United States Patent

[11] 3,593,610

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[21] Appl. No. **851,983**
[22] Filed **Aug. 21, 1969**
[45] Patented **July 20, 1971**

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[54] **METAL FABRICATING APPARATUS**
14 Claims, 6 Drawing Figs.

[52] **U.S. Cl.** **83/580,** 83/635, 83/698
[51] **Int. Cl.** **B23d 35/00**
[50] **Field of Search** 83/563, 580, 635, 698, 699, 700

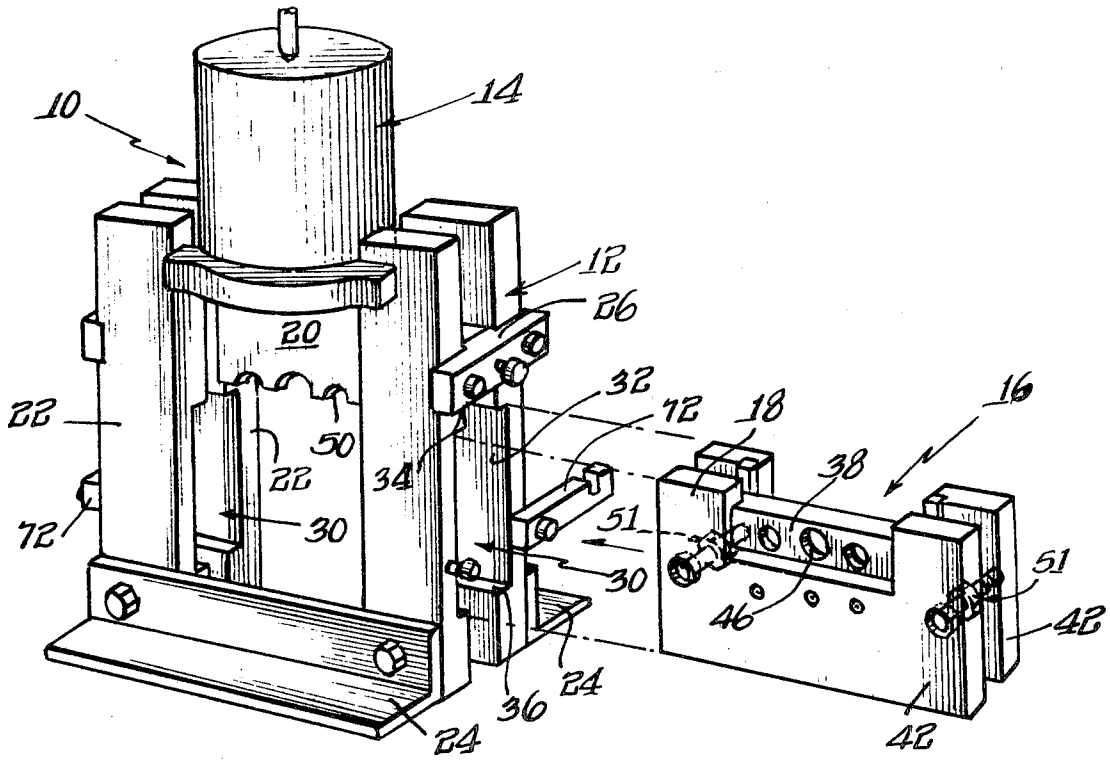
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ABSTRACT: Metal fabricating apparatus of the type which include a frame, a die unit supported on said frame, and a ram assembly mounted atop said frame. The die unit is comprised of an anvil arrangement having a stationary die blade, and a shear blade member carried by said anvil assembly and adapted for connection to a reciprocal member of the ram assembly. The frame has opposed wall portions which cooperate to define a space for reception of the die unit. In addition, the die unit includes opposed relatively movable elements, such that after initial reception of the die unit within said space, separating movement may be utilized to force said elements in firm engagement with the frame wall portions.



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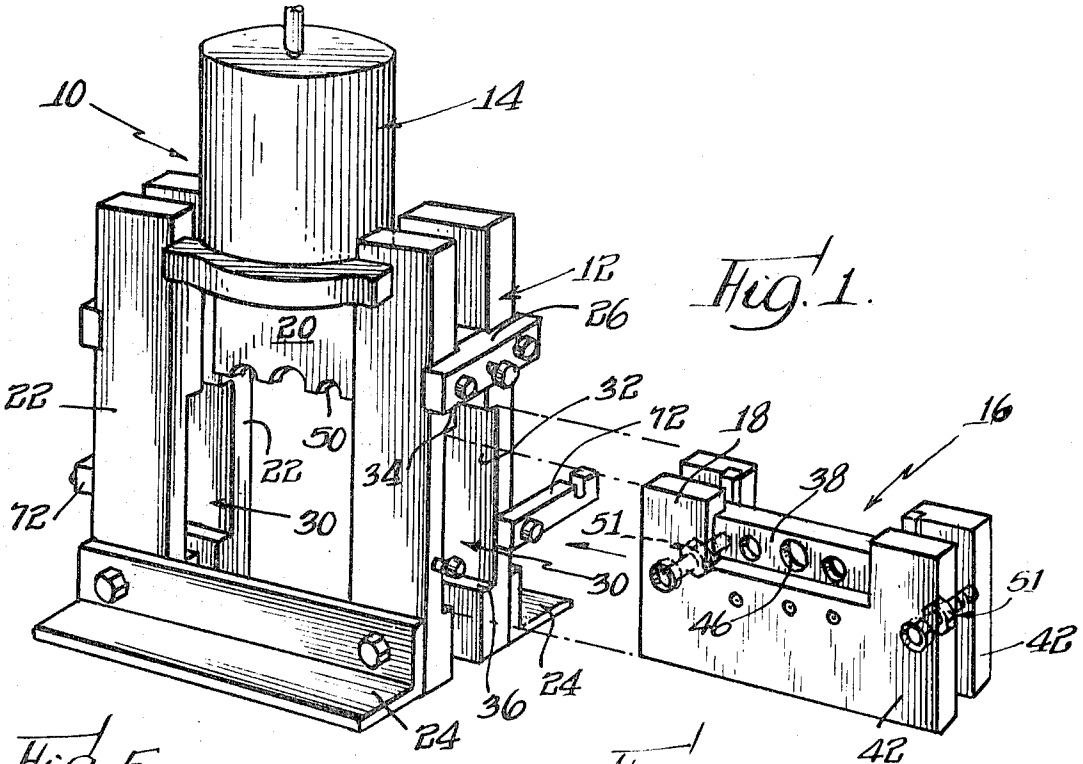


Fig. 1.

Fig. 5.

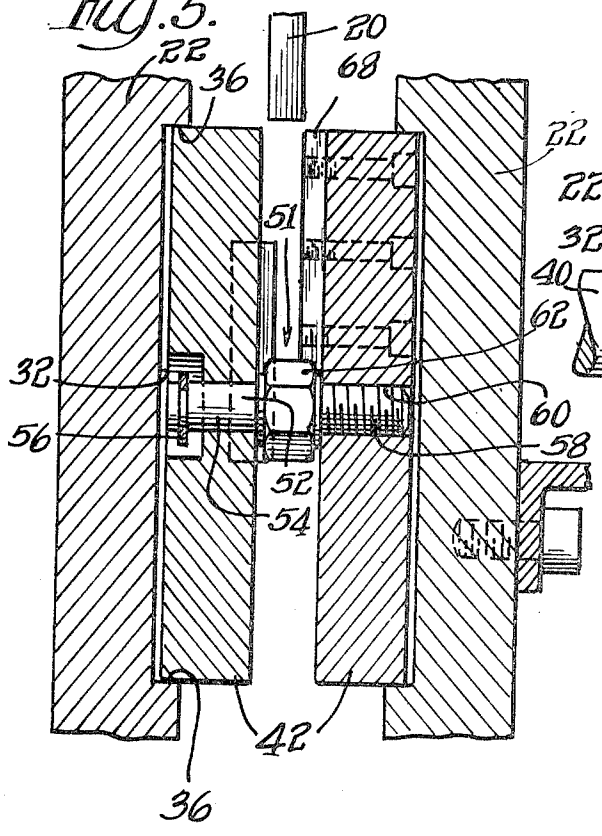
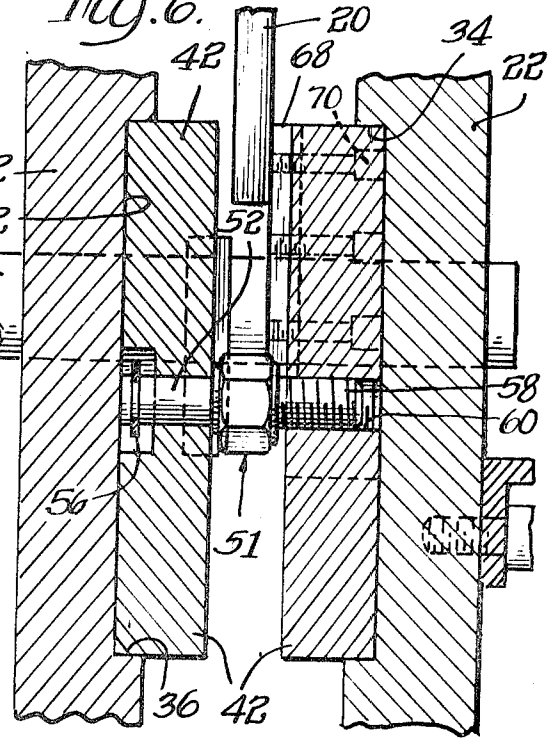


Fig. 6.



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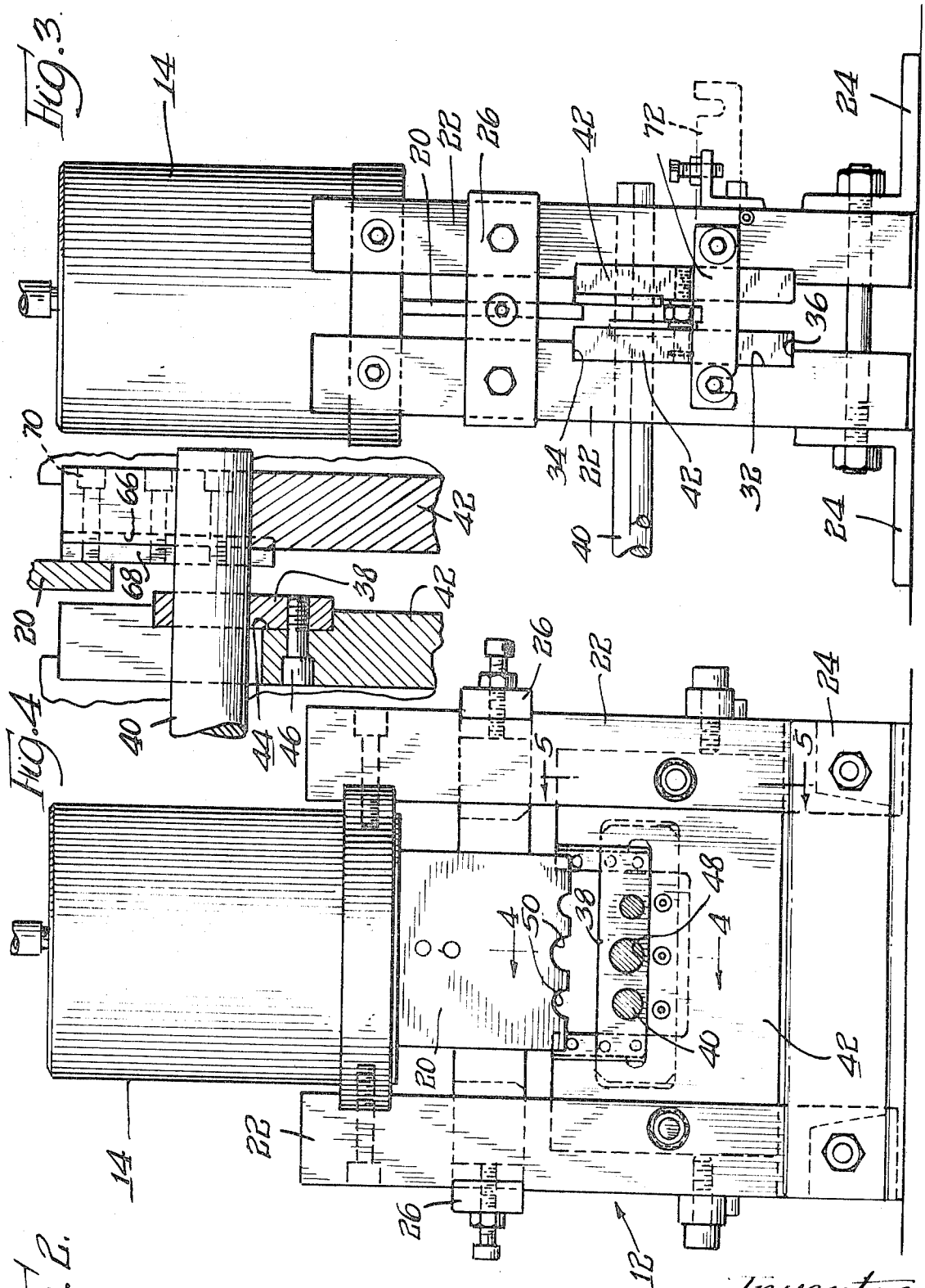


Fig. 3.

Fig. 4

Fig. 2.

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METAL FABRICATING APPARATUS

BACKGROUND OF INVENTION

The present invention relates to metal fabricating devices such as shearing presses, or the like. More specifically, this invention is concerned with the provision of a novel arrangement whereby removable die units for these devices may be easily interchanged and quickly mounted in fixed position with respect to the supporting frame and the vertically moving ram of the device.

Metal fabricating devices of the general type mentioned above normally are hydraulically operated and comprise, an upright frame; a ram arrangement mounted thereon and having a reciprocal ram member; and a die assembly having an anvil arrangement supported by the frame and a shear blade affixed to said ram member. Devices of this general type are employed by metal fabricators for a wide variety of uses. For example, these devices may be employed to shear, angle or channel irons; flat, round or tubular shock; or for that matter stock material of any size or cross-sectional configuration. In addition to the shearing of stock material, these devices are also adapted to facilitate in various forming operations that are performed in a metal working shop, such as notching, coping, bending or punching of metal sheet stock.

Accordingly, due to the numerous operations which these devices must perform, and the different sizes of stock material that must be accommodated, the fabricator must have on hand a wide selection of die units, each designed to accommodate a particular job. These die units are interchangeable and removable with respect to the frame. The anvil arrangement includes a stationary die blade element which includes an edge for cooperating with the corresponding edge of the relatively movable shear blade to perform the shearing operation.

In practice, these devices are employed for relatively short fabricating runs, with each said run requiring a different die unit. Thus, throughout the day it becomes necessary for the metal fabricator to make numerous die changes, and it is desirable to provide an overall construction which permits these changes to be effected rapidly, while assuring positive fixed positional relationships between the die unit and the frame.

SUMMARY OF THE INVENTION

Accordingly, the present invention provides metal fabricating apparatus of the type mentioned above, wherein a die unit may be quickly removed, and another properly positioned, the interchanging operation being performed with rapidity and assurance of the fixed positioning of the die unit. More particularly, the above noted advantages are realized by the provision of a metal fabricating apparatus comprising: a frame including a base portion for supporting a die unit, and an upper support portion spaced above said base portion for operably receiving a ram assembly; a ram assembly mounted to said upper portion of the frame and including a reciprocal ram member; and a die unit including, an anvil arrangement having a stationary die blade, and a shear blade member adapted for releasable connection to said reciprocal ram member; said frame defining opposed wall portions which cooperate to provide a space for reception of the anvil arrangement; said anvil arrangement including a pair of opposed elements, and means for effecting relative movement of said elements toward and away from each other, such that upon initial reception of said anvil arrangement within said space, relative separating movement may be employed to cause said elements to engage firmly said wall portions and thereby fix the position of said anvil arrangement relative to said frame.

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

DESCRIPTION OF THE DRAWINGS:

FIG. 1 is a perspective view illustrating shearing apparatus incorporating features of the present invention; the anvil arrangement of a removable die unit being illustrated in its unmounted position.

FIG. 2 is a front elevational view of the apparatus of FIG. 1 with the die unit operably positioned; said unit being designed for the shearing of tubular or bar stock material of circular configuration.

FIG. 3 is a side elevational view of the apparatus of FIG. 2.

FIG. 4 is a fragmentary sectional view taken along the line 4–4 of FIG. 2.

FIG. 5 is a fragmentary sectional view taken along the line 5–5 of FIG. 2, in the direction direction indicated, and illustrating the disposition of the apparatus elements prior to the final positioning of the die unit.

FIG. 6 is a partial fragmentary view corresponding to FIG. 5, but illustrating the relationship between the die unit and the frame upon final mounting of said unit thereto.

DESCRIPTION OF THE ILLUSTRATED EMBODIMENT

Referring now more specifically to the drawings, wherein like parts are designated by the same numerals throughout the various figures, a shearing press incorporating features of the present invention is illustrated in FIG. 1 and designated generally 10. The press or device 10 is comprised of a frame assembly 12, a ram 14 mounted atop said frame 12, and a removable die unit arrangement 16. The die unit 16 includes an anvil arrangement 18 adapted to be supported by said frame and illustrated in the removed position, and a shear blade 20 connected to a reciprocal member of ram 14. It should be noted that in practice the shearing press or device 10 is operably connected with a hydraulic power unit, which supplies actuating fluid under pressure to the ram 14 by means of suitable tubing or the like.

As can be seen in FIGS. 1—3, the frame 12 of the illustrated embodiment includes two pair of upright standards 22. Said standards are affixed to mounting brackets 24, the resulting opposed assemblies being joined by means of the T-shaped members 26. The means for receiving and mounting the anvil arrangement 18 of the die unit is provided by the relieved or milled portions 28 formed in opposing surfaces of each said standard 20. As illustrated, these relieved portions 28 on opposed standards cooperate to define channellike passages designated 30, sized to receive the die unit 18.

Each channellike passage 30 includes a pair of opposed planar wall portions 32, and upper and lower edge portions 34 and 36, respectively. The latter has the anvil arrangement 18 engaged thereon in supported relationship.

The hydraulically operated ram arrangement 14 is supported by the upper portion of the frame 12 in superposed relationship to anvil arrangement 18 of the die unit. The internal piston assembly of the ram arrangement 14, may be of various known types, and will normally include a hydraulically actuated reciprocal ram member adapted for releasable connection to the shear blade 20 of the die unit, as will be discussed more completely hereinafter.

As alluded to previously, die unit 16 comprises an anvil arrangement 18, and a shear blade 20, which prior to final assembly is slidably carried by said anvil arrangement. Shearing or severing operations of the general type for which the present invention relates, employ, in addition to the shear blade 20 which is movable, a stationary die blade. The die blade is designated 38, and in the illustrated embodiment is in the form of an apertured platelike element carried by the anvil arrangement 18.

Considering briefly then the general operation of the apparatus illustrated in FIGS. 1—3, the die unit 16 is received within the channellike passages 30 by the opposed planar walls 32 of the standards 22, and its position relative to said frame is then fixed. Next, the shear blade 20 is attached to the reciprocating member of ram 14 in proper alignment with the anvil arrangement 18, which carries the stationary die blade

38 for cooperation with said shear blade 20. Stock material 40 is now positioned in supported engagement with the anvil arrangement 18, and the ram-operated to effect reciprocation movement of the shear blade 20 which is effective to sever the stock material.

As was discussed briefly hereinbefore, it is desirable to provide for rapid interchange of the die unit 16, while assuring that the relative position of the anvil arrangement 18 is fixed and will remain unchanged during the operation of the press 10. With this in mind, attention is now invited to FIGS. 4—6, wherein the novel die unit of the present invention is disclosed in detail.

The anvil arrangement 18 for die unit 16 includes a pair of spaced-apart, interconnected elements 42, as shown in FIGS. 1 and 4—6. The space defined between the respective elements 42 accommodates the vertically movable shear blade 20. From FIG. 1 it can be seen that the respective elements 42 are platelike and of a somewhat U-shaped configuration. In this regard, the respective base portions of the "U" provide for reception and support of the stock material 40 during fabrication.

In order to accommodate the stationary die blade member 38, one of the elements 42 is provided with a relieved portion 44 proximate its base, within which said member 38 is mounted, as shown in FIG. 4. Member 38 is disposed within the recessed portion 44 prior to assembly of the elements 42 of the anvil arrangement, and retained therein by means of a plurality of cap screws 46 or the like.

In the illustrated embodiment, which is designed for shearing tubular or bar stock material of circular configuration, the stationary die blade member 38 includes several apertures 48 of differing diameter in order to accommodate said circular stock material. Correspondingly, the reciprocating shear blade member 20 has a like number of semicircular notches or cutout portions 50 of similar diametrical dimensions formed in the working edge thereof.

With reference to FIGS. 5 and 6, the novel means for mounting the die unit 16 to the frame 12 can be viewed in detail. In this regard, it will be recalled that the anvil arrangement 18 of die unit 16 is received between the opposed parallel wall portions 32 of the channellike passages 30. When initially positioned between the opposed walls 32, as illustrated in FIG. 5, the outwardly facing wall portions or surfaces of the elements 42 of said anvil arrangement 18 are spaced slightly from said opposed wall portions. This spacing permits the anvil arrangement 18 to be moved with ease. Once the proper position of the anvil arrangement relative to frame 12 and ram 14 is attained, an expanding arrangement is employed to force elements 42 into firm engagement with the opposed wall portions 32.

The expanding arrangement of the illustrated embodiment includes a boltlike member 51, having an unthreaded portion 52 received in an aperture 54 formed in one of said elements 42 and held in captive relation thereto by a snapring 56, and an oppositely directed threaded portion 58 engaged within a threaded recess 60 formed in the other opposed elements 42. Intermediate these two portions 52 and 58 is an enlarged hexagonal-shaped section 62, that may be engaged by a tool to effect rotation of said member 51. It can be seen, by comparison of FIG. 5 and FIG. 6, that rotation of member 51 will cause the elements 42 to move apart into firm engagement with the walls 32. As shown, two such members 51 are employed in the preferred form. In addition to providing for relative movement of elements 42, the boltlike member or members 50 also serve to maintain said elements 42 in assembled relationship.

While the particular expanding arrangement employed utilizes a boltlike member having only one threaded portion 58, it would be possible to thread both of the portions 52 and 58, provided a reverse threading arrangement is utilized. It can be appreciated that in substance the operation of this type of expanding arrangement would be the same as described hereinbefore.

Further, as an additional feature of this invention, means are provided to counteract wear on the elements 42 of anvil arrangement 18 during operation. It should be noted that the element 42 carrying the stationary die blade member 38 is not engaged directly by the shear blade 20, and thus all wear takes place on the surface of said member 38. Accordingly, to protect the opposite element 42 from engagement by blade 20, said element has a pair of channels 66 formed therein, with a hardened wear-resistant insert 68 disposed in each said channel. These inserts 68 are maintained in position by one or more cap screws 70, and extend from the inner face of the element 42. Thus, engagement of shear blade 20 with the inner surface of this element 42 is positively precluded, all frictional contact taking place between said wear-resistant inserts 68 and said blade.

Also, as a safety feature, means are provided to lock the die unit 16 in position once same is received in the channellike passages 30. In this regard, a pair of latch members 72 of hooklike configuration are pivotally mounted to opposite ends of frame 12. The latch members 72 engage pin elements 74, and as shown in FIG. 3, block the passages 30 and prevent inadvertent removal of the die unit 16.

While a preferred embodiment of the present invention is illustrated and described in detail, it is understood and envisioned that various changes, additions or modifications may be made. By way of example only, means other than the captive bolt arrangement may be used to effect expansion of the platelike members 42. Also, the construction of the anvil arrangement may be altered somewhat by the provision of movable elements other than the member 42. Accordingly, insofar as said changes, etc. fall within the spirit and scope of the present invention they are contemplated.

What I claim is:

1. Metal fabricating apparatus of the type described, comprising: a frame including a base portion for supporting a die unit, and an upper support portion spaced above said base portion for operably receiving a ram assembly; a ram assembly mounted to said upper portion of the frame and including a reciprocal ram member; and a die unit including, an anvil arrangement having a stationary die blade, and a shear blade member adapted for releasable connection to said reciprocal ram member; said frame defining opposed wall portions which cooperate to provide a space for reception of the anvil arrangement, said anvil arrangement including a pair of opposed elements, and means for effecting relative movement of said elements toward and away from each other, such that upon initial reception of said anvil arrangement within said space, relative separating movement may be employed to cause said elements to engage firmly said wall portions and thereby fix the position of said anvil arrangement relative to said frame.

2. Apparatus as defined in claim 1 wherein said pair of spaced-apart, relatively movable elements define a space for reception of the shear blade therebetween, and include means for supporting stock material during fabrication.

3. Apparatus as defined in claim 2 wherein said means for effecting relative movement of said elements comprise; a threaded aperture formed in one said element, and a bolt member carried by the other said opposed element in captive relation thereto, and having a threaded end portion engaged in said threaded aperture, whereby said captive bolt member interconnects said elements and may be rotated to effect relative movement therebetween.

4. Apparatus as defined in claim 2 wherein one of said opposed elements includes wear resistant means against which said reciprocal shear blade engages during the fabricating operation.

5. Apparatus as defined in claim 4 wherein said wear resistant means include; a pair of spaced channels formed in said element and disposed parallel to the path of movement of said shear blade, each said channel opening to said shear blade receiving space; and an elongate wear-resistant insert disposed in each said channel and extending from the surface of said element for engagement by the shear blade.

6. Apparatus as defined in claim 2 wherein said anvil arrangement includes, a recessed portion opening into said shear blade receiving space, and a removable die blade member fixedly positioned within said recessed portion.

7. Apparatus as defined in claim 1 wherein said anvil arrangement includes a pair of interconnected, spaced apart plate members, said plate members defining said opposed relatively movable elements for engaging the frame wall portions.

8. A die unit for use with metal fabricating apparatus of the type including a frame having a base portion for supporting said die unit, and an upper support portion spaced above said base portion and having a ram assembly operably mounted thereon, wherein said die unit is received for mounting between opposed wall portions of said frame, said die unit comprising; an anvil assembly for reception between said wall portions, said anvil assembly including stationary die blade means adapted for cooperation with a reciprocal shear blade connected to said ram arrangement, and mounting means for fixing the position of said anvil arrangement relative to said frame, said mounting means including a pair of opposed elements, each having a surface for engagement with an adjacent one of said opposed frame wall portions, and adjustment means for effecting relative movement of said opposed elements, whereby after initial positioning of said die unit said adjustment means may be operated separate from said elements, causing said elements to engage said opposed wall portions and thereby fix the position of the die unit relative thereto.

9. A die unit as defined in claim 8 further including a reciprocal shear blade carried by said anvil arrangement for connection to a movable ram member.

10. A die unit as defined in claim 9, wherein said opposed elements for engaging the frame wall portions are defined by a pair of platelike members, said members being interconnected and spaced apart to provide for reception of a shear blade therebetween.

11. A die unit as defined in claim 10 wherein one of said platelike members includes wear resistant means against which said reciprocal shear blade will engage during the fabricating operation.

12. A die unit as defined in claim 11 wherein said wear resistant means include; a pair of spaced channels formed in said member and disposed parallel to the path of movement of said shear blade, each said channel opening to said shear blade receiving space; and an elongate wear-resistant insert disposed in each said channel and extending from the surface of said member for engagement by the shear blade.

13. A die unit as defined in claim 10 wherein one said member includes, a recessed portion opening into said shear blade receiving space, and a removable die blade member fixedly positioned within said recessed portion.

14. A die unit as defined in claim 8 wherein said adjustment means for effecting relative movement of said elements comprise; a threaded aperture formed in one said element, and a bolt member carried by the other said opposed element in captive relation thereto, and having a threaded end portion engaged in said threaded aperture, whereby said captive bolt member interconnects said elements and may be rotated to effect relative movement therebetween.