

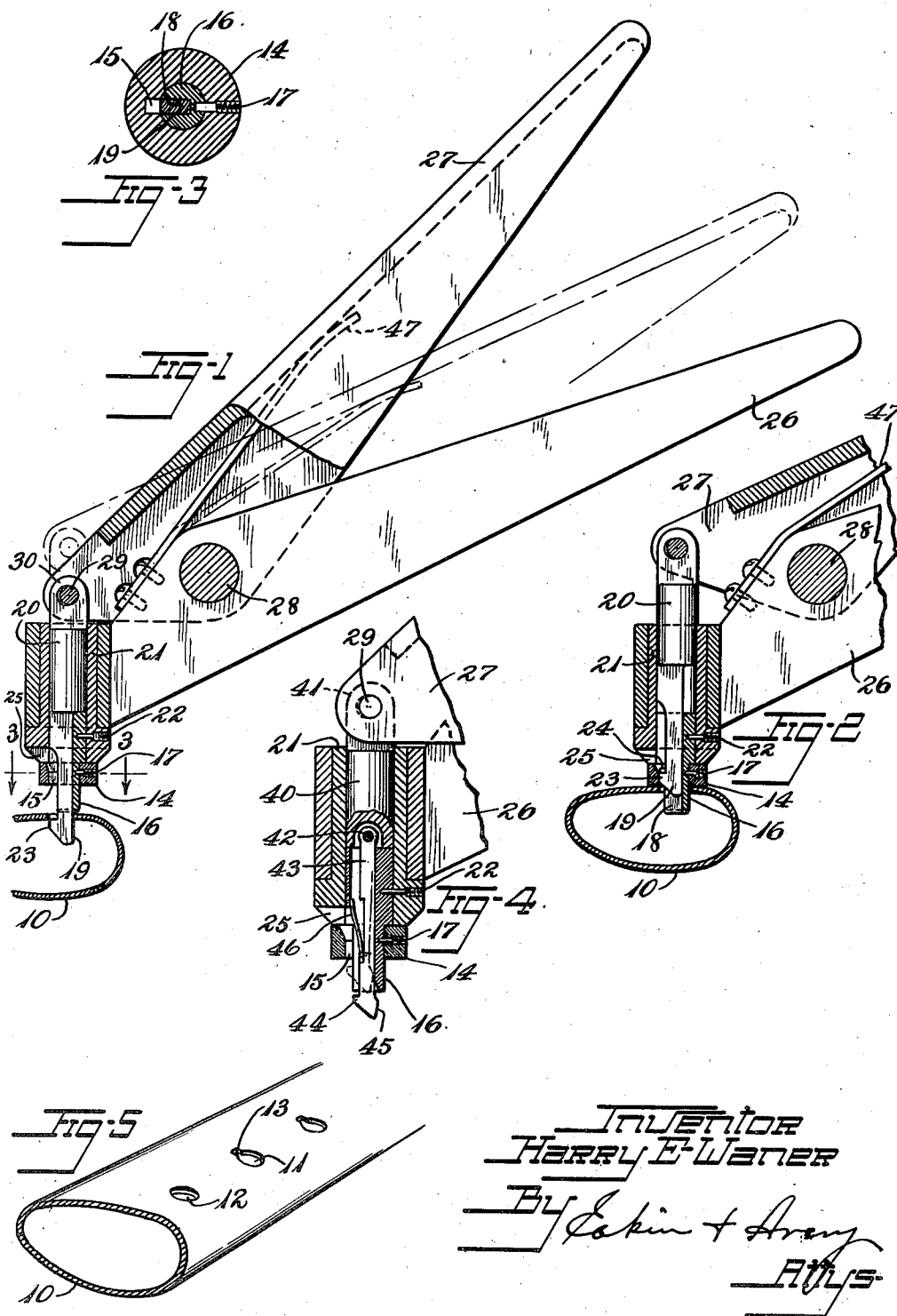
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PUNCHING IMPLEMENT

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PUNCHING IMPLEMENT

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5 Claims. (Cl. 164—120)

This invention relates to cutting devices and is especially useful where openings are to be formed in thin walls of articles made of metal or other rigid or semi-rigid materials and one side only of the wall is accessible or convenient for support against the cutting force.

It is often necessary to provide non-circular apertures in a thin sheet of metal or other rigid or semi-rigid material where the sheet is a portion of the wall of a closed article readily accessible from one face but inaccessible from the other face, or when the location of the desired aperture is so far from the margin of a sheet as to preclude the use of a punch press or other similar device.

The principal objects of the present invention are to provide facility and economy of operation, to provide for cutting without distortion of the surrounding sheet, to provide for operation from one side only of the sheet, and to accomplish accuracy of cut.

Other objects will appear from the following description and the accompanying drawing.

Of the drawing:

Fig. 1 is an elevation, partly in section, showing the device in its preferred form as it is inserted through an initial circular aperture in the wall of a tubular body of sheet material, the full lines showing the relative relation of the handles before cutting and the dot and dash lines showing the position of one of the handles after the cutting operation is accomplished.

Fig. 2 is a similar view part of the handles being broken away, showing the device at completion of the cut.

Fig. 3 is a detail sectional view taken on line 3—3 of Fig. 1.

Fig. 4 is a view, partly in section, and similar to Figs. 1 and 2, but having the operating mechanism broken away, showing a modified form of the device.

Fig. 5 is a perspective view of a tubular sheet metal article showing at 12 a circular initial aperture and at 11 an aperture which has been enlarged to provide a keyway by use of the device of this invention.

Referring to the drawing, the numeral 10 designates the thin outer wall of a hollow article in which it is desired to form apertures of non-circular shape such as the key-hole shaped aperture 11. A circular initial opening 12 is first drilled through the wall 10 and the device of the present invention is introduced through this initial opening and then operated to remove a part of

the wall adjacent the initial opening to provide the keyway 13.

The device used for enlarging the initial opening comprises a die member 14 formed with a key-hole shaped die aperture 15 extending there-through. A pilot 16 extends through the aperture in the die 14 and is fixed to the die by a screw 17. Pilot 16 is slotted lengthwise to provide a guideway 18 for a draw cutter 19. The draw cutter includes a stem 20 adapted to be reciprocated through a guide bushing 21 to which the pilot 16 is fixed by a screw 22. The cutter 19, in the form of the device illustrated in Figs. 1 to 3 is preferably integral with the stem 20 and has a single offset cutter 23 adapted to cooperate with the key aperture 15 of the die when the cutter is retracted toward the die. The dimensions of the cutter are such that when projected through the die it may be inserted through the metal aperture 12 in the wall 10 as shown in Fig. 1. The clearance space above the cutter 23 then permits the movement of the tool laterally along the wall 10 to a position where the pilot 16 may be pushed through the aperture 12 to bring the face of the die 14 in contact with the wall 10. In this position the cutter 23 will underlie the wall 10 and upon retraction of the cutter a slug 24 of material will be sheared from the wall as seen in Fig. 2. An opening 25 through the guide bushing 21 permits the escape of the slug.

As a convenient means for operating the parts just described, a pair of operating levers 26 and 27 pivoted at 28 after the manner of pliers may be provided. Lever 26 is fixed to the guide bushing 21 and lever 27 is provided with a pin 29 which loosely engages an ear 30 formed on the cutter stem.

In the modified form of the device, illustrated in Fig. 4, the manipulating levers, guide-bushing pilot, and die are the same as in the preferred form of the device. The cutter member comprises a plunger stem 40 having an ear 41 for engaging the pin 29 at its upper end, and a pivot pin 42, at its lower end, to which a swinging cutter blade 43 is pivoted. Blade 43 is formed with a cutter 44 projecting forwardly at its lower end and a raised cam surface 45 at the rear of its lower end. In this form of the device the cutter blade is of such dimensions that when extended it does not project laterally beyond the pilot 16 and is held against the pilot by a leaf spring 46, but in its retractive movement the cam surface 45 engages the guide surface of the pilot and causes the cutter 44 to be projected later-

ally as shown by the dot and dash lines in Fig. 4. This modification enables the device to be inserted without movement laterally with respect to the initial aperture.

5 In either form of the device a spring 47 attached to the lever 26 normally holds the blade in its projected position.

While the device has been shown as constructed to cut a keyway adjacent the initial aperture, it is apparent that different cutting blades and dies may be used to cut extensions of the initial aperture of different shapes.

In the use of the device the metal or other material surrounding the initial opening is held flat against the face of the die and the cutting is accomplished without deformation of the wall around the aperture. The device is especially useful in forming apertures through the thin metal skin of aircraft where anchoring members are to be secured thereto.

I claim:

1. Hand-operated cutting apparatus adapted to enlarge an initial small aperture in sheet metal or other stiff sheet material by operation from one side only of the material, said apparatus comprising a die member adapted to support the material adjacent to the aperture, a reciprocable cutter extending past the die and adapted to pass through the initial aperture, said cutter having a laterally projecting cutting shoulder cooperating with the die to remove a determinate quantity of material in a single retracting movement to produce the desired enlargement and means for supporting and operating the apparatus manually, said means comprising a pair of manually operated arm members one of which is connected with said die and the other of which is connected with said cutter for retracting the same to effect such cutting in cooperation with the die.

2. Cutting apparatus adapted to enlarge an initial small aperture in sheet metal or other stiff sheet material by operation from one side only of the material, said apparatus comprising a die member adapted to support the material adjacent to the aperture, a reciprocable cutter extending past the die and adapted to pass through the initial aperture, said cutter having a laterally projecting cutting shoulder cooperating with the die to remove a determinate quantity of material in a single retracting movement to produce the desired enlargement, means for retracting the cutter to effect the cutting in cooperation with the die, and means additional to said cutter for positively locating the die with respect to the aperture during the cutting movement for removing a determinate quantity of the material.

3. Cutting apparatus adapted to enlarge an initial small aperture in sheet metal or other stiff sheet material, said apparatus comprising a die

member adapted to support the material adjacent to the aperture, a pilot member extending past the face of the die and adapted to be positioned in the aperture in the material in contact with the side thereof to locate the die with respect to the aperture, a reciprocable cutter extending past the die and adapted to pass through the aperture along the pilot member, said cutter having a laterally projecting cutting shoulder cooperating with the die to remove a determinate quantity of material in a single retracting movement to produce the desired enlargement, and means for retracting the cutter to effect the cutting in cooperation with the die.

4. Cutting apparatus adapted to enlarge an initial small aperture in sheet metal or other stiff sheet material, said apparatus comprising a die member adapted to support the material adjacent to the aperture, a reciprocable cutter extending past the die and having a head adapted to pass through the aperture and a reduced shank, the lateral extension of the head past the shank constituting a cutting shoulder which cooperates with the die to remove a determinate quantity of material in a single retractive movement to produce the desired enlargement, a pilot member extending past the face of the die along a portion only of the reduced shank of the cutter and adapted to be positioned in the aperture in the material in contact with the side thereof to locate the die with respect to the aperture, the pilot member being grooved to accommodate and guide the shank of the cutter, and means for retracting the cutter into cutting engagement with the die.

5. Cutting apparatus adapted to enlarge an initial small aperture in sheet metal or other stiff sheet material, said apparatus comprising a die member adapted to support the material adjacent to the aperture, a reciprocable cutter having a shank and a head including a laterally projecting cutting shoulder cooperating with the die to remove a determinate quantity of material in a single retractive movement to produce the desired enlargement, a pilot member extending past the face of the die and adapted to be positioned in the aperture in the material in contact with the side thereof to locate the die with respect to the aperture, the pilot member being grooved to accommodate the shank of the cutter, the head of the cutter in its extended position being sheltered by the pilot and adapted to pass through the aperture in advance thereof, means for moving the cutter laterally with respect to the pilot into alignment with the die, and means for retracting the cutter to effect the cutting in cooperation with the die.

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