Feb. 26, 1946. W. H. SNOW ET AL 2,395,692

APPARATUS FOR FORMING FLANGES

Filed Aug. 31, 1942 2 Sheets-Sheet 1

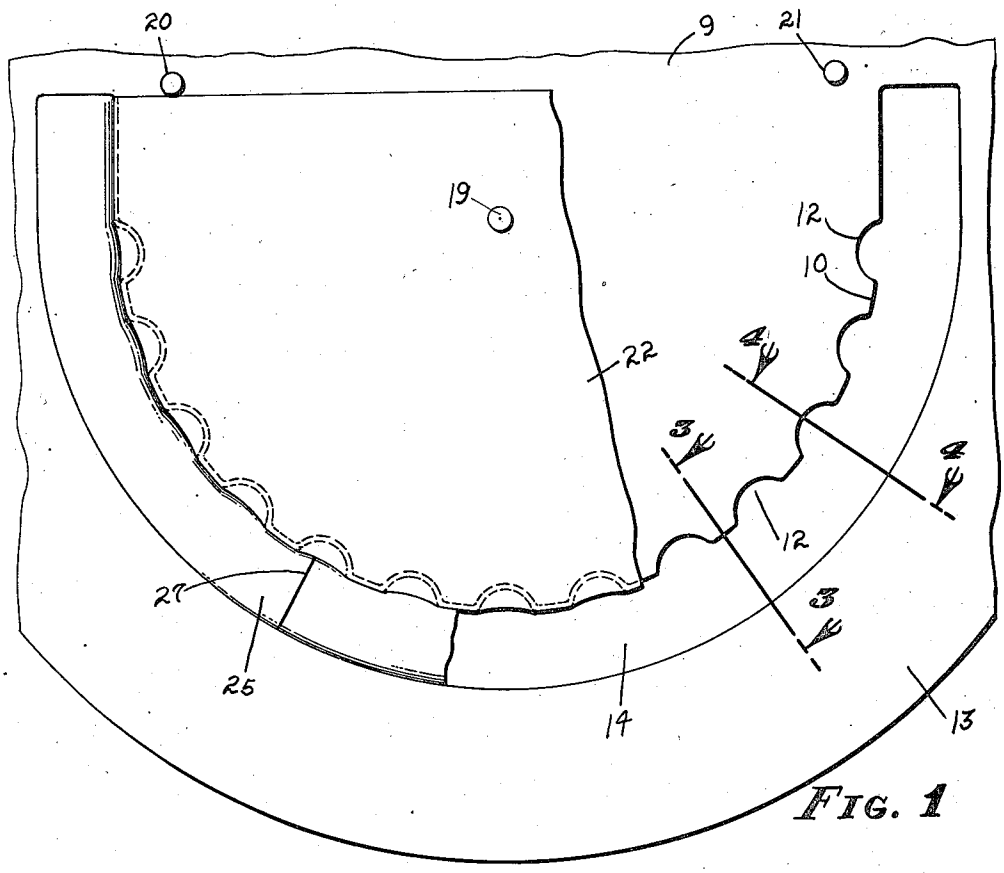


FIG. 1

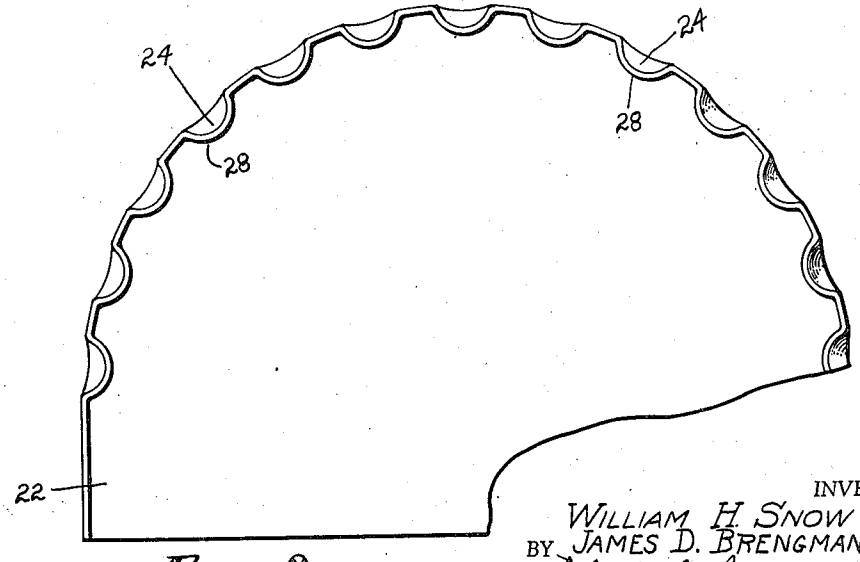


FIG. 2

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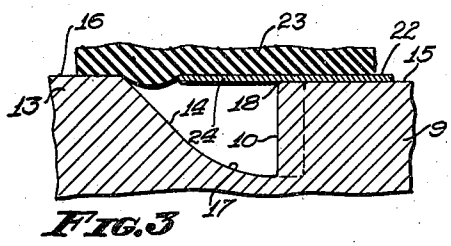


FIG. 3

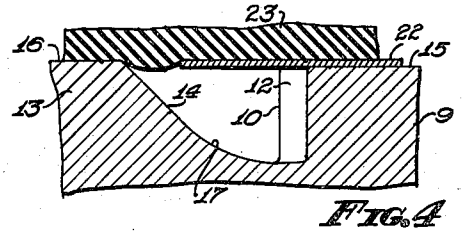


FIG. 4

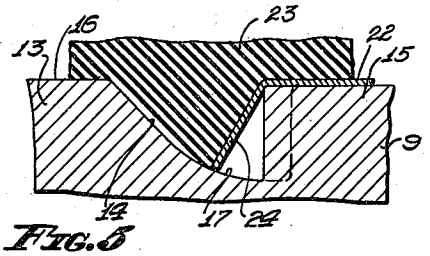


FIG. 5

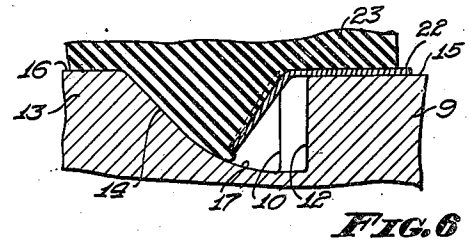


FIG. 6

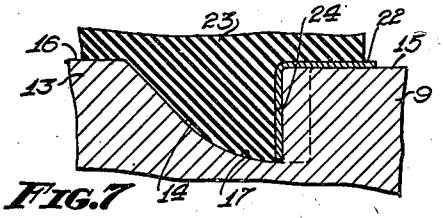


FIG. 7

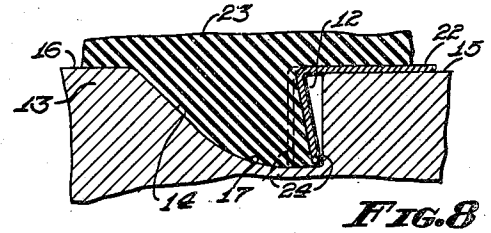


FIG. 8

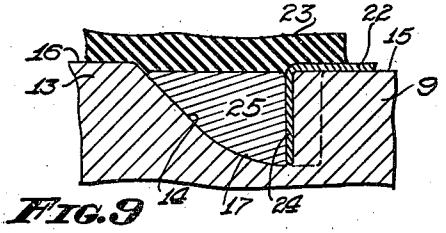


FIG. 9

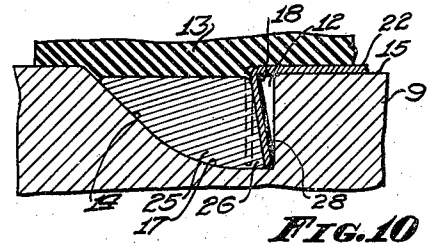


FIG. 10

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APPARATUS FOR FORMING FLANGES

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Application August 31, 1942, Serial No. 456,734

1 Claim. (Cl. 113—44)

Our invention relates to apparatus for forming flanges on a convex radius.

It is an object of the present invention to provide apparatus readily adaptable for use with a rubber punch and a form block such as is used in a hydro-press. In the forming of a flange which causes compression of the metal, a rubber punch is not capable of forcing the metal to flow, consequently buckles are normally formed in bending a flange around a convex radius by use of a hydro-press. It has heretofore been necessary to smooth out such buckles by hand operations after forming. An alternative method of notching or scalloping the edge of the material that is to be formed into a flange may be employed to eliminate the buckling.

Since hand operations and notching or scalloping each requires extra time and expense, it is object of our invention to eliminate not only the requirement of the preliminary notching and scalloping but also the subsequent hand finishing operations.

The primary object of our invention is to provide apparatus that affords means for controlling the formation of buckles in flanges formed on a hydro-press, whereby the direction of buckling and the locations of the buckles may be predetermined.

By means of proper consideration of the following factors, namely, the gauge of the metal to be formed, the radius of curvature, and the depth of the flange to be formed, adequate provision may be made in designing a form block to provide the necessary accommodations for the excess material which produces the buckling during the forming operations. Proper consideration of the foregoing factors allows the buckling action to be controlled to the extent that the undesirable contours formerly obtained may be eliminated and the resultant contour, while buckled, will be of a structurally advantageous form. Such a contour provides a faying surface suitable for assemblies requiring close engagement with adjacent pieces. The aforementioned buckles, properly placed, actually provide increased rigidity in such structures.

Further objects of our invention are to provide such apparatus to control the buckling in flanges formed on a hydro-press which is positive in operation, of practicable nature and convenient in use, of improved structure, economical to manufacture, relatively simple, of great speed of operation and of general superiority and serviceability.

The invention also comprises novel details of construction and novel combinations and arrangements of parts, which will more fully appear in the course of the following description. However, the drawings merely show and the following description merely describes one embodiment of the present invention, which is given by way of illustration or example only.

In the drawings, like reference characters designate similar parts in the several views.

Fig. 1 is a plan view of a form block showing a work piece thereon, broken away.

Fig. 2 is a partly broken away view of one face of the finished product.

Fig. 3 is a section taken on the line 3—3 of Fig. 1, showing a rubber punch at the beginning of the flange bending operation.

Fig. 4 is a section similar to Fig. 3, but taken on line 4—4 of Fig. 1.

Fig. 5 is a section taken on line 3—3 of Fig. 1 but showing the bending in a more advanced stage.

Fig. 6 is a section similar to Fig. 4 but showing the bending in a more advanced state than in the latter figure.

Fig. 7 is a sectional view along the line 3—3 of Fig. 1, showing the completion of the bending operation.

Fig. 8 is a sectional view along the line 4—4 of Fig. 1, at the conclusion of the bending operation.

Fig. 9 is a sectional view along the line 3—3 of Fig. 1, after a pattern slug has been placed in the die block.

Fig. 10 is a sectional view along the line 4—4 of Fig. 1, after the pattern slug has been placed in the die block.

Referring more in detail to the drawings, the reference numeral 9 generally designates a die block having a curve 10 on a relatively short radius and provided with grooves 12 in the circumference of such curve extending from the upper face 15 of the die block 9 to a depth at least equal to the flange to be formed to provide space to accommodate the excess peripheral material. A dam 13 is arranged circumferentially around the die block body 9. The upper faces 15 and 16 respectively of the die block body 9 and the dam 13, are substantially flush with each other, as best shown in Sheet 2.

A channel 14 is cut circumferentially around the die block body 9. The channel 14 preferably slopes downwardly from the top surface 16 of the dam to the bottom of the recesses 12. At least part 17 of the incline is preferably on a radius about an edge 18 of the die block body 9. A centering pin 19 is mounted on the die block body

9 together with guide pins 20 and 21, for a blank 22.

In the use of the present apparatus, the metal blank 22 is placed upon the die block with the pin 19 engaging in a perforation in such blank. The guide pins 20 and 21 also aid in properly aligning the blank when it is placed in position on the die block.

Thereupon the hydro-press is actuated, causing the rubber punch 23 to descend upon the blank as shown in Figs. 3 through 10, it being noted from these figures, as well as from Fig. 1, that, since the grooves 12 extend at their upper ends from the upper surface of the die block, as before stated, they offer no resistance at the bending edge of the block to such slight indentation of the inner, upper edge of the flange, in the flange forming operation, as may be necessary to absorb excess material during the bending operation. In this way creases and wrinkles are avoided, and the result is that the finished flange will have a bent edge with more or less concavely indented edge portions alternating with the convex edge portions along the faying surfaces of the flange between its inward buckles as plainly seen in Figs. 1 and 2. It is plain from Figs. 1, 4, 6 and 8 that the die block grooves 12 are of the same width and depth from top to bottom.

Substantially at the beginning of the operation, the rubber punch appears as shown in Figs. 3 and 4 along lines 3—3 and 4—4. Applying pressure upon the rubber punch causes it to bend flange 24 downwardly into the channel 14, as shown in Figs. 5 and 6. Further pressure results in the work piece being formed substantially as shown in Figs. 7 and 8 with the bent edge composed of spaced convex portions and alternate, spaced, slightly concave portions and the flange composed of spaced convex portions and spaced, alternately arranged buckled areas or scallops.

As a supplementary step, to aid the hydro-press in certain forming operations, auxiliary means are sometimes desirable. This is by reason of the fact that it is not always possible to develop pressures of sufficient intensity in forming operations of this type to secure thoroughly adequate and satisfactory results. In the present process, as a means to assist in completely eliminating small wrinkles or intermediate buckled areas occasionally encountered, the following means may be employed to advantage. A relatively hard slug 25 is cast to fit the channel 14 with the flange 24 of a work piece in place and properly formed, as by manual means. With this manually formed piece in place forming a part of the mold, the slug 25 is cast.

In the example shown, the slug 25 has a series of spaced, vertically inclined toes 26 that substantially conform to the desired contour of the buckled portions of the flange of the finished work piece.

After the initial forming operation, the press is opened and the slug is placed in position. Thereupon the rubber punch 23 is again brought down, causing the slug 25 to force the flange 24 into intimate contact with the configurations of the form block as shown in Figs. 9 and 10.

When the slug 25 is first formed, it will be integral from end to end of the channel 14, but it may be cut into a plurality of sections along transverse lines 27, to provide for individual adjustment during the forming operation. These slugs may be of metal having relatively low melting point, such as what is known in the trade as "cerrobend," which is known to those skilled in the art and which is a modified Woods metal that liquefies at approximately 160° F.

The finished product will be similar to that shown in Fig. 2 which has the flanges 24 buckled under, as shown at 28.

The foregoing product has been found to have smooth faying surfaces on the flange 24 between the inwardly bent buckles 28. Moreover, the apparatus has been found to embody the objects hereinbefore stated and to produce the present product with satisfactory speed, economy and efficiency.

While we have illustrated and described what we now regard as the preferred embodiment of our invention, the construction is, of course, subject to modifications without departing from the spirit and scope of our invention. We, therefore, do not wish to restrict ourselves to the particular form of construction illustrated and described, but desire to avail ourselves of all modifications that may fall within the scope of the appended claim.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

In combination, in a flanging press, a rubber press head, a die block comprising, a one-piece body having a plane upper face and having an upwardly facing rubber press head receiving channel formed therein on a convex radius, said channel having closed ends and a rear wall perpendicular to the plane upper face of the die block and provided with a plurality of uniform vertically extending corrugations opening through said plane upper face of the die block, said channel further having an uninterrupted curved combined bottom and front wall extending from the lower edge of the rear wall and merging into the plane upper face of the die block at a predetermined distance from the upper edge of the rear wall of said channel to form a cam surface, and a removable auxiliary die block having a cam surface conforming to the cam surface of the channel and disposed within the latter for movement into engagement with a partially formed flange of a workpiece supported on the plane upper face of the die block, whereby the partially formed flange of the workpiece will be forced against the rear corrugated wall of the channel, so as to complete the flanging of the workpiece.

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