

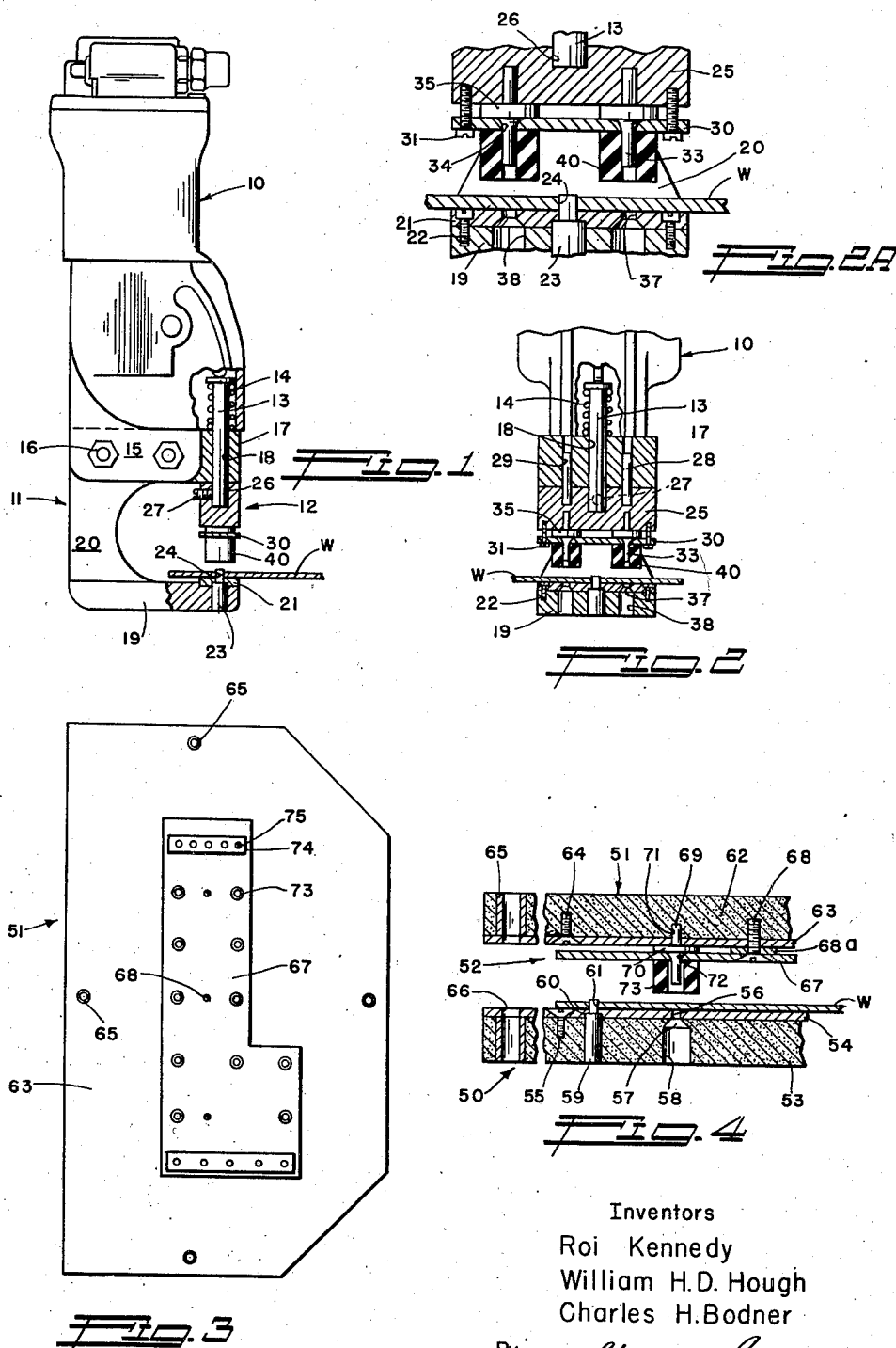
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PUNCH MEANS

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PUNCH MEANS

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This invention relates to punching apparatus and relates more particularly to tools for punching openings in sheet material and the like. A general object of the invention is to provide a simple, practical and very effective means for simultaneously forming a plurality of openings in sheet stock, plates, etc.

In the mass production of sheet objects requiring the provision of accurately located openings it has been the common practice to drill the openings. The drill breakage is very high, particularly where small or relatively small openings are drilled in tough materials. Furthermore, the drilling operation produces burrs that must be removed in a subsequent operation to condition the objects or parts for fabrication.

Another object of the invention is to provide a punch operable to form openings in tough materials without leaving burrs and without the breakage of parts.

Another object of the invention is to provide a punch or tool operable to simultaneously punch a plurality of accurately located burrless openings in tough resilient material in a single operation and without distortion of the work.

Another object of the invention is to provide a tool of the character mentioned embodying a simple, very effective stripper means assuring the formation of clean, burrless openings without distorting the work piece even after extended use of the tool.

A further object of the invention is to provide a small, compact conveniently operated power punch for simultaneously forming burrless openings in plate or sheet parts.

Other objects and features of the invention will be better understood from the following detailed description of typical, preferred forms of the invention throughout which description reference is made to the accompanying drawing in which:

Figure 1 is a side elevation of a pneumatic tool embodying one form of the invention with the principal parts appearing in vertical cross section;

Figure 2A is an enlarged fragmentary vertical detailed sectional view of the active parts of the tool shown in Figure 1, being a view taken in a plane at right angles to the plane of sectioning of Figure 1;

Figure 2 is a fragmentary vertical detailed sectional view of the punch taken in the same plane as Figure 2A;

Figure 3 is an elevation view of the under side

of the upper assembly of another form of the invention and,

Figure 4 is an enlarged fragmentary vertical sectional view of the apparatus illustrated in Figure 3.

In Figures 1, 2 and 2A of the drawing we have illustrated the invention embodied in a punch operable to simultaneously form spaced openings in a piece of work. The particular embodiment of the invention shown in Figures 1, 2 and 2A is intended to form two spaced openings in a plate nut, it being apparent that the invention may be adapted to other uses. The tool of Figures 1, 2 and 2A comprises generally a pneumatic tool in the form of a small riveter 10, a yoke 11 attached to the riveter 10, and a punch assembly 12 in the yoke operated by the riveter.

The riveter 10 may be of conventional construction and its details form no part of the present invention except insofar as they occur in combination with the other elements of the invention. It will be sufficient to state that the pneumatic tool 10 has a downwardly projecting plunger or ram 13 that is operated downwardly by pneumatic power and returned by a spring 14.

The yoke 11 is attached to a lower flange 15 of the tool 10 by spaced bolts 16. The upper jaw 17 of the yoke 11 has a vertical opening 18 slidably passing the ram 13. The lower jaw 19 of the yoke 11 is connected with the upper jaw 17 by a web 20. The upper face of the lower jaw 19 carries a die plate 21 of hard material, the plate being attached to the jaw by spaced screws 22. A locating pin 23 is replaceably secured in the lower jaw 19 and extends upwardly through an opening in the die plate 21 to protrude beyond the upper face of the plate. The work W is adapted to be engaged against the plate 21 and has an opening 24 for receiving the pin 23 to be accurately located thereby.

The punch assembly 12 includes what we will term a punch holder 25. The punch holder 25 is an elongate horizontally disposed member arranged at the under side of the upper yoke jaw 17. A socket 26 in the upper side of the work holder 25 receives the lower portion of the pneumatic ram 13. A set screw 27 may serve to fix the holder 25 to the ram 13. Guide rods 28 are fixed to the holder 25 and project upwardly therefrom to slidably operate in openings 29 in the upper jaw 17. The guide rods 28 insure the correct movement of the holder. A stripper plate 30 is provided at the under side of the punch holder 25 and is freely suspended therefrom by spaced screws 31.

The punch assembly 12 further includes spaced punches 33. The punches 33 are engaged in openings in the holder 25 and pass downwardly through openings 34 in the stripper plate 30. The shanks of the punches have snug slip fits in the openings of the holder 25. Annular flanges 35 are provided on the punches 33 intermediate their ends and are engaged between the stripper plate 30 and the under side of the holder 25. The flanges 35 bear against the under side of the holder 25 to receive the downward thrusts therefrom and engage against the upper face of the plate 30. The bodies of the punches 33 are tapered at the under sides of the flanges 35 to present downwardly converging surfaces and the openings 34 of the stripper plate 30 are tapered or correspondingly shaped to receive the tapered parts. The portions of the punches 33 which project downwardly from the plate 30 are formed to punch openings of the selected diameter in the work W. The die plate 21 is provided with openings 37 vertically aligned with the punches 33. The under parts of these openings 37 are flared or enlarged and communicate with openings 38 in the lower jaw 19. The openings 38 are adapted to discharge the slugs or scrap pieces of metal punched from the work W by the punches 33.

The invention is characterized by stripper blocks 40. The stripper blocks are provided at the under side of the stripper plate 30 and are thick walled tubular parts engaged about the downwardly projecting portions of the punches 33. The blocks 40 are formed of a compressible resilient material such as rubber, rubber composition, or synthetic rubber. The upper ends of the stripper blocks 40 bear against the under side of the plate 30 and the blocks are proportioned to normally extend downwardly beyond the lower ends of the punches 33. With the ram 13 in its raised position, the lower ends of the blocks 40 are spaced above the die plate 21 so that the work W may be readily positioned on the die plate.

In the use or operation of the tool illustrated in Figures 1, 2 and 2A the work W is engaged on the die plate 21 so that the pin 23 engages in its opening 24. The pneumatic tool 10 is then put into operation so that the ram 13 forcibly moves downwardly to actuate the punch assembly 12. The compressible blocks 40 first come into engagement with the work W and the stripper plate 30 is in effect clamped between the blocks 40 and the flanges 35 of the punches. The skirts or flanges 35 of the punches are thus forced against the under face of the punch holder 25 and this action serves to accurately align the punches with the openings 37 in the die plate 21. In this connection, it is to be understood that after extended usage the upper portions of the punches 33 may have limited movement in the openings of the holder 25, and the tapering portions of the punches operate in the tapered openings 34 of the stripper plate 30 to provide for the automatic aligning of the punches 33 as just described. By the time the lower ends of the punches 33 engage the work W the punches are accurately aligned with respect to the openings 37 in the plate 21. The punches 33 pass through the work W to punch or form the openings therein. In practice the tool accurately forms the spaced openings without burrs and without distortion of the work. The slugs or metal parts displaced by the punches fall out through the openings 37 and 38, there being no chips or cuttings to interfere with subsequent operations.

In Figures 3 and 4 we have illustrated the in-

vention embodied in a template pierce die that includes generally a lower plate assembly 50, an upper plate assembly 51, and punch means 52 on the upper assembly.

5 The lower plate assembly includes a base plate 53 of metal, a selected plastic or other suitable material. A die plate 54 of selected hard steel is secured to the upper face of the base plate 53 by screws 55. Spaced openings 56 are provided in the die plate 54 in positions determined by the particular work to be performed. Openings 57 in the base plate 53 communicate with the die openings 56 and join channels or grooves 58 formed in the under side of the base plate 53. The openings 15 57 and the channels 58 serve to receive the slugs punched from the work W.

Means is provided for locating the work W on the die plate 54. Any selected form of locating means may be employed. In the simple case illustrated locating pins 59 are secured in openings in the base plate 53 and have shouldered engagement in openings 60 in the die plate 54. Reduced portions of the locating pins 59 project from the die plate 54 and are adapted to extend through openings 61 in the work W to accurately locate the work.

The upper assembly 51 includes an upper or outer plate 62 of plastic or other suitable material and a plate 63 of steel or the like secured to the under side of the plate 62 by screws 64. The upper and lower assemblies 50 and 51 may correspond in outline or configuration and means are provided for locating the die assemblies in the die set. In the case illustrated these locating means 35 consist of aligned bushings 65 secured in openings in the edge portions of the base plate 53 and the outer plate 62. The die plate 54 and the plate 63 may have openings 66 communicating with the bushings 65.

40 The punch means 52 is provided on the under side of the upper plate assembly 51. The punch means includes a stripper anchor plate 67 spaced from the under side of the plate 63 and freely suspended therefrom by screws 68. Spacers 68A may be provided on the screws between the plates 63 and 67. The punch means 52 further includes a plurality of punches 69. The punches 69 may be of the same construction as the punches 33 described above; that is they may be elongate members provided between their ends with annular flanges or skirts 70. The upper portions of the punches 69 are slidably received in openings 71 in the plate 63 and the plate 62 so that the upper faces of the skirts 70 may flatly bear against the under side of the plate 63. The punches 69 extend 55 downwardly through openings 72 in the anchor plate 67. The surfaces of the shanks of the punches 69 curve or taper downwardly and inwardly from the under sides of the skirts 70 and the openings 72 are correspondingly tapered so that the punches may have limited rocking movement under certain conditions of operation. The punches 69 project downwardly from the anchor plate 67 to cooperate with the openings 56 in the die plate 54 during the punching operation.

Stripping means are provided for the punches 69. Where the punches 69 are substantial distances apart, individual stripper blocks 73 are provided on the individual punches. The blocks 73 may be similar to the above described blocks 40, being tubular, cylindrical members of compressible, resilient material such as rubber or synthetic rubber. Where the punches 69 are in adjacent relation, a single stripper block 74 may be provided for the several adjacent punches. Such 75

blocks 74 are illustrated in Figure 3 and in this case they are elongate members having spaced openings 75 for receiving the active cutting portions of the punches. The upper ends of the stripper blocks 73 and 74 bear against the under surface of the anchor plate 67 and the blocks may extend below the idle punches.

In use the work W is arranged on the die plate 54 to be accurately located by the engagement of the locating pins 59 in the openings 61. When the die set is operated the stripper blocks 73 and 74 first come into engagement with the work W and are compressed. The punches 67 are forced downwardly through the work W into the openings 56 to form accurately located burrless openings. The slugs pass down through the openings 56 into the channels 58. When the assemblies 50 and 51 are separated, the punch work W may be removed. The punches 69 mounted as described above are self aligning in the same manner as are the punches in Figures 1 to 2A.

Having described only typical forms of the invention, we do not wish to be limited to the specific details herein set forth, but wish to reserve to ourselves any variations or modifications that may appear to those skilled in the art or fall within the scope of the following claims.

We claim:

1. In punch means, a die part having an opening, a second part, one part being movable toward the other, an anchor member movable with and hung from said second part, the anchor member and said second part having openings aligned with the first named openings, a punch received in the second named openings and projecting from said member to punch an opening in work on the die part upon movement of one part toward the other, and an annular skirt on the punch engaged between said member and said second part and cooperating therewith to constitute the sole means for holding the punch against axial movement whereby the engagement of the skirt with said second part serves to position the punch.

2. In punch means, a die plate having an opening, a part movable toward the die plate, an anchor member suspended from said part and having an opening aligned with the first named opening, a punch having a tapered portion engaged in the second named opening and a portion projecting toward the die plate to punch an opening in the work on the die plate upon movement of said part toward the die plate, and a flange on the punch engaged between said part and the anchor member, the engagement of said tapered portion in said second named opening allowing the punch to rock so the engagement of the flange with said part brings the second named portion of the punch into alignment with the opening of the die plate.

3. In punch means, a die plate having an opening, a part movable toward the die plate, an anchor member secured to said part to be in spaced relation thereto and having a tapered opening aligned with the first named opening, a punch having a tapered portion tiltably engaged in the second named opening and a portion projecting toward the die plate to punch an opening in the work on the die plate upon movement of said part toward the die plate, a flange on the punch between said part and the anchor member adapted to be forced against said part to tilt the punch to bring its second named portion into alignment with the opening in the die part, and a compressible resilient stripper on the project-

ing portion of the punch compressed between the work and said member during the punching action to strip the punch and to cause said member to force said flange evenly against said part.

4. In punch means, a die plate on which the work is arranged and having an opening, a part movable toward the die plate and having a flat face opposing the die plate, a member secured to said part and spaced from said face, the member having a tapered opening aligned with the first named opening, a punch having a tapered portion movably engaged in the tapered opening and a cutting portion projecting from said member to punch an opening in the work upon movement of said part toward the die plate, and a flange on the punch between said part and member having a face to move said tapered portion in the tapered opening to bring said cutting portion into alignment with the first named opening for flatly bearing on the first named face.

5. In punch means, a die plate on which the work is arranged and having spaced openings, a part movable toward the die plate and having a flat face opposing the same, a member secured to said part and spaced from said face, the member having tapered openings aligned with the first named openings, punches having tapered portions movably engaged in said openings and cutting portions projecting toward the work to punch openings therein upon movement of said part toward the die plate, flanges on the punches adapted to come into even engagement with said face to align the punches with the first named openings, and stripper elements around said cutting portions compressed between said member and work during the punching operation, said compression assuring the flat engagement of the flanges with said face to align the punches with said first named openings.

6. In punch means, a die plate on which the work is arranged and having spaced openings, a part movable toward the die plate and having a flat face opposing the same, a member suspended from said part and spaced from said face, the member having tapered openings aligned with the first named openings, punches having tapered portions movably engaged in said openings and cutting portions projecting toward the work to punch openings therein upon movement of said part toward the die plate, flanges on the punches adapted to flatly bear on said face to align the punches with the first named openings, and a block of compressible resilient material having openings receiving the several cutting portions and compressed between said member and the work to cause said flanges to flatly engage said face and to strip the punches.

7. In punch means, a part presenting a flat surface, a member carried by said part and presenting a face spaced from and opposing said flat surface, the member having an opening whose wall is divergent toward said face, and a punch having an active portion, a flange between said surface and face and presenting an extensive surface for bearing on the first named surface to accurately align the punch and a portion joining the flange and active portion and presenting a surface complementary to and engaging the wall of said opening to assist in aligning the punch and to permit said surface of the flange to evenly bear on said first named surface.

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