June 7, 1932. J. VEHKO 1,861,648

DIE AND PUNCH

Filed Dec. 15, 1927 2 Sheets-Sheet 1

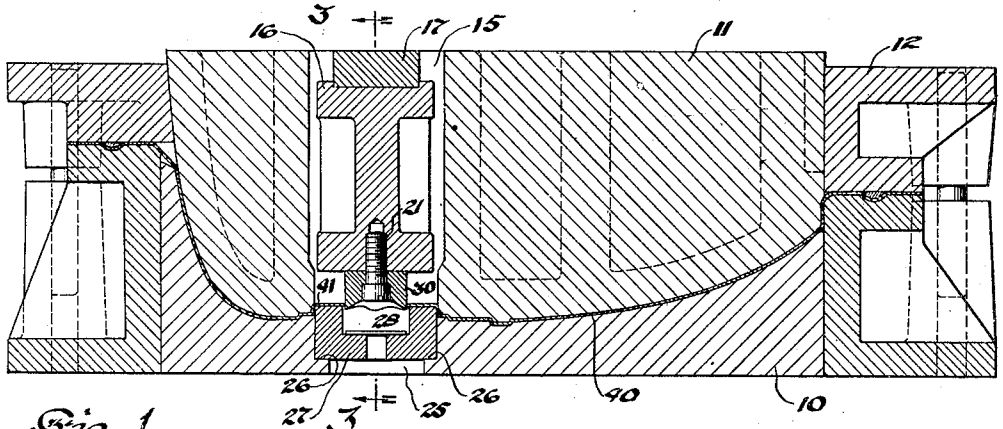


Fig. 1

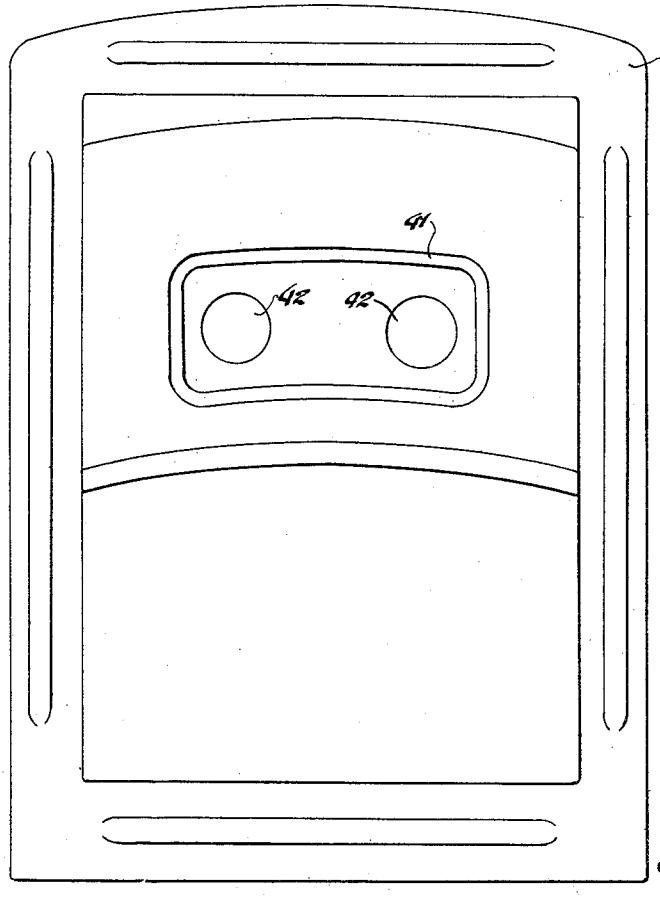


Fig. 2

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DIE AND PUNCH

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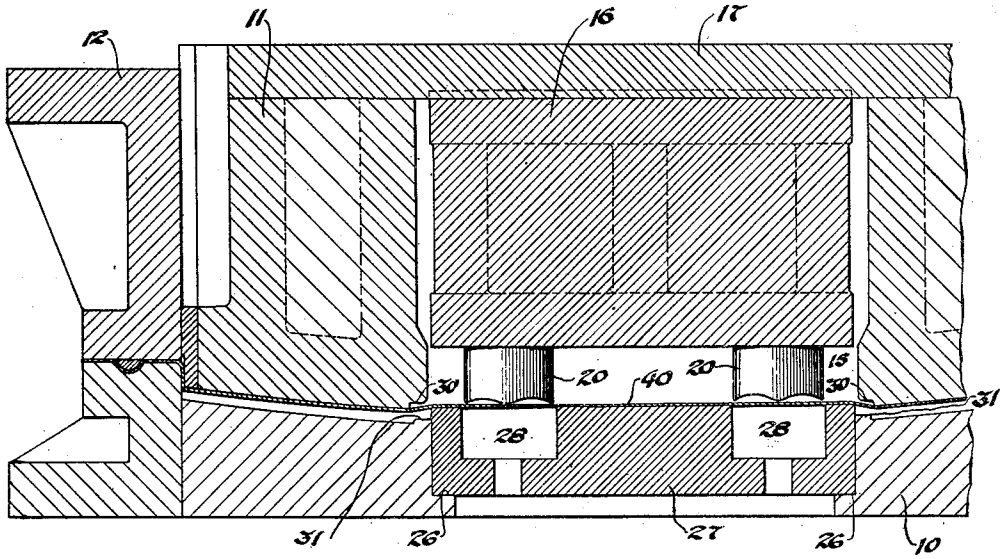


Fig. 3

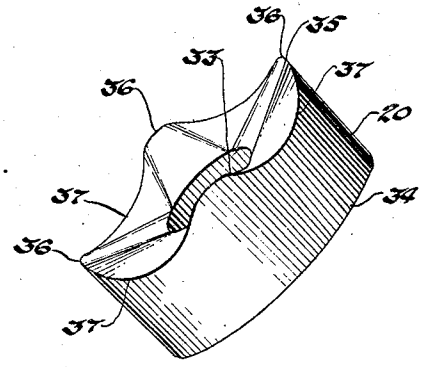


Fig. 4

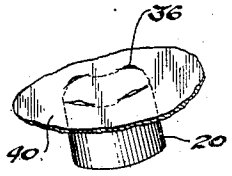


Fig. 5

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UNITED STATES PATENT OFFICE

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DIE AND PUNCH

Application filed December 15, 1927. Serial No. 240,128.

One object of my invention is to provide a drawing die in which offsets may be formed in a sheet metal panel in one operation which heretofore have required a plurality of operations.

Another object of my invention is to provide a die in which the tension of the drawing metal may be relieved simultaneously with the forming of the offsets therein in order that the metal of the panel may be free to flow to the forming offsets without undesirably tearing or otherwise deforming.

Another object of my invention is to provide a die having a punch therein for relieving the tension of the drawing metal in which the punch forms the relief opening gradually rather than instantaneously.

With these and other objects in view my invention consists in the arrangement, combination and construction of the various parts of my improved device, and the steps of my process as described in the specification, claimed in my claims, and shown in the accompanying drawings in which:—

Fig. 1 is a longitudinal cross section of the die and punch at the end of the drawing operation.

Fig. 2 is a plan view of the metal panel after the same has been impressed in the die.

Fig. 3 is a partial transverse cross section taken on the line 3—3 of Fig. 1, and showing the upper half of the die and the punches just prior to the completion of the drawing operation.

Fig. 4 is a perspective of the punch embodied in my invention.

Fig. 5 is a perspective of a portion of the metal panel showing the beginning of the punch operation, the punch being positioned beneath the panel in order to better illustrate the action of its cutting edge.

I have shown in the accompanying drawings a die comprising a lower half 10, an upper half 11 and a retaining collar 12. The die is adapted to be mounted in the conventional form of press, the lower half 10 being secured in the usual manner to the bed plate of the press and the upper half 11 together with the retaining collar 12 secured in the conventional manner to the ram of the press. In the upper half of the die 11 I have provided a transverse opening 15 in which is positioned a member 16 which is secured to a supporting member 17 which in turn is secured by suitable bolts or clamps (not shown) to the upper half 11. On the bottom of the member 16 I have secured punches 20 by means of the screw studs 21 as shown in Fig. 1. I have provided a shouldered opening 25 in the lower half 10 and on the shoulder 26 in this opening I have positioned a member 27 having openings 28 therein adapted to receive the ends of the punches 20. The upper edges and surface of the member 27 extend above the surface of the lower half 10 and are adapted to slide into the lower end of the opening 15 in the upper half 11.

The die shown in the drawings, Figs. 1 and 3, is designed to form a sheet metal panel for the rear of a closed automobile body and to press or draw therein parallel-sided or other non-circular offset reveals for the rear window of the body. The panel, which is illustrated in plan view in Fig. 2, may be designated by the numeral 40 and the reveals for the rear window opening may be generally designated by the numeral 41. These reveals are shown in cross section in Fig. 1 and are drawn to shape between the edges of the block 27, the edges of the upper half 11 which border the opening 15 and which have cut away portions 30 therein (Fig. 3), and raised portions 31 formed on the lower half 10 on the edges of the opening 25 in which the member 27 rests. The punch 20 is cylindrical in shape and has a counter-bored center opening 33 designated to receive the head of the screw stud 21 as shown in Fig. 1. One end of the punch 34 is flat and adapted to fit tightly against the lower end of the member 16. The other end of the punch is generally concave with the outer edges forming the cutting edges of the punch. This cutting edge, which may be generally designated by the numeral 35, is undulated or waved, having high portions 36 and low portions 37. The member 16 is so hung in the opening 15 in the upper half 11 that the high portions of the cutting edges of the punch 20 will contact with the metal panel at about the instant,

or shortly thereafter, when the upper half 11 begins to draw the metal panel 40 over the member 27. As the operation proceeds from that point the high portions 36 of the punches 20 will penetrate the panel 40, as illustrated in Fig. 5, progressively to form a series of spaced cuts, preferably concentrically curved and unequally spaced from the edges of the reveal, said cuts being progressively increased as the low portions 37 of the punches 20 come into action and shear the metal of the panel between the perforations made by the high points 36, thus gradually relieving, as it develops therein, the tension of the drawing metal as it flows to form the reveals 41 and forming the relief openings 42. It is also an advantage in some instances to so position the punch or so construct the high and low points of the cutting edges that the high points will cut through the points of greatest tension in the drawing metal leaving the low portions to shear through the points of lesser tension. It will be understood, of course, that the punch may be formed with as many high and low portions as desired and in such order and positions as desired.

In the device illustrated, the member 27 is of the shape and in position to form the depression for the window opening in the panel. After the panel is removed from the die the portions between the inner edges of the window reveals 41 are cut out, thus forming the window opening.

My invention has several advantages over existing practices. It eliminates at least one operation in the forming of a sheet metal panel such as described, that operation being the one formerly necessary to form the relief openings 42 before the panel was impressed in the die.

Another advantage of my invention is that it eliminates an undesirable tearing which frequently takes place in the die operation when the relief openings are punched in the panel prior to the impression of the panel in the die. The relief openings are not all cut out instantaneously by my punches owing to the high and low places in the cutting edges, and those portions of the metal which are last to be cut tend to guide and control the flow of metal and to localize the undesirable tearing to points in the salvage portions of the panel surrounding the relief openings 42.

Another advantage of my device arises from the fact that the member 27 need not be made with the accuracy and fineness which is required in dies and punches which are used to form relief openings prior to the die operation. The openings 28 in the member 27 need only be of a size to admit the punches 20 and need not be formed to fit the punches with great accuracy and exactness. This construction of the member 27 and the openings 28 is made possible by the use of the punches with the high and low portions in their cutting edges, as the relief openings are not cut out instantaneously but rather are sheared out, the portions last to be sheared thus holding the metal in position for the shearing action of the punch. It is to be understood, of course, that any number of punches desired may be used, the number depending usually on the size of the offset to be formed in the panel. A considerable saving in labor and machinery is obtained in the elimination of the pre-punching operation and punch press and the subsequent transportation of the panels from the punch press to the forming die. Also much skilled labor is saved because it is not necessary to form the member 27 with its openings 28 and the punches 20 with the exactness and accuracy necessary for a punch and die to be used for a pre-punching operation.

Formal changes may be made in the specific embodiment of the present invention without departing from the spirit or substance of the broad invention the scope of which is commensurate with the appended claims.

What I claim is:

1. In combination with a pair of dies adapted to bend and flow sheet metal to shape under pressure, piercing means carried by one of said dies, said piercing means being positioned to engage said sheet metal in the region of flow and having relieved cutting edges adapted to shear through succeeding high tension areas in said sheet metal during the drawing interval to relieve deforming tension therein during advance of said dies.

2. A metal drawing process suitable for use in the production of non-circular offsets, such as those of parallel-edged reveals for windows in panels of vehicle bodies, characterized by the fact that during the drawing of said offsets, a plurality of cuts are progressively formed within the area defined by said offsets but spaced therefrom.

3. A metal drawing process suitable for use in the production of non-circular offsets, such as those of parallel edged reveals for windows in panels of vehicle bodies, characterized by the fact that during the drawing of said offsets, a plurality of cuts are progressively formed within the area defined by said offsets but spaced therefrom,—mentioned cuts being gradually so extended as to shear out a relief opening.

4. A metal drawing process suitable for use in the production of non-circular offsets, such as those of parallel-edged reveals for windows in panels of vehicle bodies, characterized by the fact that during the drawing of said offsets, a plurality of cuts are progressively formed within the area defined by said offsets but spaced therefrom,—mentioned cuts being gradually so extended as to shear

out a plurality of relief openings within said area.

5. A metal drawing process suitable for use in the production of non-circular offsets, such as those of parallel-edged reveals for windows in panels of vehicles bodies, characterized by the fact that during the drawing of said offsets, a plurality of cuts are progressively formed within the area defined by said offsets but spaced therefrom,—said cuts being extended, during said drawing, at such a rate as to promote a desired flow of metal and to obviate objectionable tearing.

6. A metal drawing process suitable for use in the production of non-circular offsets, such as those of parallel edged reveals for windows in panels of vehicle bodies, characterized by the fact that during the drawing of said offsets, a plurality of cuts are progressively formed within the area defined by said offsets but spaced therefrom,—mentioned cuts being so formed that all parts within said area are maintained in a desired relative position.

7. In the process of drawing non-circular offsets in sheet metal panels by means of pressure actuated forming dies, the step which comprises shearing progressively through the metal between said forming offsets during the formation of said offsets by said dies, and thereby controlling the tension of the metal between said forming offsets to prevent undesirable tearing and wrinkling at the offsets.

8. In combination with a pair of dies adapted to draw non-circular offsets in sheet metal, piercing means positioned and adapted to shear progressively through the metal between said forming offsets during the formation of said offsets by said dies, whereby the tension of the metal between said forming offsets is controlled to prevent undesirable tearing and wrinkling at the offsets.

9. In combination with a pair of dies adapted to draw non-circular offsets in sheet metal, piercing means positioned and adapted to shear progressively through the metal between said forming offsets at a plurality of points during the formation of said offsets by said dies, whereby the tension of the metal between said forming offsets is controlled to prevent undesirable tearing and wrinkling at the offsets.

10. In combination with a pair of dies adapted to draw non-circular offsets in sheet metal, piercing means having undulated cutting edge positioned and adapted to shear progressively through the metal between said forming offsets during the formation of said offsets by said dies, whereby the tension of the metal between said forming offsets is controlled to prevent undesirable tearing and wrinkling at the offsets.

11. In combination with a pair of dies adapted to draw non-circular offsets in sheet metal, piercing means carried by one of said dies and positioned and adapted to shear progressively through the metal between said forming offsets during the formation of said offsets by said dies, whereby the tension of the metal between said forming offsets is controlled to prevent undesirable tearing and wrinkling at the offsets.

12. In combination with a pair of dies adapted to draw non-circular offsets in sheet metal, piercing means carried by one of said dies and positioned and adapted to shear progressively through the metal between said forming offsets at a plurality of points during the formation of said offsets by said dies, whereby the tension of the metal between said forming offsets is controlled to prevent undesirable tearing and wrinkling at the offsets.

13. In combination with a pair of dies adapted to draw non-circular offsets in sheet metal, piercing means having undulated cutting edge carried by one of said dies and positioned and adapted to shear progressively through the metal between said forming offsets during the formation of said offsets by said dies, whereby the tension of the metal between said forming offsets is controlled to prevent undesirable tearing and wrinkling at the offsets.

JAMES VEHKO.