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CRIMPING DIE DEVICE

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6 Claims. (Cl. 113—54)

My invention relates to a die device for turning over an upstanding edge flange upon a sheet metal automobile door panel, or similar work, upon another metal sheet, e. g. the inner metal panel of a door.

In the quantity production of such doors it is desirable that the crimping over of the edge flange of the outer panel upon the inner panel edge to form a reinforcement and a smooth finish at the edge of the door be accomplished expeditiously, and in such manner that the crimped joint is in all cases firmly pressed down evenly all around the edge of the door. The panels of such doors are usually formed, the outer with a flange extending laterally from the plane of the body of the panel, while the inner is flanged laterally, spacing its body from the outer panel and provided with an edge flange adapted to seat against the body of the outer panel within the lateral edge flange thereon, over which the said edge flange is crimped in the assembly of the door.

It is an object of my invention to provide a crimping die for use in connection with such doors and similar work which can be used in the ordinary die press to effect the crimping together of the edges of the work at one working stroke of the press, thereby effecting a great saving in the cost of production where quantity production is desired, and at the same time obtaining an excellent product. To attain this object the dies are so designed that the lower die resting on the press bed is formed with a die surface supporting the edge of the work, and this is opposed by two sets of crimping dies, one set being adapted in the initial stroke of the press to effect a partial and even turn over of the lateral edge flange of the work, and the other set being adapted to effect the final firm crimping down of the flange in the further down stroke of the plunger of the press.

Further objects and advantages will become apparent from the following detailed description of the improved crimping die device when read in connection with the accompanying drawings, in which,

Fig. 1 is a side elevational view, more or less diagrammatic, showing a side of the die device of my invention extending in the direction of the length of the door, the curved dotted lines indicating the curved outlines of the door panels.

Fig. 2 is a vertical sectional view of the improved device, showing the upper and lower die holders in one position of approach movement.

Fig. 3 is a similar view showing the parts at the end of the approach movement.

Figs. 4 and 5 are sectional views corresponding to Figs. 2 and 3, showing a modified form of the invention.

According to my invention I provide upper and lower die holders 10 and 11, respectively, which are adapted to be secured respectively to the plunger and bed of a press. The lower die holder is provided with an upstanding shouldered and buttressed rib 12 of massive proportions conforming generally to the longitudinal and lateral dimensions of the doors to be operated on. Upon the shoulder 13 of this rib is seated a die 14 having a surface 15 conforming to the contour of the edge of a door and upon which the edge of the door to be crimped is adapted to be seated. The die is locked in place by the bolts 16. On a shoulder 17 outwardly of the shoulder 13 are secured by bolts 18, the blocks 19 and 20 having the inclined cam surface 21 inclined at an angle of substantially 45°. The block 9 is extended up slightly higher than the die surface 15, thereby forming a positioning shoulder for locating and retaining the work in proper position. The purpose of this inclined surface 21 will be hereinafter described.

The upper die holder 10 carries fixed and movable die surfaces, which are adapted to act successively in turning down the edge flange of the door.

The movable dies 22 have an elongated upper portion 23 guided for movement laterally of the direction of movement of the press plunger by the guideways 24 provided on the die holder 10. At the inner ends of portions 23, they are provided with a downwardly extending portion 23', the lower end of which has a short inwardly extending arm 25 formed with the die surface 26 inclined at the same angle as the surface 21, that is, at an angle of substantially 45°. It is this surface 26 which is adapted to effect the initial turning over of the flange on the work.

In the form of my invention shown in Figs. 2 and 3, the movable dies 22 are forced to their inner operative position by powerful springs 27 which act against the vertical portions 23' of the dies and a vertically extending apron 28 secured, as by bolts 29, to the outer edge of the die holder 10. As many such springs are used in connection with each die section 22 as may be necessary. In this case three are shown, see Fig. 1.

These springs must be powerful enough to cause the turning over of the flange on the work through an angle corresponding to the incline of

the die surface 26 without yielding, yet must not greatly exceed the force required for this purpose, so as not to greatly oppose the further descent of the upper die holder after the parts have reached the position shown in Fig. 2, for it will be obvious that the dies 22 will be forced laterally against the action of the springs 27 by engagement of the inclined face 26 with the inclined cam face 21 on the blocks 19 and 20 on the lower die holder 11, in the further descent of the die holder 10.

To effect the final crimping down of the flange of the work, a fixed die 30 is rigidly secured to the under side of the upper die holder as by bolts 31, the die 30 having a working face 32 corresponding in contour to the die face 15 upon which the edge of the work to be operated on rests, and directly opposed thereto. Thus in the final approach movement of the die holders 10 and 11 in the operation of the press in which they are installed, the flange is firmly and uniformly crimped, as shown in Fig. 3, between the upper and lower opposed die surfaces 15 and 32.

In the modified construction shown in Figs. 4 and 5, the movable dies 22' are adapted to be positively moved in both directions and held to the work during the partial turning over of the flange by abutments 32' secured to the lower die holder 11'. Except for these abutments the lower die holder may be the same as in the form first described. The dies 22' are guided for transverse movement in the upper die holder 10' by means of the jibs 33 and when the upper die holder is in its raised position the vertical faces 34 on the dies bear against corresponding vertical faces 35 on the abutments 32' on the lower die holder 11'. This engagement continues during the time the inclined die faces 26' are acting on the flange of the work, to turn it over through substantially 45°, and it is only when the work of these movable dies has been completed that the faces 34 descend below the faces 35 on the abutments 32'. The dies 22' are subsequently guided laterally between the parallel inclined faces 20' and 36, both rigid with the lower die holder 11', and the coating parallel surfaces 26' and 21' on the die members 22', until, in the final position of approach of the two die holders, the dies 22' occupy the positions shown in Fig. 5.

While the die is thus positively moved transversely to the direction of movement of the die holders 10' and 11' during their approach and separation movements, relatively light springs 38, as compared with the springs 27, are employed to hold the dies from outward displacement, should the upper die holder 10' rise high enough, to disengage faces 34 and 35. The springs 38 are arranged in recesses 39 in the abutments 32' and between the die members 22' and downwardly projecting plates 40 arranged at intervals, and secured to the upper die holder 10' by the bolts 29'.

The fixed die 30' and its working face 32', the lower die 14' and its working face 15' are similar in all respects to the corresponding parts in the form shown in Figs. 2 and 3.

Assuming the die holder 10 secured to the plunger of a press and the die holder 11 to its bed, the operation of the new improved die device is as follows:

An outer panel *a* having an upstanding edge flange as *b*, in the position shown in dotted lines in Figs. 2 and 4 is first placed in position with its outer edge supported by the die face 15 and located by the upwardly projecting portion of the blocks 19. Then the inner panel *c* having its edge

flange, as *d*, resting on the body of the panel *a* just inside the edge flange *b* thereof is brought into position. It is held down in the operation of crimping by a suitable means, such as the hold down member 41 engaging it adjacent its periphery.

The press is now started to execute the usual cycle of approach and separation movement. This causes the die holders to approach each other and during the approach, the inclined faces 26 on the transversely movable dies 24 engage the flange *b* and turn it down uniformly from the dotted line position in Fig. 2 to the full line position through approximately an angle of 45°. This initial turning over of the flange accomplished, the work of the dies 22 is over and they are moved laterally out of the way of the descending dies 30 by the engagement of the inclined face 26 with the correspondingly inclined cam face 21. After they have been moved laterally out of the way, the dies 30, by their faces 32, engage the partially turned down flange, and complete the turning down and finally at the end of the stroke of the press firmly crimp the joint between the opposed surfaces 15 and 32 under the heavy pressure then available, and forming a very tight and effective crimped jointer entirely around the margin of the door.

While I have herein described specific embodiments of my invention in which two separate sets of dies are mounted on the movable member of the press, it will be understood that this specific embodiment of the invention is not intended to limit its applicability in other forms which will be evident to those skilled in the art, and such forms are intended to be included in the claims appended hereto.

What I claim is:

1. In a crimping die device, die holders adapted to be relatively approached and separated, a die on one of said holders having a face conforming to and supporting a perimetral edge of the work to be operated on, die members movable in the direction of said approach and separation movement and transversely thereto, and having inclined faces adapted to initially engage an upstanding perimetral edge flange on the work supported on said first-named die face in the approach movement of said holders to partially turn down said flange, means for moving said die faces transversely in the further approach movement, and additional die faces on the other of said holders conforming in contour to the die face on which the work is seated and adapted to engage the partially turned down flange on the work and crimp it down in the last of the approach movement of said holders.

2. In a crimping die device, die holders adapted to be relatively approached and separated, a die on one of said holders having a face conforming to and supporting a perimetral edge of the work to be operated on, a die fixed on the other of said holders and having a surface adapted to engage the work and dies movable in the direction of the approach and separation movement of the holders and transversely thereto, said last-named dies having faces adapted to engage the work initially in the approach movement of the holders to partially turn down an upstanding perimetral edge flange thereon, and means for, during the continued approach movement of the holders, causing said movable dies to be moved to inoperative position whereby to permit the faces of the fixed dies to act on the work to fully turn down said flange in the final approach movement.

3. In a crimping die device, die holders adapted to be relatively approached and separated, a die on one of said holders having a perimetral face conforming to and supporting the edge of the work to be operated on, die members movable in the direction of said approach and separation movement and transversely thereto, and having operative faces inclined at an angle of substantially 45° to the direction of travel of said holders during the approach movement thereof, and additional die faces on the other of said holders conforming in contour to the die face on which the work is seated and adapted to engage the partially turned down flange on the work and crimp it down in the last of the approach movement of said holders.

4. In a crimping die device, die holders adapted to be relatively approached and separated, a die on one of said holders, having a face conforming to and supporting the edge of the work to be operated on, fixed and movable dies carried by the other of said holders, the movable dies having inclined faces adapted to engage the work initially under yielding pressure to partially turn down an upstanding edge flange thereon, and means for, during the continued approach movement of the holders, positively causing said movable dies to be moved to inoperative position, whereby to permit the faces of the fixed dies to act on the work to fully turn down said flange in the final approach movement.

5. In a crimping die device, die holders adapted to be relatively approached and separated, a die on one of said holders having a face conforming to

and supporting a perimetral edge of the work to be operated on, dies movable transversely of the approach and separation movement of the holders and having inclined faces adapted, in the approach movement of the holders, to engage an upstanding perimetral edge flange on the work and partially turn it down, and a member fixed to the work supporting die holder having an inclined face in the path of movement of the inclined faces of the dies for causing a transverse withdrawal of the dies from operative engagement with the work in the further approach movement of said holders, to permit engagement of the partially turned down flange by die faces directly opposed to the die face on which the work is supported to finally crimp down said flange between said opposed faces in the final approach movement of the holders.

6. In a crimping die device, die holders adapted to be carried by the bed and plunger, respectively, of a die press, a die on one of said holders having a perimetral surface adapted to receive the edge of the work to be operated on, and die members movable with respect to one of said holders and adapted in the relative approach movement of the plunger and bed of the press to engage throughout the die surface an upstanding flange at the edge of the work to partially turn it over and then be moved into inoperative position, and a further die fixed on the other of said holders and operative in the final approach movement of the holders to crimp the flange down firmly upon the first-named die surface.

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