Aug. 12, 1958 L. HARDMAN 2,847,053

DIE MEANS FOR FORMING DEEP BENDS

Filed June 7, 1954 2 Sheets-Sheet 1

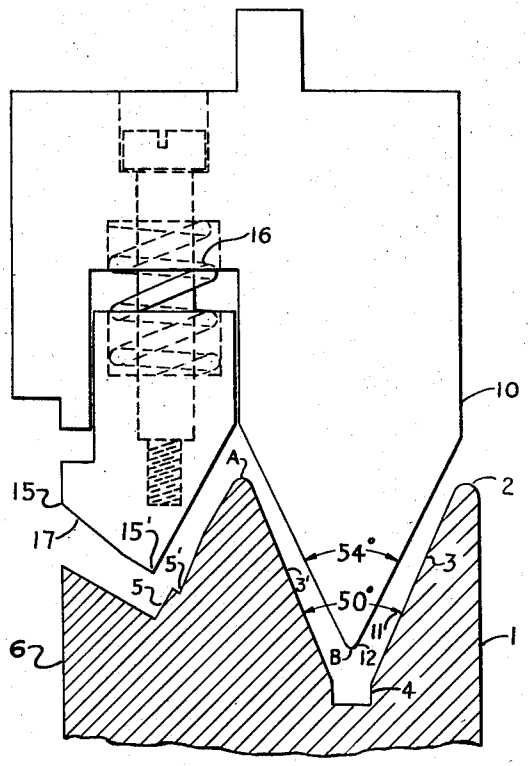



FIG-1




FIG-2

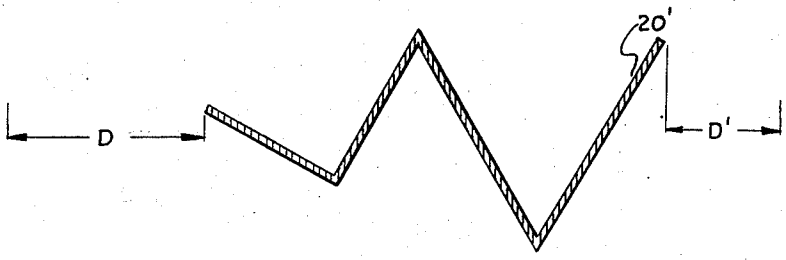



FIG-3

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DIE MEANS FOR FORMING DEEP BENDS

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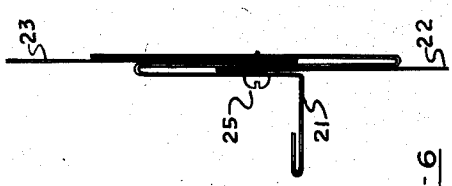



FIG.-6

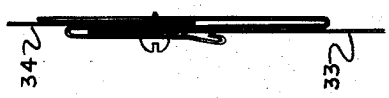



FIG.-9

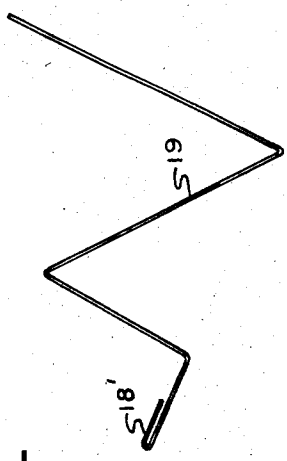



FIG.-5

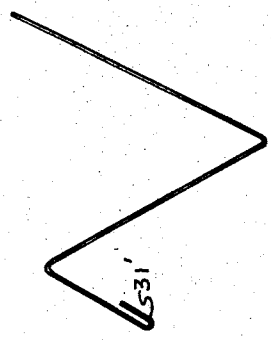



FIG.-8

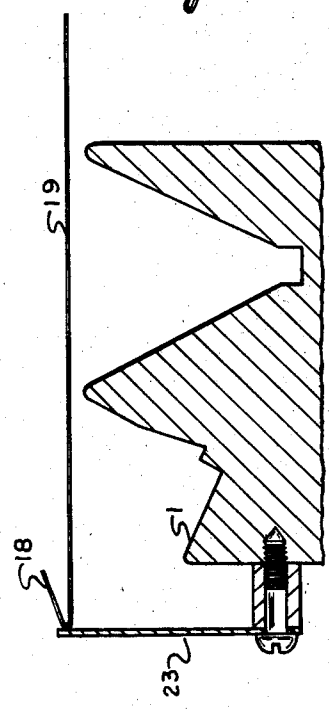



FIG.-4

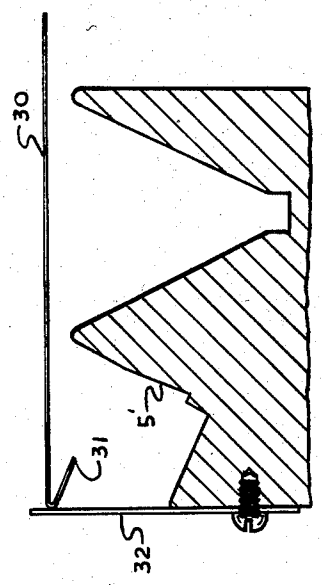



FIG.-7

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2,847,053

# DIE MEANS FOR FORMING DEEP BENDS

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Application June 7, 1954, Serial No. 434,764

1 Claim. (Cl. 153—21)

This invention relates to metal forming dies and more particularly to dies for forming multiple deep bends in sheet metal, to make sheet metal locking members.

In sheet metal work, it is necessary quite often to make deep multiple bends in metal strips, for instance in making the locking strips for metal duct work, such as bar slip locks and S slip locks. In making such bends the overall dimensions of the metal strip varies considerably. In other words, as the die is applied to the metal strip to make the deep bends, the metal travels relative to the die face. For instance, assume a strip is 6" in width. After making deep bends, the overall width may be as little as 3½". Therefore, the die must be specially constructed in order to permit the movement of the metal during the application of the die. The present invention is not concerned with repeated strokes. The die of the present invention is designed to form the bends in one stroke of the press.

In order to avoid tearing the metal at the sharp bend points, the die is specially constructed so that there is space around positive portion of the die for the metal to travel. Another special feature of the present invention is that one of the sharp positive bends is a spring loaded portion whereby the pressure is automatically compensated so that the metal will not be torn or sheared. In one embodiment of the invention a strip about 6" wide, each end of the strip travels at least ¾" relative to the die face.

Accordingly, a principal object of the invention is to provide new and improved means for making deep bends in sheet metal.

Another object of the invention is to provide new and improved means for making multiple deep bends in sheet metal including dies having special free space to permit the sheet metal to travel relative to the die face during the pressure stroke.

Another object of the present invention is to provide new and improved means for making bends in sheet metal including means to permit the sheet metal to travel relative to the die face during the pressure stroke, including die means having a spring loaded portion adapted to compensate the force applied to prevent tearing or shearing of the metal.

These and other objects of the invention will be apparent from the following specifications and drawings of which:

Figure 1 is an elevation sectional view of the die of the present invention.

Figure 2 is a sectional view of a sheet metal blank.

Figure 3 is a sectional view of a piece formed with a triple bend by the embodiment of the invention of Figure 1.

Figures 4, 5 and 6 illustrate the use of the invention in forming a bar slip locking member.

Figures 7, 8 and 9 illustrate the use of the invention in forming an S slip locking member.

Referring to Figure 1, there is shown a metal forming die comprising lower member 1 and upper member 10, the



lower member 1 has on its right hand edge a rounded point portion 2 which falls off as it moves to the left into a V shaped depression having sides 3 and 3' having an angle of for instance 50°. At the bottom of the V shaped depression is a square recess 4. Proceeding to the left, at the top of the surface 3', there is a point A and the surface 5 of the die falls off again parallel to the surface 3. The surface 5 has a notch 5' which will be discussed later. At the bottom of the surface 5, there is a V shaped cross-section which rises again only about half way to the top before it intersects the left hand edge 6 of the die.

The metal may extend out the left side of the die so that the die will accommodate different size strips of metal.

The lower die may be referred to as the negative die and the upper die as the positive. The upper positive die 10 comprises a positive V shaped projection B which is in one embodiment 54°. Note that the positive die 10 has a greater angle 54° than the negative lower die which is 50°. Therefore, the positive die will not fit all the way into the negative die but leaves a space around the point B. The open space plus the open recess 4 permits the metal to creep around the sharp point B of the positive projection 10 of the upper die. If this space was not provided, the metal blank would be undoubtedly torn or sheared.

The upper die 10 contains another positive projection 15 which is not integral with the upper die but which is spring loaded movably with respect to the upper die by means of the spring 16. The purpose of the spring loading is to permit the metal to travel around the point 15' of the spring loaded portion so that the point 15' will not tear or shear the metal. This is accomplished by choosing the strength of the spring 16 such that it will not tear the metal being formed but on the other hand, will apply sufficient pressure to form the metal bend as the die is closed. The member 15 contains a tapered portion 17 which is used in closing a hem as discussed in connection with Figures 4, 5 and 6.

Referring to Figures 2 and 3, Figure 2 shows a metal blank 20 before it is formed and Figure 3 shows the formed piece. The dimensions D and D' show the amount of travel, of the ends of the metal strip 20 after it is formed. From this, it can be seen that in a strip about 6" wide, each end of the strip would travel about ¾" relative to the die face.

Figures 4, 5 and 6 show another use of the invention for forming a bar slip locking member 21. This member is shown in Figure 6, locking together two sheet metal pieces 22 and 23. It is formed as follows:

A metal blank 19 having a hook 18 is inserted in the die, and positioned against stop plate 23. When the die is closed, the blank 19 is formed as shown in Figure 5. The tapered portion 17 closes the hook 18 to form a strengthening hem 18'.

The piece 19 is then squeezed together by other apparatus, outside the scope of the present invention, to form the bar lock 21 of Fig. 6. After the pieces to be locked 22 and 23 are inserted, a sheet metal screw 25 may be used to fasten them. The pieces 22 and 23 are normally fully inserted. They are shown only partially inserted for clarity.

Figures 7, 8 and 9 show how the invention forms an S type slip lock.

The blank 30 has a hook 31 which is formed in the notch 5' to form the hem 31' of Fig. 8. The blank 30 is placed against stop 32. During the forming the blank 30 travels sufficiently to locate the hook 31 in notch 5'.

Figure 9 shows the piece 30 squeezed to form an S slip lock illustrated as locking pieces 33 and 34. The pieces 33 and 34 are normally fully inserted. They are shown partially inserted for clarity.

I claim:

Multiple deep bend single stroke die means comprising a lower die member having a first V-shaped recess, a second V-shaped recess beside said first recess, said first recess being deeper than said second recess and having an expansion notch at the bottom thereof to permit travel of the work piece, a positive upper die member having a first V-shaped projecting member positioned to mate at a first time with said first V-shaped recess, said first projecting member having a greater angle between its tapering sides than the angle between the tapering sides of said first recess, a second V-shaped projecting member adapted to nest in said positive upper die member and being positioned to mate with said second V-shaped recess after said first time, connecting means connecting said second V-shaped projecting member and said upper die member and permitting longitudinal displacement of said second V-shaped projecting member with respect to said upper die member, and expansion spring means positioned between said second V-shaped projecting member and said positive upper die member.



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