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P. H. TAYLOR ET AL

2,837,161

PERFORATING APPARATUS

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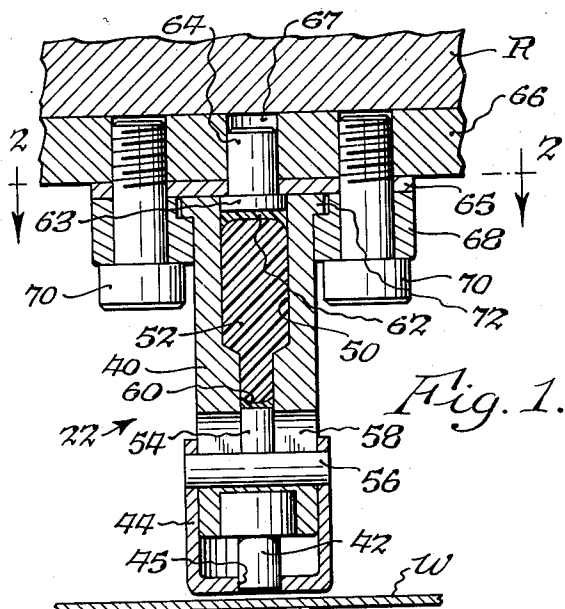


Fig. 1.

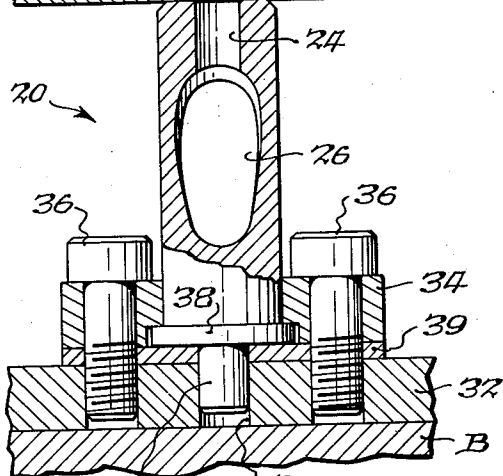
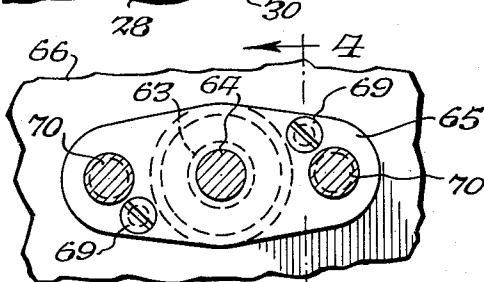


Fig. 2.

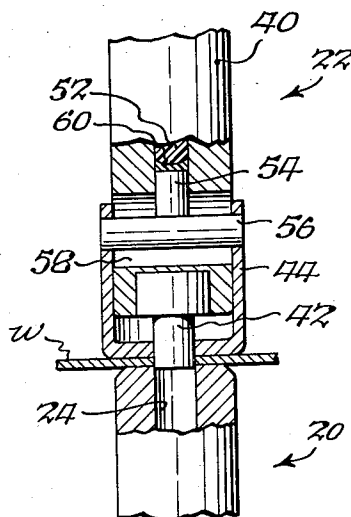


Fig. 3.

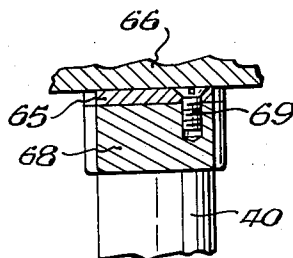


Fig. 4.

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PERFORATING APPARATUS

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6 Claims. (Cl. 164—110)

The present invention relates generally to perforating implements for punching holes in sheet metal, or other material. More particularly, the invention relates to a perforating implement which may be supported from the ram of a punch press for cooperation with a die that is mounted on the bed of the press.

In the conventional perforating device, the work which can be perforated is limited by the capacity of the wound steel wire spring used for stripping the punch from the work after the perforating stroke is completed. To punch sheet metal stock above $\frac{1}{8}$ " in thickness with conventional perforating devices, the springs, which have to be used, are too large for presses of standard sheet heights. Therefore, when thicker sheets are to be perforated, costly, special presses are required. As a result, the stripping springs of conventional perforating apparatus are frequently overloaded with the result that early failure occurs.

One object of the present invention is to provide a perforating device for attachment to the ram of a punch press, which will have a greater capacity and be more compact than conventional perforating devices of this type, or which can punch sheet metal of greater thickness than conventional ram-supported perforating devices.

Another object of this invention is to provide a perforating implement of the character described having separate punch and die units that can be mounted on the ram and bed, respectively, of a standard punch press.

Another object of the invention is to provide a perforating implement of the character described with which the shut height of the press can be reduced as compared with conventional perforating implements of equal capacity.

A further object of this invention is to provide a perforating implement of the character described in which the punch unit can be affixed to the ram of a press in such a manner that the ram receives the forces due to pressurization of the stripping means within the unit.

Another object of the invention is to provide a perforating implement of the character described which is simplified in construction as compared with conventional perforating implements. To this end it is a purpose of the invention to provide a perforating implement of the character described in which the punch support also constitutes the spring housing.

Other objects of the invention are to provide a perforating implement of the character described which will have relatively low cost, be reliable, and have long life.

Still other objects of the invention will be apparent hereinafter from the specification and from the recital of the appended claims.

In the drawing:

Fig. 1 is a part view, part axial section of a perforating implement constructed according to one embodiment of this invention showing the punch unit of the implement affixed to the ram of a punch press and the die unit affixed to the bed of the press and showing a metal sheet

positioned between the two units ready for perforating;

Fig. 2 is a section taken on the line 2—2 of Fig. 1 looking in the direction of the arrows;

Fig. 3 is a fragmentary side elevation, partly broken away, showing the position of the punch upon completion of a working stroke; and

Fig. 4 is a fragmentary section taken on line 4—4 of Fig. 2 looking in the direction of the arrows.

Referring to the drawing by numerals of reference, 20 and 22 denote, respectively, the die unit and the punch unit. The die unit 20 is affixed to the bed B of a punch press and the punch unit 22 is affixed to the reciprocable ram R of the press.

The die unit 20 may be of conventional construction. It has a bore 24 and a communicating discharge passage or chute 26 to the outside through which slugs punched from a workpiece W may pass. The die unit is centered on the bed of the press by a pilot pin 28 which engages in a hole 30 in a template or bed plate 32. The die unit is secured to this template or bed plate by a retaining member 34 and bolts 36. Retaining member 34 surrounds the die and seats against a shoulder or flange portion 38 on the die. Bolts 36 pass through holes in member 30 and thread into the bed-plate. A spacer or washer 39 is interposed between retaining member 34 and bed-plate 32.

The punch unit 22 comprises a punch support member 40 having a punch 42 affixed to its lower end. Reciprocably mounted on support member 42 is a stripping collar 44 which has an opening 45 through which the working end of punch 42 may pass.

Support member 40 has a central, inverted-bottle-shaped bore 50 therein which is filled with a compressible, solid, plastic stripping material 52, such as hard silicone, nylon, polystyrene or the like.

Reciprocably mounted in the support 40 is a piston 54. This piston bears at its lower end on a cross-bar 56 which is anchored at its opposite ends in the stripping collar 44 and which passes through a diametrical slot 58 in the support member. The upper end of piston 54 reciprocates in the lower end of bore 50 and bears against a nylon or other plastic seal 60. Seal 60 has a concave upper face to engage the convex lower face of the compressible solid spring member 52; and seal 60 has a plane lower face to engage the plane upper face of piston 54.

The upper end of bore 50 is closed by a nylon or other plastic seal 62. This seal has a concave lower face which presses against the convex upper face of the compressible, solid spring member 52. The upper face of seal 62 is plane and seats against the lower plane face head 63 of a pilot pin 64. The shank of the pilot pin 64 passes through a hole in a back-up or pressure plate 65 and seats in an aperture 67 in a ram plate 66. Head 63 of the pilot pin 64 engages in the bore 50 of support or housing 40.

The support or housing 40 is secured to ram plate 66 by a retaining member 68 and screws 70. Retaining member 68 surrounds the punch support member 40 and engages against a flange or collar 72 formed on support 40. Plate 65 is secured to member 68 by screws 69.

The bolts 70 pass through holes in member 68 and plate 65 and thread into plate 66. The ram plate is fixedly secured in conventional manner to the ram of the press.

When ram R moves downwardly on the working stroke of the press, the punch support 40, punch 42 and stripping collar 44 move with it until stripper collar 44 strikes the workpiece W. Thereafter, as the ram continues to descend, the punch 42 and support 40 move relative to the collar (Fig. 3), and the punch is forced through the workpiece to perforate the same. Simul-

taneously, piston 54 is forced by cross-bar 56 upwardly into bore 50. Since seal 62 is held against upward movement by plate 65, the solid spring member 52 is compressed.

Upon completion of the working stroke and retraction of the ram R, the compressed, solid spring material 52 expands. This causes stripper member 44 to be held against workpiece W while the punch 42 is withdrawn, or stripped, from the work.

From the foregoing, it is seen that the pilot pin 64 not only serves to properly align the punch unit 22 with the die unit 20, but its head 63 acts as a closure member for the upper end of bore 50. Head 63 backs up nylon seal 62. This eliminates the necessity of a brazed closure for the upper end of bore 50. Further, the head 63 of pilot pin 64 is secured against movement by the thin plate 65 which abuts against the ram-plate 66, so that the ram R is actually the supporting medium against the internal pressure of the spring 52. The plate 65, therefore, acts as a closure and reduces to a minimum the shut-height of the press. Pilot pin 64 is retained by plate 65 for initial assembly to hold the parts together, but is clamped firmly against this plate and bed plate 66 in operation so that it is supported against the tremendous forces due to pressurizing solid spring member 52. Thus, a simple, combined spring container and punch holder is provided, while the ram acts actually as the pressure supporting member, and minimum press shut-height is achieved.

While the invention has been described in connection with one embodiment thereof, it will be understood that it is capable of further modification, and this application is intended to cover any variations, uses, or adaptations of the invention following, in general, the principles of the invention and including such departures from the present disclosure as come within known or customary practice in the art to which the invention pertains, and as may be applied to the essential features hereinbefore set forth and as fall within the scope of the invention or the limits of the appended claims.

Having thus described our invention what we claim is:

1. The combination with a punch press, which has a reciprocable ram and a bed, of a perforating implement comprising a punch unit affixed to said ram and a separate die unit affixed to said bed and axially aligned with said punch unit, said punch unit comprising a supporting member having a central bore, means for securing said supporting member to said ram, pilot means mounted to project from the bore of said supporting member to engage said ram to locate said punch unit on said ram, said pilot means including a closure portion slidably engaged in the upper end of said bore to close said upper end, a punch secured to the lower end of said supporting member, a stripping member reciprocable on said supporting member, and compressible, solid stripping material filling said bore and interposed between said closure portion and said stripping member so that when said stripping member engages the work on a working stroke of the ram said compressible material is compressed while the punch perforates the work.

2. A perforating implement comprising a punch support member adapted to be secured to the ram of a punch press, a punch secured to said member at one end thereof, said member having a chamber formed therein, a solid, compressible medium filling said chamber, a stripper sleeve surrounding said member and reciprocally mounted on said member, means connecting said stripper to said compressible medium at one end of said chamber to compress said medium when said stripper engages the work on a working stroke of said ram and while the punch is perforating the work, a pilot member for closing the opposite end of said chamber and having a projecting portion for locating said punch support member on said ram, and a plate for securing said pilot member fixedly to said punch support member, said plate being adapted to seat on said ram when said support member

is secured to said ram and said plate having an opening through which the projecting portion of said pilot member projects.

3. A perforating implement comprising a punch support member adapted to be secured to the ram of a punch press, a punch secured to said member at one end thereof, said member having a chamber formed therein, a solid, compressible medium filling said chamber, a stripper sleeve surrounding said member and reciprocally mounted on said member, means including a piston reciprocable in said chamber and operatively connected to said medium for compressing said medium upon movement of said stripper on said member, said piston forming a closure for one end of said chamber, a headed pilot pin for closing the opposite end of said chamber, and a plate for securing said pilot pin against movement outwardly of said chamber, said pilot pin having a shank portion adapted to project through a hole in said plate to locate said member on said ram, and means for connecting said plate to said ram when said member is secured to said ram to transmit the internal pressure in said compressible medium to said ram.

4. A perforating implement comprising a punch support member adapted to be secured to the ram of a punch press, a punch secured to said member at one end thereof, said member having a chamber formed therein open at both ends, a compressible solid material filling said chamber, a pair of sealing members sealing said solid material against extrusion from said chamber, a stripper sleeve surrounding said member and reciprocable on said member, said stripper sleeve being positioned to engage the work on the perforating stroke of said punch, a piston acting against one of said sealing members, means connecting said stripper sleeve to said piston to compress said compressible material after said stripper sleeve has engaged the work while the punch is perforating the work, whereby on release of the perforating force said compressible material will expand to strip said punch from the work, and a pilot pin for holding the other sealing member against movement outwardly of said chamber, said pilot pin being adapted to be engaged with said ram to locate said member on said ram.

5. A perforating implement comprising a punch support member adapted to be secured to the ram of a punch press, a punch secured to said member at one end thereof, said member having a chamber formed therein open at both ends and cylindrical in shape at both of its ends, at least, a compressible solid material filling said chamber, a piston reciprocable in one end of said chamber, a stripper reciprocable on said member, a bar connected to said stripper and extending diametrically through an axially-elongate slot in said support member, said bar engaging said piston to compress said compressible material after said stripper has engaged the work while the punch is perforating the work, whereby on release of the perforating force said compressible material will expand to strip said punch from the work, a pilot pin, said pilot pin having an enlarged head reciprocable in the opposite end of said chamber, said pilot pin being engageable with said ram to locate said support member on said ram, and a plate secured to said support member for holding said pilot pin in said support member, said pilot pin having a shank portion, and said plate having a hole in it through which the shank portion of said pilot pin projects to engage said ram, said plate being adapted to transmit the internal pressure in said compressible material from said head to said ram when said support member is secured to said ram.

6. The combination with a punch press which has a reciprocable ram and a bed, of a punch unit secured to one of said parts and an aligned die secured to the other, said punch unit comprising a support member having a bore filled with a compressible medium, a pilot pin reciprocable in said bore and projecting beyond one end thereof to engage said one part to locate said support mem-

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ber on said one part, means for securing said support member to said one part, a plate interposed between said support member and said one part and having a hole therethrough through which said pilot pin extends, means for sealing said medium against extrusion from said bore at said one end thereof, a punch secured to the free end of said punch support, a stripper reciprocable on said support and having an opening therethrough through which said punch may extend when said stripper engages the work while the punch is perforating the work, a piston reciprocable in the opposite end of said bore to compress said medium on movement inwardly of said bore, and a cross-bar secured to said stripper and extending through a diametral axial slot in said support to engage said piston to move said piston inwardly on the perforating movement of the punch after the stripper has engaged the work.

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