Nov. 19, 1957 F. CICERO 2,813,571

CHANNEL DIE FOR FLANGING AND FOLDING CORNERS

Filed Feb. 25, 1954

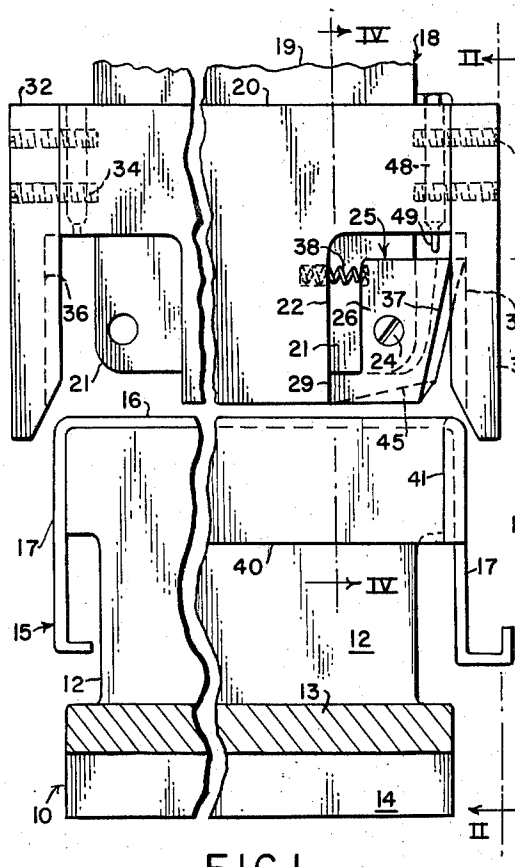


FIG. 1

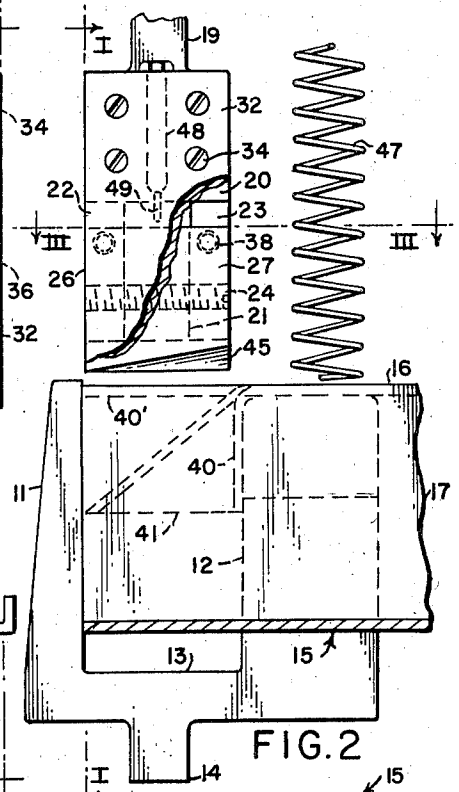


FIG. 2

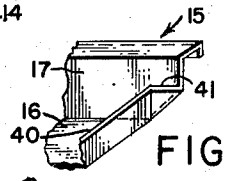


FIG. 7

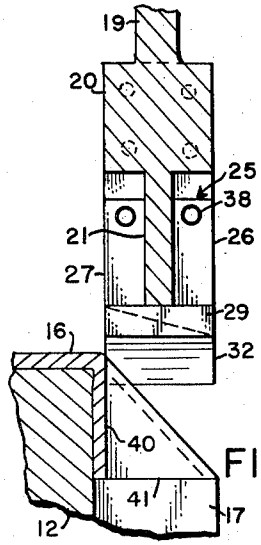


FIG. 4

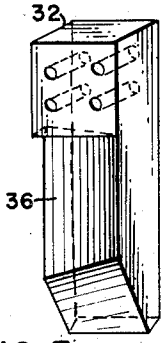


FIG. 5

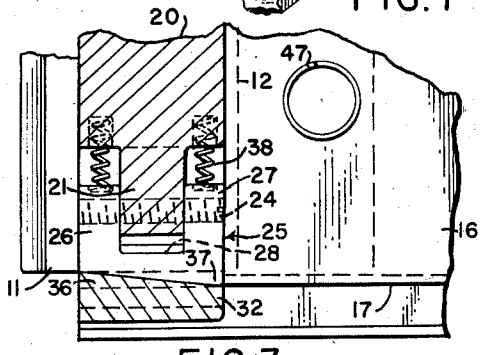


FIG. 3

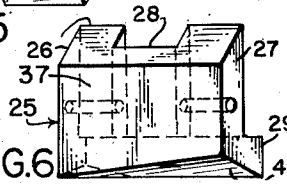


FIG. 6

INVENTOR.

Frank Cicero

United States Patent Office 2,813,571 Patented Nov. 19, 1957

2,813,571

CHANNEL DIE FOR FLANGING AND FOLDING CORNERS

Frank Cicero, Los Angeles, Calif.

Application February 25, 1954, Serial No. 412,573

7 Claims. (Cl. 153—21)

My invention relates to sheet-metal fabricating dies of the type which are commonly used with power brakes for shaping the ends of channel members, or in making boxes, of sheet material having unnotched corners when flat.

In forming an end flange on sheet metal canopies, roofing channels, and tiles, it has been the prior practice to use a U-shaped, or channel-like matrix die secured to the bed or base of a power brake, and a simple bar-like punch die secured to the ram of the brake. The punch die is actuated by the ram to press down one end portion of the bottom of the channel member when the channel member is supported in inverted position on the free end of one of the arms of the matrix die with the end portion thereof, including the previously mentioned end portion of the bottom, extending toward or against the side of the other arm of the matrix die, this other arm being higher than the first mentioned arm, the punch die traveling into the channel of the matrix die and pressing down the end portion of the bottom against the inner wall of the first mentioned arm of the matrix die. In order to prevent damage to the corner folds produced during this procedure, it is necessary to use a punch substantially shorter than the width of the channel. This use of a punch of substantially less length than the width of the channel required a fold-closing operation which was usually imperfectly and expensively done by hand.

The present improvement includes a mechanical arrangement which operates to close and finish the folds above referred to, simultaneously with the operation of forming the end flange. In my improved die, each lower corner of the punch die is reduced in thickness to form a rib which is enclosed by a specially shaped block member pivoted intermediate its ends on a pin extending traversely through the rib. The main body of the punch is preferably as long at one side as the inner width of the channel, and there are specially shaped guide members or bars fastened at ends of the punch which are preferably arranged and designed to push the sides of the channel gradually inward during the forming operation. Between the pivoted members and the guide members are gaps or spaces which receive the triangular end folds as the punch moves downward into the matrix die and turns the end flange. In the open position of the dies, the gaps or spaces have inverted V-shapes, the walls defining such gaps being inclined inward in their extension toward the rear of the punch die mechanism. The arrangement of the parts is such that when the punch is moved through part of its downward travel and the end flange is turned approximately half-way, the pivoted members start to rotate about their supporting pins due to the entrance into the V-shaped gaps of the thick, loose, triangular folds then being produced. This pivoting movement is continued during further downward movement of the punch, with the result that the bottom portion of the pivoted members are moved outward toward the sides of the channel, which are then backed by the guide members to close the folds. The fact that the gaps

are open at the beginning of the forming operation, and are not brought into closing position until substantial completion of the forming operation, permits the downward moving end flange to pull down the side walls of the channels to form the triangular shaped folds. These folds are pushed inwardly during the forming operation by the slanting surfaces of the guide members in order that the material will not be stretched by said pulling of the flange. The pivoted members are returned to their normal positions by spring reaction when the ram moves upwardly, and the channel is freed from the punch by means as hereinafter described. The pivoted members are provided with two-way inclined bottoms as shown, in order that their pressure or forming action upon the above mentioned folds will occur at the proper time after initiating the formation of the end flange and the above mentioned folds. And it must be noted that the said pressure upon the sides of the channel will prevent the latter from getting an uneven bottom surface as in the prior practice above referred to.

In the annexed drawing which illustrates a preferred construction:

Fig. 1 is an elevation of my improved die mechanism, as seen from the rear, with one of the pivoted forming members of the upper die removed, and with one of the arms of the lower channel-shaped die cut away, the view including a channel roof member shown in position on the lower die, the left hand and right hand portions of the channel member being differently drawn so as to show, respectively, the original shape of the end of the channel member and the reformed shape of the channel member.

Fig. 2 is a side elevation of the die mechanism and the channel member shown in Fig. 1, the view being taken from a line corresponding to the line II—II in Fig. 1, and showing both the finished and original shape of the end of the channel member. Looking at the matrix in Fig. 2, the arm at the right is located at the operator's side or front of the power brake.

Fig. 3 is a sectional plan view taken from the line III—III in Fig. 2.

Fig. 4 is a sectional elevation taken on line IV—IV of Fig. 1.

Fig. 5 is a perspective view of one of the guide members.

Fig. 6 is a perspective view of one of the pivoted forming members of the upper die.

Fig. 7 is a perspective view of a corner of a channel member after being preformed by my die mechanism.

Referring to the drawings, the U-shaped matrix die **10** has a rear side or arm **11**, a front side or arm **12**, a bottom portion **13** and a butt **14** which is adapted to be inserted in the base or bed of a power brake, punch press or the like. A sheet metal roofing channel **15** is shown in Figs. 1 and 2 as being positioned over the matrix die. This channel member comprises a bottom portion **16** and sides **17**. The improved punch die **18**, which fastens to the ram of a power brake or the like by its butt **19**, has a bar-like main member **20** reduced in thickness at each lower corner portion, and thus formed with ribs **21** and shoulders **22** and **23**. A pivoting block or pivotally supported member **25** is mounted on each rib **21** by means of a pivot pin **24** which should have a bushing and extends through the rib. These pivotally supported members are each constructed with two side walls **26** and **27** which extend over the associated rib **21**, a back wall **28** and bottom wall **29**. As shown, the bottom wall **29** of the pivotally supported members are extended and normally abut against the shoulders **22** and **23**, while a space is provided between walls **26** and **27** and the shoulders **22** and **23** and between the vertical sides of the ribs and the back walls **28** of the members. In other words, the pivoted members are constructed with U-shaped channels which receive the reduced

portions of the main member and, in consequence of the provision of the above described spaces, are capable of being moved toward and away from the shoulders 22 and 23. Only one of the pivotally mounted members 25 appears in Fig. 1, since the left hand portion of the upper die mechanism has been shown with the associated pivotally mounted member removed. The two-way slanting surface of one of the guide members 32 is indicated in Figs. 1, 3 and 5 by the reference numeral 36. This surface partly slopes outward in its downward extension, and also slopes outwardly in its extension toward the front of the die from the face of the guide member. As it is apparent, the guide bars 32 could be provided without the slanted surface 36 leaving therefore simply an upstanding surface opposite that of the slanted surface 37. The backs 28 of the pivotally mounted members 25 are formed with slanting surfaces 37 which project in two way in normal position and parallel the slanting surfaces 36 on the guide bars at the end of the forming operation. In the normal position of the pivotally mounted members 25, the tops of the surfaces 37 abut against the slanting surfaces 36 of the guide members, the latter surfaces preferably being extended upward a little higher than the tops of the pivotally mounted members 25.

The guide members 32 are secured to the main member 20 by screws 34, and the upper ends of the surfaces 37 on the pivotally mounted members 25 are normally held in abutting relation to the guide members 32 by springs 38. As clearly illustrated in the drawing the springs 38 are partly embedded in the member 20 in holes formed in the vertical shoulders 22 and 23.

When the upper die mechanism is moved downward between the arms 11 and 12 of the matrix die, the end 40' of the bottom 16 of the channel (see Fig. 2) is turned down as indicated by the numeral 40 in Figs. 1, 2, 4 and 7; and at the same time the triangular portion 41 of the sides 17 are pulled or rolled down and laid flat against the sides 17 due to the insertion of the folding metal into the upper portion of the inverted V-shaped gaps, the spring 38 being compressed by rotation of the pivotally mounted members 25. The pivotally mounted members 25 have the same thickness as the member 20, and are constructed with a two-way slanting bottom surface 45 with its highest point at the corner formed by the surface 37 and the side 27. It is important to note that the horizontal length of the slanted bottom 45, as taken along the thickness of the block is the same as the width or depth of the flange 40. Consequently, if one should want to obtain a less deep flange by the use of the same punch and matrix, obviously he would have to replace the block with another having a shorter horizontal length above referred to and also replace the guide member with another having a less wide slanted surface 36. Moreover, it is apparent that the flange 40 may be made as deep as the sides 17 of the channel simply by providing a wider opening on the matrix and a thicker punch die mechanism.

To further aid the folding action of the triangular portions 41 of the sides 17 of the channel, the bottoms of the members 25 may be further slanted as desired in relation to the bottom of the member 20.

A number of compression coil springs 47 may depend from the ram of the brake to press down on the channel over the front arm 12 of the matrix die and to aid in the release of the channel from the upper die mechanism.

Moreover it may be found desirable to lubricate the pivotally mounted members 25 and the portions of the channel member which are folded. I, therefore, provide drilled wells or reservoirs 48 in the member 20 for containing lubricant, or lubricant soaked cotton. The wells 48 connect with conical apertures which extend downward through the bottom surfaces of the overhanging portions of the member 20 above the upper ends of the members 25. Pins 49 are mounted in the conical apertures. These pins are formed with conical heads which seat within the conical apertures, and with depending portions which are engaged by the members 25 to unseat the heads and to cause an outward flow of lubricant from the wells 48. Compression coil springs may be inserted in the wells 48 to maintain the conical heads of the pins 49 normally seated within the conical apertures, and thereby prevent an excessive outward flow of lubricant from the wells 48.

While I have herein shown my die mechanism for flanging and folding corners in channels as embodied in a preferred form of construction, it will be apparent that further alterations or modifications or adaptations and further adjustments and additions might be made in the construction without departing from the spirit of the invention. Consequently, without limiting myself in this respect, I wish to be afforded the full scope of the appended claims.

I claim as my invention:

1. In a die of the type referred to and comprising a U-shaped matrix die and a punch die therefor: a bar-like main member of said punch die; a pivoting block fastened at lower corner of main member by means of a pin means transversing the block and said corner, the latter forming a rib means therefor; a guide member attached at both ends of said main member and having a two-way slant surface adaptable to press inwardly an end portion of the sides of a channel in position over the matrix to have a flange turned the main member being of a length substantially the same as that of the inner width of the channel, the pivoting blocks having a slant surface normally two-way projecting and facing said slant surface of the guide members, both of said surfaces forming in normal position an inverted V gap slant in depth, downward movement of the main member into the matrix effecting said turning of the flange and pivoting movement of the blocks to press a folding triangular end of the sides of the channel against said sides, the bottom of the blocks being slanted upwardly toward the corner aligned with the related end of the turned flange.

2. In a die of the type referred to and comprising a U-shaped matrix die and a punch die therefor: a bar-like main member of said punch die; a pivoting block fastened at each lower corner of the main member by means of a pin means transversing the block and said corner, the latter forming a rib means therefor; a guide member attached at both ends of said main member for enclosing when in operation the sides of a channel in position over the matrix to have a flange turned, the pivoting blocks having a slant surface projecting normally against an upstanding surface of the guide members and forming an angular gap therewith, the guide members also having a two-way slant surface adaptable to press inwardly an end portion of the sides of a channel in position over the matrix to have a flange turned, downward movement of the bar-like member into the matrix effecting said turning of the flange and pivoting of the blocks to press the folding triangular ends of the sides of the channel against said sides, the bottom of the blocks being slanted upwardly toward the corner aligned with the related end of the turned flange.

3. A device as described in claim 2 and including means operative to pivot the blocks to the unoperated position, following upward movement or return of the punch die to the inoperated position and removal of the channel from the gaps in between the blocks and the guide members, said means comprising: spring means supported by the main member and adaptable to force the upper end of the blocks abutted against the guide members.

4. A device as described in claim 2 and including: a reservoir provided within the main member for containing lubricant material and having an outlet aligned with the top of the block adjacent the guide member the outlet providing a shoulder; and a plug means normally seated on the shoulder and having an extension adaptable to be set in motion by the top of the block when this is moved from the guide member, thus unseating the plug means to allow drip of the material

to lubricate the block and the folding corner of the channel.

5. A device as described in claim 2 and including: a ram; a spring means, carried by the ram whereat said punch die may be attached, adaptable to press upon the channel when the punch die is in operated position and to push the channel out of a possible grip of the pivoting blocks and guide members when the ram and punch die return to the inoperated position.

6. In a die of the type referred to and comprising a channel-like matrix die and a punch die thereof: a bar-like main member of said punch die having a portion around the two lower corners reduced in thickness; two blocks having a U-shaped cut-out whereinto said reduced portion inserts, a pin means being provided transversing the blocks and the reduced portions, the bottom of the blocks being normally abutted against the shoulders formed by the reduced corners, a space being provided in between the upper portion of the blocks and said shoulders and in between said reduced portion and the inner side of the cut-out in order that the blocks may be pivoted or moved toward and from said shoulders; a bar member attached at each end of said main member and pending therefrom for enclosing in the operation the sides of a channel in position over the

matrix die to have an end flange turned, the surface of the blocks opposite the bar members being slanted to form therewith when in the inoperated position inverted V gaps slant in depth, the bar member having the surfaces opposite the blocks also slanted to press inwardly an end portion of the sides of the channel, downward movement of the main member into the matrix effecting said turning of the flange and pivoting of the blocks to press the folding triangular ends of said sides against said sides of the channel.

7. A device as described in claim 6 and a bottom surface of the block being slanted upwardly toward the corner vertically aligned with the relative end of the turned flange when the punch die is in the inoperated position.

References Cited in the file of this patent

UNITED STATES PATENTS

448,814	Fox	Mar. 24, 1891
810,818	Stevenson	Jan. 23, 1906
1,092,486	Hoffman	Apr. 7, 1914
1,462,475	Atkinson	July 24, 1923
2,350,046	Kelleher	May 30, 1944
2,638,958	Norquist	May 19, 1953