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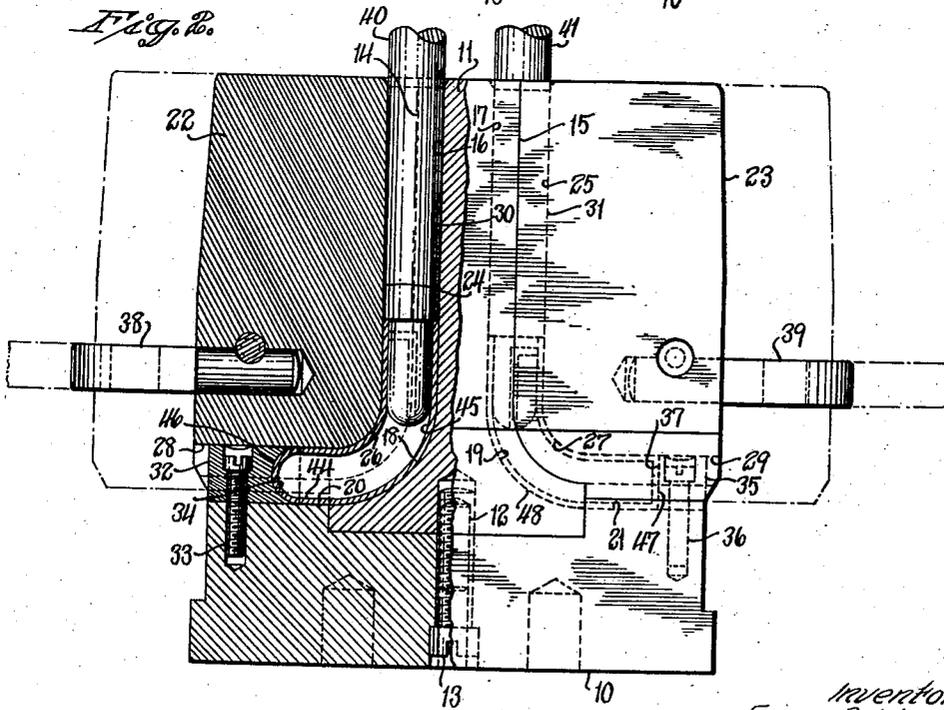
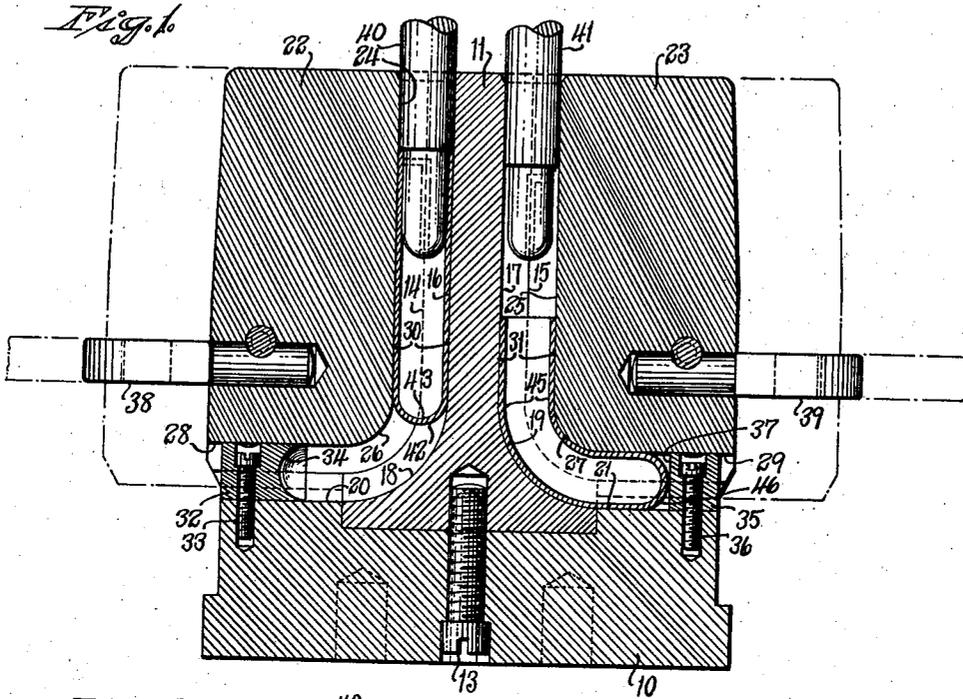
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2,183,702

DIE ASSEMBLY FOR FORMING HOLLOW METAL ARTICLES

Original Filed May 11, 1937

2 Sheets-Sheet 1



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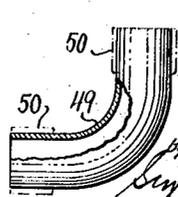
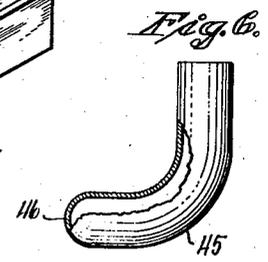
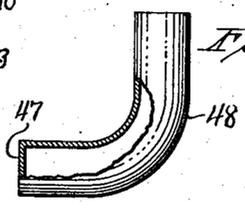
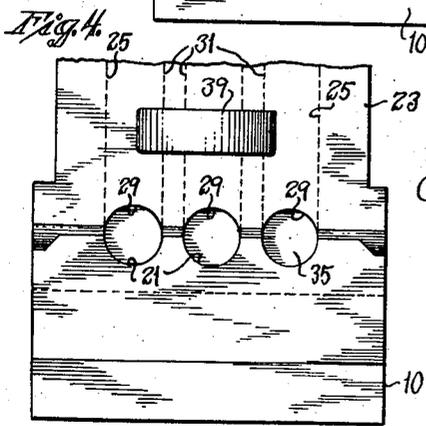
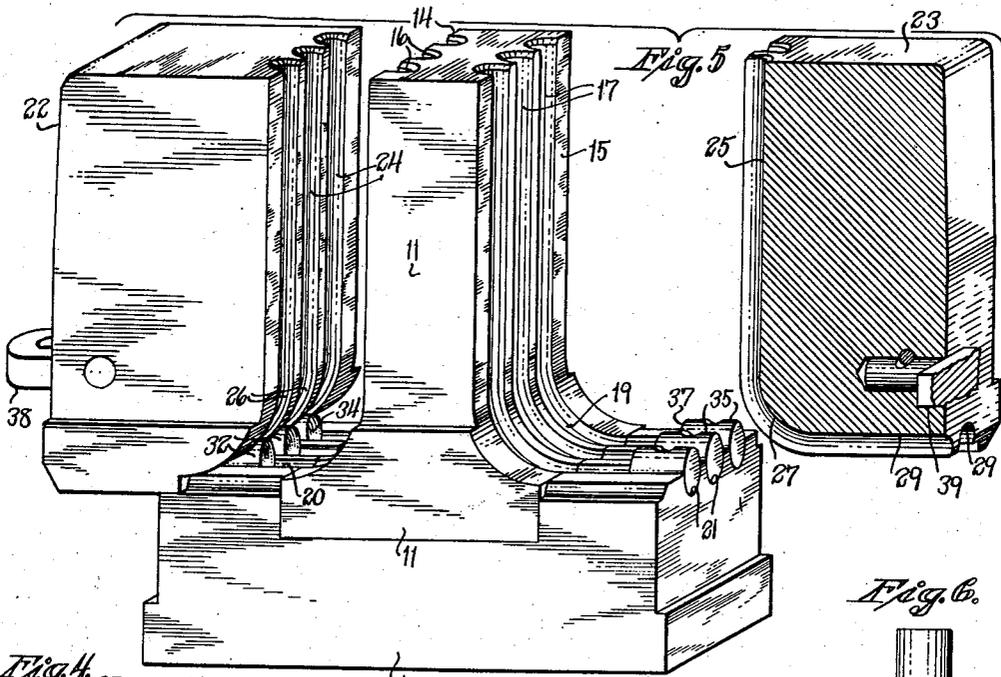
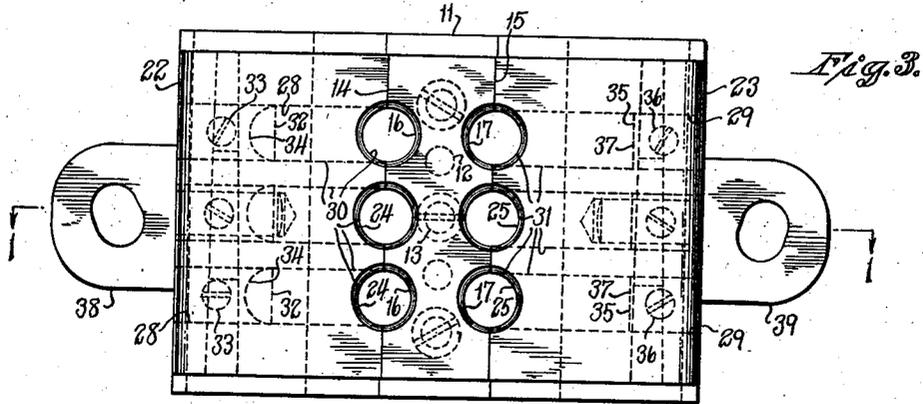
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DIE ASSEMBLY FOR FORMING HOLLOW METAL ARTICLES

Original Filed May 11, 1937

2 Sheets-Sheet 2



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# UNITED STATES PATENT OFFICE

2,183,702

## DIE ASSEMBLY FOR FORMING HOLLOW METAL ARTICLES

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Original application May 11, 1937, Serial No. 141,936. Divided and this application December 9, 1938, Serial No. 244,781

2 Claims. (Cl. 153-48)

This invention relates to improvements in die assemblies and particularly to die assemblies for forming hollow sheet-metal elbows or the like.

This application is a division of my application Ser. No. 141,936 filed May 11, 1937.

One of the objects of the present invention is to provide a superior die assembly of the character referred to which may be produced at a low cost for manufacture.

Another object is to provide a superior die assembly in which the component units may be readily opened and closed.

With the above and other objects in view, as will appear to those skilled in the art from the present disclosure, this invention includes all features in the said disclosure which are novel over the prior art and which are not claimed by me in a separate application.

In the accompanying drawings in which one way of carrying out the present invention is shown for illustrative purposes:

Fig. 1 is a vertical sectional view on line 1-1 of Fig. 3, with certain of the parts shown in elevation and with plungers and blanks added;

Fig. 2 is a view similar to Fig. 1 but with more of the die assembly shown in elevation, and also illustrating a different stage of the operation;

Fig. 3 is a top plan view of the die assembly shown in Figs. 1 and 2, without the plungers and blanks;

Fig. 4 is a broken view thereof in end elevation;

Fig. 5 is a perspective view of the die assembly with one of the guide-dies shown detached and in vertical longitudinal section;

Fig. 6 is a side elevation partly in section of a second-stage elbow blank;

Fig. 7 is a side elevation partly in section of a third-stage elbow blank; and

Fig. 8 is a side elevation partly in section of a completed elbow.

The die assembly illustrated in Figs. 1 to 5 of the drawings includes an inverted T-shaped deflecting-die unit which comprises a base block 10 and a vertical block 11 rigidly secured together by a suitable number of dowel-pins 12 and screws 13. The opposite vertical walls or faces 14 and 15 of the vertical block 11 are respectively formed with a plurality of vertical guide-channel grooves 16 and 17 which are respectively smoothly merged by arcuate deflecting-channel grooves 18 and 19 with horizontal deflecting-channel grooves 20 and 21 in the upper face of the base block 10. The grooves 16 to 21 are, in effect, continuous and are all of semicircular form in cross-section.

Fitting into the angular notch-like recesses provided on the opposite sides of the deflecting-die unit, are guide-die units 22 and 23 respectively having vertical guide-channel grooves 24 and 25 which are respectively merged by arcuate deflecting-channel grooves 26 and 27 with horizontal deflecting-channel grooves 28 and 29 in the under faces of the units 22 and 23. As illustrated in Figs. 1, 2 and 3, the grooves 16, 18, 20, 24, 26 and 28 form the three L-shaped channels 30, and the grooves 17, 19, 21, 25, 27 and 29 form the three L-shaped channels 31. The lower outer end of each channel 30 is blocked by a stop-abutment 32 secured to the base block 10 by a screw 33 and having in its inner-face a hemispherical recess 34. In the particular form of die assembly illustrated in the drawings, the lower outer end of each channel 31 is blocked by a cylindrical stop-abutment 35 secured to the base block 10 by a screw 36 and having a flat inner-face 37.

The guide-die units 22 and 23 of the die assembly illustrated in the drawings may be brought into assembled relation and held therein by any suitable means, such, for example, as the mechanism illustrated in my previously mentioned application Ser. No. 141,936 which is adapted to actuate the guide-die units horizontally back and forth between the open dotted line and closed full line positions shown in Figs. 1 and 2 by means of the I members 38 and 39. The plungers 40 and 41 are carried by a plunger-head or ram (not shown) of any suitable press, such, for example, as that illustrated in my afore-mentioned application.

First-stage or test-tube shaped blanks 42 of copper or other suitable metal, after having been filled with oil or the like, are forcibly displaced longitudinally by means of the plungers 40 until they seat in the hemispherical recesses 34 of the stop-abutments 32. In this operation, due to the fact that each curve 18 is of greater length than curve 26, metal which initially occupies the central bottom location indicated at 43 of the blank 42 shown in Fig. 1, will move around to some such position as indicated at 44 of the second-stage L-shaped blank 45 in Fig. 2.

The second-stage blanks 45 shown at the left of Fig. 2 and also shown in Fig. 6, after being suitably annealed and filled with liquid, are placed in the channels 31 in the right side of Fig. 1 as illustrated in the said figure, and first-stage blanks 42 are placed in channels 30 in the left side of Fig. 1. The guide-dies 22, 23 are then closed to full line assembled position shown in

Fig. 1, whereupon when the plungers 40 and 41 are forced downward by the plunger-head (not shown), the first-stage blanks 42 are formed into second-stage blanks 45 and the previously formed second-stage blanks 45 located in the channels 31 at the right of Fig. 1, have their rounded ends 46 forced outward to become the flat ends 47 shown at the right of Fig. 2, to form the third-stage blanks 48 shown at the right of the figure referred to and in Fig. 7. By removing the flat end portion 47 of the third-stage blank 48, a finished elbow 49 is produced as shown in Fig. 7. The elbow 49 may, if desired, have one or both of its respective opposite ends expanded as indicated by broken lines at 50 in Fig. 8.

It will be appreciated that instead of making two different stage blanks at one operation as illustrated in Figs. 1 and 2, the die assemblies could be so constructed and operated as to make all blanks, at a given operation, the same or duplicates of one another, by having the right-hand stop-abutments identical with those at the left hand of Fig. 1.

By providing a die assembly which is divided in planes transverse to the plane of the elbow to be produced rather than dividing the dies in a plane parallel with the flatwise plane of the elbow, not only is interchangeability achieved, but the various units may be accurately and economically produced. For instance, the guide- and deflecting-channel grooves of the deflecting-die unit may be conveniently produced by a simple milling operation, and similarly the guide- and deflecting-channel grooves of the guide-die units may be milled. Furthermore, in forming the rounded portion or fillet interconnecting the adjacent ends of the straight grooves, a die-unit may be revolved about the axis of the said rounded portion so that a milling cutter will serve the purpose of producing this portion also, rather than requiring time consuming and expensive die-sinking operations which would be necessary were an angular recess to be formed all in one face of a die-block. Also, the fact that the stop-abutments 32 and 35 are separately made and separately attached to the die assembly, facilitates forming the deflecting-channel grooves by a milling cutter with complete freedom and high speed without the need of special finishing operations for forming the end surfaces 34 and 36 of the stop-abutments, such as would be necessary if the stop-abutments were integrally formed with either the base block or guide dies.

The invention may be carried out in other specific ways than those herein set forth without departing from the spirit and essential characteristics of the invention, and the present embodiments are, therefore, to be considered in all respects as illustrative and not restrictive, and all changes coming within the meaning and equivalency range of the appended claims are intended to be embraced therein.

I claim:

1. A die assembly for forming hollow metal articles comprising: two similarly-constructed guide-die units, and a single deflecting-die unit; each of the former having angularly-related faces substantially coextensive with angularly-related face-portions of the latter; the said deflecting-die unit including oppositely-extending base-faces arranged below and respectively facing one of the angularly-related faces of each of said guide-die units, and the said deflecting-die unit also including oppositely-facing side-faces interposed between said guide-die units and respectively facing the other angularly-related face of each of the said guide-die units; the latter being each provided with a groove extending from end to end thereof in its said angularly-related faces and providing one complementary half of an article-forming channel therein; and the said deflecting-die unit having a groove extending from the outer end of each of said oppositely-facing side-faces to the outer end of each of said oppositely-extending base-faces, the grooves of the said deflecting-die unit each providing one half of an article-forming channel and respectively complementing the half of the article-forming channel in each of the said guide-die units.

2. A die assembly for forming hollow metal articles comprising: two similarly-constructed guide-die units, and a single deflecting-die unit; each of the former having angularly-related faces substantially coextensive with angularly-related face-portions of the latter; the said deflecting-die unit including oppositely-extending base-faces arranged below and respectively facing one of the angularly-related faces of each of said guide-die units, and the said deflecting-die unit also including oppositely-facing side-faces interposed between said guide-die units and respectively facing the other angularly-related face of each of the said guide-die units; the latter being each provided with a groove extending from end to end thereof in its said angularly-related faces and providing one complementary half of an article-forming channel therein; the said deflecting-die unit having a groove extending from the outer end of each of said oppositely-facing side-faces to the outer end of each of said oppositely-extending base-faces, the grooves of the said deflecting-die unit each providing one half of an article-forming channel and respectively complementing the half of the article-forming channel in each of the said guide-die units; and separate abutment-members, each constructed and arranged to interfit with and to be fixedly secured in place in the groove of one of the said guide-die units and the complementary-groove of the deflecting-die unit adjacent the terminating outer ends of the respective grooves, to close the said article-forming channels.

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