Feb. 25, 1964 J. F. GROSH 3,122,044

METAL PUNCHING APPARATUS

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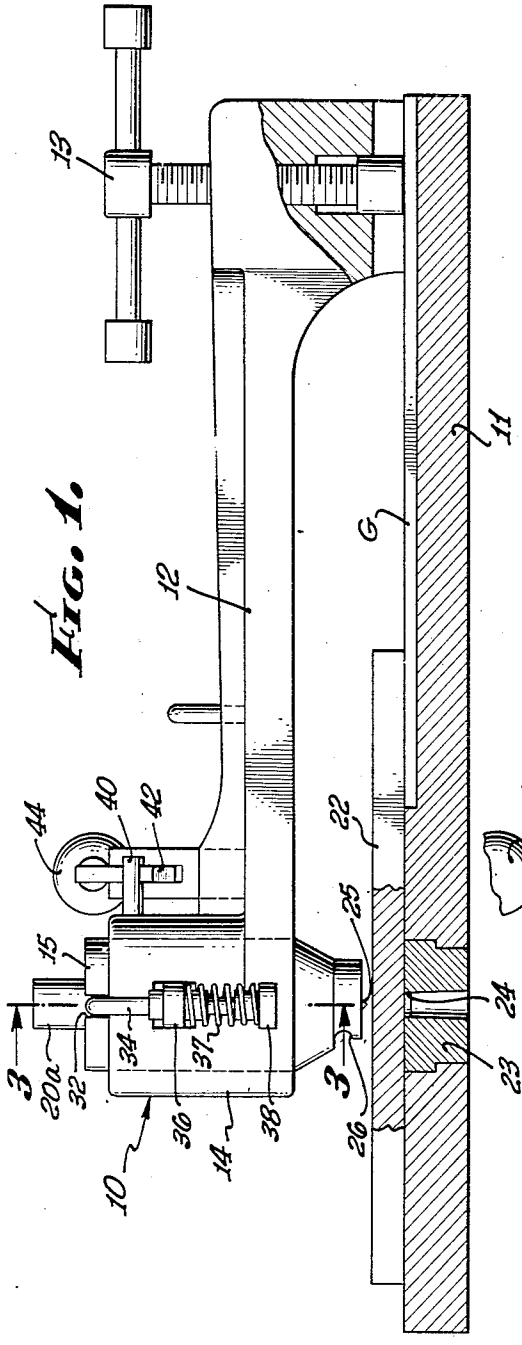


FIG. 1.

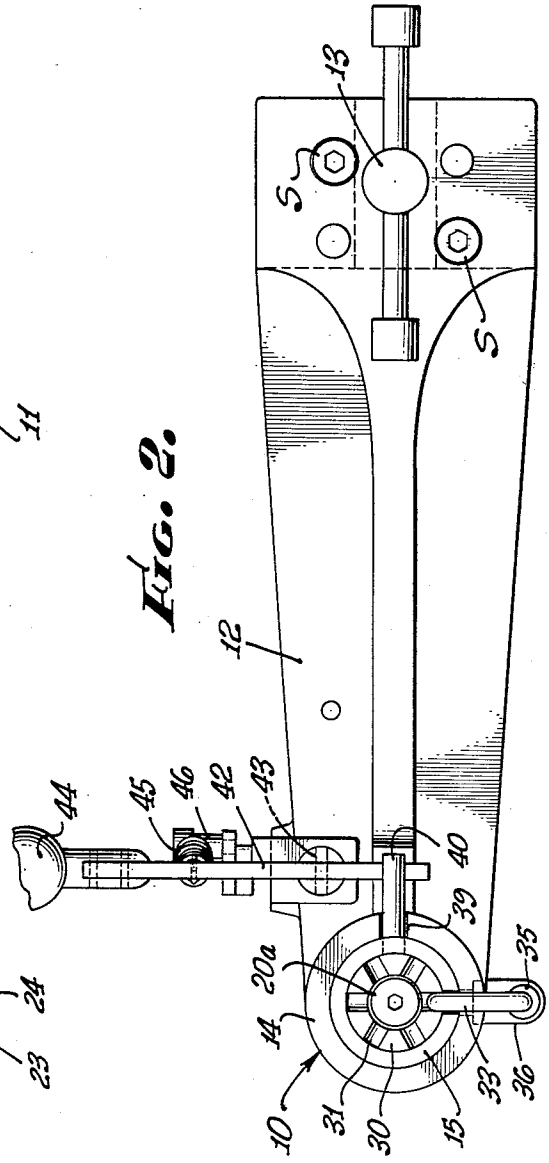


FIG. 2.

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FIG. 3.

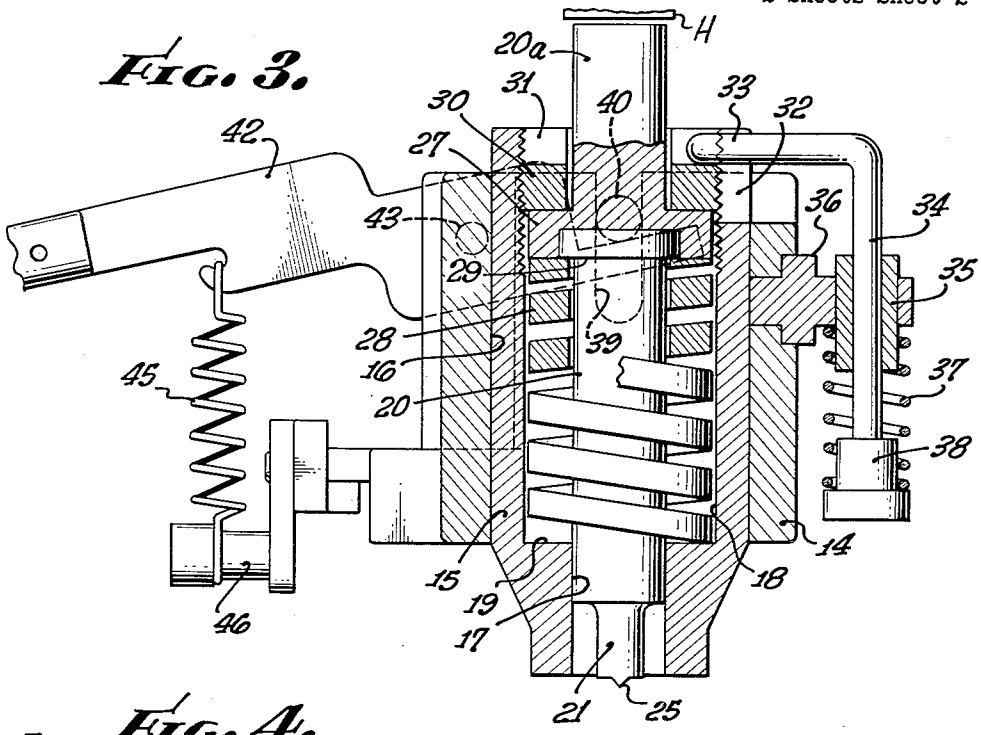


FIG. 4.

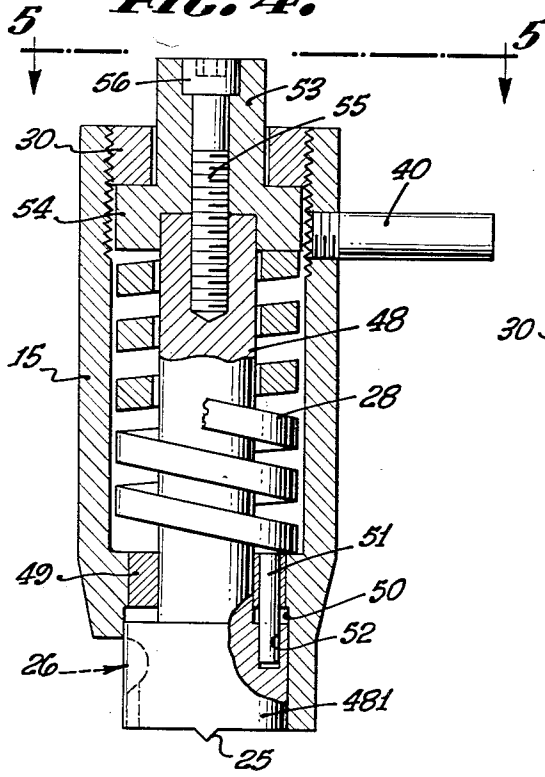
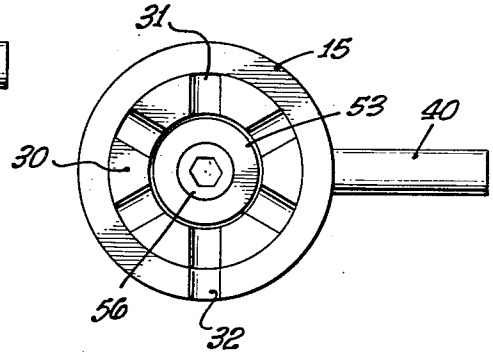


FIG. 5.



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METAL PUNCHING APPARATUS

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9 Claims. (Cl. 83—588)

This invention has to do generally with metal punching apparatus, and is directed particularly to an improved assembly of the punch and its associated mounting and control parts, which presents various advantages over conventional mechanisms in the metal punch category.

One of my major objects is to provide improved mechanisms adaptable for the use of various size punches, all of which may be used and interchanged by simple manipulations applying to the same body structures. In this manner, it is possible by providing whatever number of die sizes desired and the corresponding punches, to accommodate the latter interchangeably within the same basic mounting and associated operating parts, so that essentially the same equipment may be used for punching a large variety of hole sizes.

A further object of the invention is to incorporate these features, and to gain superior punching action and accuracies, in a novel structure which may be characterized as employing a floating punch capable of finding exact punch centers and of performing the punching and retractive movements efficiently and accurately. This objective is accomplished by accommodating the punch for axial movement within a vertically movable tubular body, with resistance to downward (punching) displacement of the punch out of the body under the influence of driving force applied to the upper end of the punch. The punch-containing body is rendered vertically displaceable and variable for proper clearance above the work, as by mounting the body and punch assembly for raising and lowering relative to a stationary work support. Thus the punch becomes axially movable relative to the punch-containing body, and both the body and punch are movable bodily and together above the die and workpiece.

The invention has various additional features and objects, such as the form and arrangement of the punch within the body, provision for adjustment of the punch position relative thereto and the corresponding spring tension, as well as modifications of the punch adapting it to larger sizes. All these will be understood most readily from the following detailed description of certain illustrative embodiments of the invention shown by the accompanying drawings, in which:

FIG. 1 is a view showing in side elevation a punch holder and mounting assembly embodying the invention;

FIG. 2 is a plan view of FIG. 1;

FIG. 3 is an enlarged cross section taken on line 3—3 of FIG. 1;

FIG. 4 is a view similar to FIG. 3 showing a variational form of the invention; and

FIG. 5 is a plan view taken on line 5—5 of FIG. 4.

Referring first to FIGS. 1 and 2, the punch holder assembly, generally indicated at 10, is shown to be mounted above the punch press table 11 on an arm 12 releasably held to the table by bolts or screws S. A work-positioning gage, not show, may be received within slot or recess G and releasably held therein in any of various positions longitudinally of the arm assembly, by screw 13. Formed integrally with the end of the arm 12 is a tubular housing or support 14 which mounts the punch and the punch-containing holder or body 15.

Referring to FIG. 3, the punch holder 15 is shown to comprise a tubular body slidable vertically within bore 16 of the support 14, body 15 containing larger and smaller diameter bores 17 and 18, respectively, below and above the internal shoulder 19. The body contains an axially aligned punch body 20, the lower reduced end

21 of which constitutes the punch proper adapted to be driven through the work metal 22, see FIG. 1, into a die 23, the upper bore 24 of which corresponds closely to the punch diameter. The bottom of the punch has a center point 25 which is observable by the operator through the relieved side of the body 15 at 26, to permit accurate positioning of any point on the work piece with relation to the punch center 25.

The punch has an enlarged diameter portion 27 engaged by a coil spring 28 surrounding the punch and confined between shoulders 19 and 29 and acting to resist downward displacement of the plunger out of the body. The punch enlargement 27 engages upwardly against a tubular nut 30 threaded into the top of the body and having radial wrench slots 31, see FIG. 5, individually alignable with a slot 32 in one side of the body 15. The nut 30 is adjustable to predetermine the upper position of the punch and the corresponding spring tension. Provision is made for preventing unintentional rotation of the nut 30 during operation of the assembly, by means of a locking arm 33 extending through slot 32 into the nut slot 31, the arm 33 extending downwardly at 34 through guide or bearing 35 mounted as at 36 to the support 14. The arm 33 is urged downwardly by coil spring 37 confined between mounting 36 and head 38 on the downward arm extension 34. Thus as body 15 is moved vertically, arm 33 travels with and maintains the locked position of the nut 30 and the thrust of spring 37 is transmitted by the arm to the nut-carrying body 15.

The support 14 is slotted at 39 to receive a pin 40 extending into the body 15, see FIG. 2, the pin being engaged upwardly by a lever arm 42 pivoted at 43 and having a terminal handle 44. Being slidably received within the bore 16, the assembly of the holder 15 and contained punch 20 is capable of lowering by gravity assisted by spring 37 to enable the punch point 25 to "find" a predetermined center on the work piece. After the punching operation, the assembly may be restored to the FIG. 3 position by downward swinging of the arm 42. If it is desired to render automatic such restoration of the holder and punch assembly to elevated position, the arm 42 may be connected by coil spring 45 to a stationary support 46 on the arm 12. Thus when the spring is used, upward swinging of arm 42 against the resistance of the spring will permit the holder and punch assembly to lower, bringing the point 25 onto the work, and then after the punching operation, spring 45 will automatically elevate the assembly away from the work.

It is believed that the operation of the assembly will be apparent from the foregoing. Assuming the punch to be centered on the work, as preliminarily determined by bringing the punch and body assembly down to the position in which point 25 centers on the work, the driving head H of the punch press engages the upper end portion 20*a* of the punch to drive the latter downwardly against the resistance of spring 28 and out of the body through the work metal and the die. Upon release of the driving head, arm 42 may be swung to return the punch body to the normal position of FIG. 3.

Different effective diameter punches may be substituted for the one illustrated simply by removal of the nut 30 and substitution of a different punch which may be the same as that illustrated, but varying in the diameter of the punch terminal 21. Such diameter variation may occur to a maximum corresponding substantially to the diameter of bore 17.

FIG. 4 illustrates a variational form of the invention, in which provision is made for utilizing punches whose effective diameters exceed the diameter of the body or shank portion of the punch. In this view, parts corresponding to those appearing in FIG. 3 are given the

same reference numerals. Here shank 48 of the punch is shown to extend through bearing 49 and to carry a larger diameter head 481 receivable upwardly within bore 50. The punch may be held against rotation by pin 51 projected downwardly within bore 52 of the punch. The top 53 and enlarged diameter 54 of the punch may be releasably attached to the upper end of the shank 48 by screws 55, the head 56 of which is countersunk in the punch head. When it is desired to substitute punches of different effective diameters, nut 30 is unscrewed from the body, screw 55 removed to disconnect punch head 53 in shank 48 and the latter is withdrawn and replaced with a lower punch section differing only in the diameter of the head or punch proper 481.

I claim:

1. Metal punching apparatus comprising

(A) a stationary support,

(B) a body carried by said support and movable vertically therein above the work metal to be punched,

(C) a punch displaceable downwardly within the body and out of its lower end to penetrate tha work metal,

(D) yielding means resisting said downward movement of the punch within the body,

(E) a vertically movable punch driving member,

(F) means manually operable to move said body vertically above the work metal, and

(G) yielding means acting independently of said manually operated means to exert downward thrust tending to displace said body downwardly within said support.

2. Apparatus according to claim 1, in which said manually operated means (F) includes yielding means tending to elevate said body.

3. Apparatus according to claim 1, in which said yielding means (G) comprises a downwardly expanding coil spring extending vertically at the side of the body opposite said manually operable means (F).

4. Apparatus according to claim 1, in which said yielding means (G) comprises an arm extending outwardly and laterally from said body and a spring urging and acting to displace said arm downwardly.

5. Apparatus according to claim 1, in which said body is slidable within a vertical bore in the support and from which the body is upwardly withdrawable for replacement by a similar body containing a different size punch.

6. Apparatus according to claim 5, in which said manually operable means (F) comprises a lever at one side of the body and operatively associated therewith, and said yielding means (G) comprises a spring urged member operatively associated with said body at the opposite side thereof.

7. Metal punching apparatus comprising,

(A) a stationary tubular support containing a vertical bore,

(B) a cylindrical body slidable vertically within said bore above the work metal to be punched,

(C) a punch displaceable downwardly within said body and out of its lower end to penetrate the work metal,

(D) yielding means resisting said downward movement of the punch within the body,

(E) a vertically movable punch driving member,

(F) a manually operable member adapted to move said body vertically above the work metal,

(G) means releasably associating said member (F) with said body to permit upward withdrawal of the body from the support bore for replacement by a similar body containing a different size punch,

(H) and yielding means acting independently of said member (F) to exert downward thrust acting to displace said body downwardly within said support bore and releasably associated with the body to permit withdrawal of the body from the support bore.

8. Apparatus according to claim 7 in which said means (G) comprises a projection carried by said body and extending outwardly through a vertically extending opening in said support.

9. Apparatus according to claim 7, in which said body contains in its upper end a threaded insert adjustable to variably tension said yielding means (D) and in which the apparatus includes an arm carried by the body to hold said insert against rotation, said yielding means (H) exerting downward thrust against said arm.

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