis of alignment.

2. Apparatus as defined in claim 1 wherein said alignment means further include means on the support surface defining a track sized to closely receive and position said die unit with respect to said ram along a second axis of alignment.

3. Apparatus as defined in claim 1 wherein said recess means is of a depth such that when said protuberance means are received therein the underside of said die unit will rest firmly on said support surface of the base portion.

4. Apparatus as defined in claim 1 wherein said protuberance means include bearing members to facilitate movement of said die unit to and from the operable position on said base portion.

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5. Apparatus as defined in claim 1 wherein said pair and said third protuberances are defined by rollers journaled to the underside of said anvil.

6. Apparatus as defined in claim 5 wherein said recess means include a first elongate channel sized to receive said pair of rollers, and a second, substantially shorter channel sized to receive said third roller.

7. Apparatus as defined in claim 1, further including cam lever means to facilitate removal of said die unit.

8. A removable die unit for use in apparatus of the type described, said apparatus including a frame having a base portion and a support surface, and a ram reciprocally mounted to said frame for movement toward and away from said support surface; said removable die unit adapted to be positioned in operative association with said apparatus and comprising: an anvil arrangement mountable on said base portion; a blade element slidably and telescopically associated with said anvil arrangement and adapted to be releasably connected to said ram, whereby when said die unit is operably associated with said apparatus said blade element and anvil arrangement are adapted for the processing of a workpiece; and bearing means on said die unit adapted to facilitate proper positioning of said unit with respect to the ram, the bearing means comprising a pair of protuberances positioned approximate adjacent cor-

ners on one end of the anvil arrangement and a third protuberance carried by the opposite end of the anvil arrangement intermediate the adjacent corners thereof, said bearing means protruding beyond the underside of said anvil arrangement and being adapted for reception in correspondingly shaped and located recess means formed in said base portion supporting surface to position properly said die unit with respect to said ram along a first axis of alignment.

9. A die unit as defined in claim 8 wherein said protuberances are defined by rollers journaled to said anvil arrangement.

10. A die unit as defined in claim 8 wherein said protuberances extend beyond the underside of said die unit for a distance less than the depth of the recess means in said support surface such that when said protuberances are disposed therein the underside of said die unit will rest firmly upon the support surface of said apparatus.

11. A die unit as defined in claim 8 further including guide blocks along longitudinal edges thereof adapted to cooperate with a track provided on the support surface of said base portion to align said unit with respect to said ram along a second axis of alignment.

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