May 16, 1944. L. R. PEASE 2,348,998

FLANGE FORMING DIE ASSEMBLY

Filed April 21, 1942 2 Sheets-Sheet 1

Fig. 1.

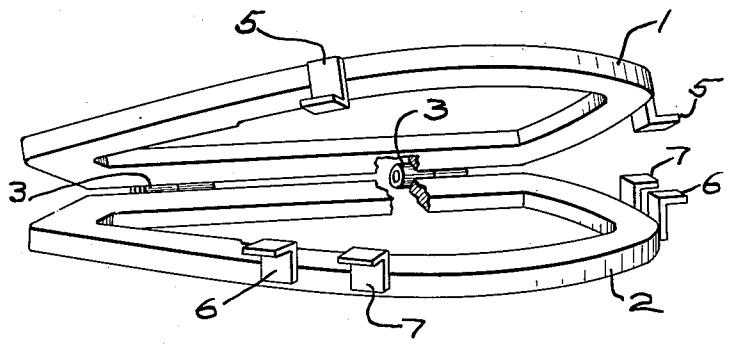


Fig. 2.

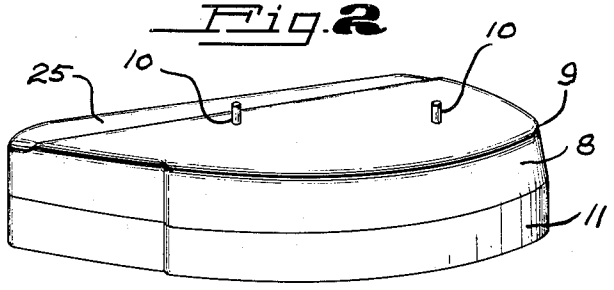
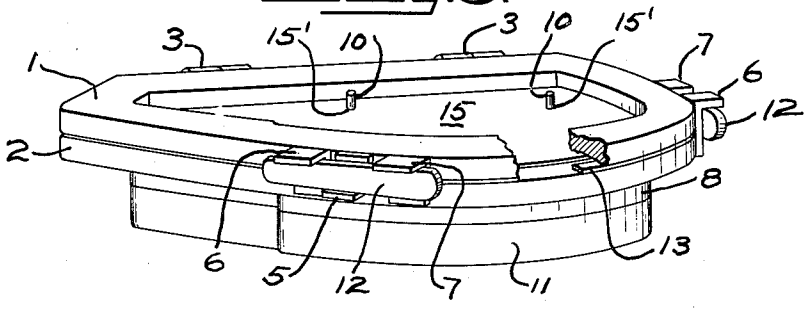


Fig. 3.



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Fig. 4.

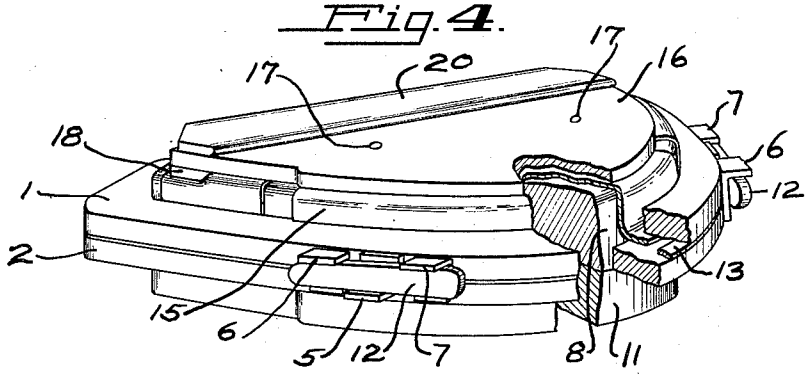


Fig. 5.

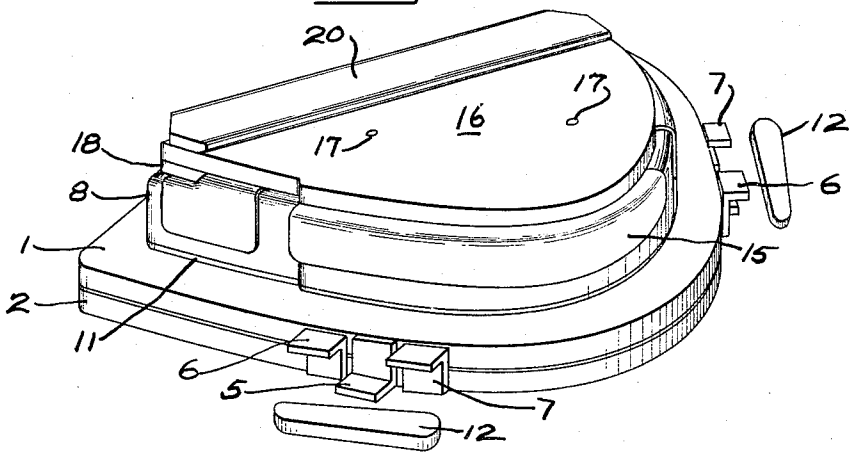
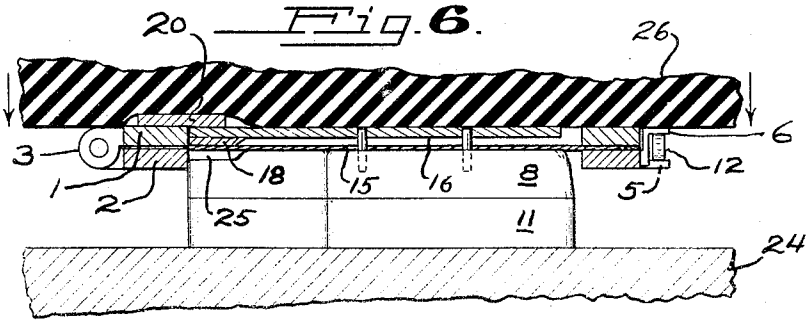


Fig. 6.



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UNITED STATES PATENT OFFICE

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FLANGE FORMING DIE ASSEMBLY

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Application April 21, 1942, Serial No. 439,905

8 Claims. (Cl. 113—44)

My invention relates to draw rings used with flange-forming dies, and more particularly to a flanging tool designed primarily for use on hydraulic presses having rubber platens, hereafter referred to as hydro-presses.

This application is a continuation-in-part of my prior application, Serial No. 405,424, filed August 4, 1941, and entitled Draw ring.

Among the objects of my invention are: To provide a draw ring assembly for use primarily with hydro-presses, this draw ring assembly being ideally adapted for forming either open or closed, straight or curved flanges on sheet material; to provide a draw ring lock for use on hydro-press dies which will reduce hand forming of the flanged part to a minimum; to provide a draw ring assembly and lock, for use with hydro-presses whereby the sheet stock is under such control that wrinkling of flanges of parts being formed is eliminated entirely; and to provide a simple draw ring assembly for use with hydro-presses whereby smooth flanges may be formed on sheet material.

Other objects of my invention will be apparent or will be specifically pointed out in the description forming a part of this specification, but I do not limit myself to the embodiment of the invention herein described, as various forms may be adopted within the scope of the claims.

In the drawings:

Fig. 1 is a perspective view of one preferred form of draw ring and locking mechanism illustrating my invention.

Fig. 2 is a perspective view of a form block in position to receive the draw ring of Fig. 1, and the stock to be formed.

Fig. 3 is a perspective view showing the draw ring with the sheet stock locked between the halves thereof and properly located on the form block.

Fig. 4 is a perspective view, partly in cutaway section, showing the sheet stock partially formed, with the halves of draw rings still locked.

Fig. 5 is a perspective view showing the sheet stock completely formed, with the draw ring free from the formed part.

Fig. 6 is a diagram showing how the assembly is used in a hydro-press.

The device to be described herein has proved satisfactory for closed, 90°, and open flanges without wrinkling, thus eliminating the greater part of hand work after forming.

I will further describe my invention by referring in detail to the drawings, which show sequential steps in forming 90° and open flanges on sheet stock. Referring first to Fig. 1, the draw ring comprises an upper half 1 and a lower half 2 joined along one edge by hinges 3. The draw ring halves can be cut from boiler plate or any kind of steel. The thickness of each ring portion is determined by the size, shape and thickness of the sheet stock to be formed. The width of each ring portion is preferably such that the draw ring exceeds the length in any direction of the flange in flat pattern by a small amount, say ¼ of an inch to allow for the use of a spacer, as will be brought out later.

The inside cutout of the draw rings is made to include the form block width plus the thickness of the metal for all 90° flanges. For open flanges, the inside coutout of the draw ring should include the equivalent of the outside area of the formed flange from the largest area of the formed part.

I prefer to polish the inside flat surfaces and inside edges of the draw ring halves, this polishing however being only to prevent scratching of the material being formed and to offer less resistance when forcing the draw ring over the form block in process of forming the part.

Upper draw ring half 1 is provided with a single locking lug 5 fitting between two spaced lower ring lugs 6 and 7 when the draw ring is closed. A form block 8 is utilized which may be made from dural or steel or other substantial material. The form block is not cut to allow for any spring-back. The form block is provided with an upper edge 9 rounded to the curvature of the flange bend, and with upper sheet stock locating pins 10. The form block 8 is preferably mounted on a spacer block 11 cut flush with the bottom of the form block. Spacer block 11 should be of sufficient thickness so that the draw ring will drop entirely free from the flange of the formed part after the flanging operation has taken place. The upper surface of the form block may be contoured, as will be later described.

Fig. 3 shows the assembly of the sheet stock to be formed in the draw ring, and in position over the form block and spacer block. Here the edges of the sheet stock to be formed, have been clamped between the draw ring halves by the use of tapered lock pins 12 wedged between lug 5 and lugs 6 and 7. Also clamped between the draw rings is a spacer 13 the same thickness or .002" or .003" less than that of the sheet stock to be formed. The spacer should be anchored in any convenient manner on the outer edge of the inside flat surface of one of the draw ring halves.

The spacer is for the purpose of eliminating hinge breakage and the bending of the draw ring.

The sheet stock 15 is provided with apertures 15' in which pins 10 register in order to hold the clamped sheet stock in proper relation to the form block. The draw ring is properly located when in open position (Fig. 1) and lower half 2 is placed over form block 8 prior to inserting sheet stock 15 on form block 8 and into draw ring halves 1 and 2.

When the lock pins 12 are forced into position as shown in Figs. 3 and 4, the taper thereof causes a downward pressure on lug 5 attached to the upper draw ring and upward pressure on lugs 6 and 7 attached to lower draw ring which in turn creates a viselike grip on the sheet edges between the halves of the draw ring. A lock should be located as near to bend radii of the flange as possible, in order to avoid the spreading of the draw ring halves next to the form block. If the draw ring halves are permitted to spread, it will allow stock to wrinkle where the stock is to be shrunk. Consequently, the chief function of the draw ring would be defeated. Furthermore, a lock should be located at all critical outside contours where shrinkage is to be effected.

Although the assembly as shown in Fig. 3 may be used in the hydro-press, a steel pressure plate 16 may be placed over the sheet stock to be formed, inside of the upper draw ring half as shown in Figs. 4 and 5. This pressure plate is provided with apertures 17 also registering with pins 10 extending upwardly from the form block, to hold the pressure plate in proper position. The lower surface of the pressure plate may, in case a joggle is to be formed in the part, be provided with a shim 18 along one edge thereof, to force metal into a joggle channel 25 cut into the top of form block 8. Thus the top of the metal sheet may be formed at the same time the sides thereof are being flanged. There may be one or more joggles formed in the part, and the pressure plate will therefore have varying thickness depending upon the desired contour of the surface of the finished part.

I may also prefer to utilize, as a part of the pressure plate, a baffle strip 20 positioned above the edges of the parts either on which no flanges are to be formed, or above the edges of the part on which flanges are to be shorter than flanges on other portions of the same part. The purpose of the baffle is to reduce the area of the draw ring which is exposed to the rubber of the platen, thereby equalizing the pressure of the platen all around the rings, in proportion to the resistance offered by the sheet stock. This resistance will vary in accordance with the length of the flange being formed, the resistance being the least when no flange at all is being formed, and being greatest when the maximum flange length is to be formed on the sheet stock. The baffle plate therefore will have lateral dimensions varying in accordance with the length of flange to be formed around the contour of the part. The use of the baffle prevents the draw ring from being forced down in tilted position.

I wish it to be distinctly understood, however, that the pressure plate and baffle may not be required in forming many parts with the draw ring assembly herein described. The type and nature of the parts to be formed will determine whether or not the pressure plate or baffle will be needed. When used, both the pressure plate, and the baffle, can obviously be modified to suit the particular part being formed.

It is to be understood then, that the assembly in some cases as shown in Fig. 3 without the use of the pressure plate or baffle, or an assembly including the pressure plate and baffle, may be positioned in the hydro-press 24 as shown in Fig. 6, and pressure applied thereto by the rubber platen 26 of the press. This pressure causes a downward motion of the draw ring as shown in Fig. 4, with the flange partially formed with the edges still locked in the draw ring.

The next step in the operation is shown in Fig. 5, where the flange has been completely formed over the form block. The draw ring is free of the formed part. In spite of the fact that the spacer 13 is still between the draw ring halves, the lock pins 12 usually drop free from the lugs. The entire assembly may then be removed from the hydro-press, the formed part removed and the assembly reloaded with an unformed sheet for a repetition of the cycle.

In cases of 90° flanges, only one form block and one draw ring is required for forming both a right and a left-hand part. By turning over the form block and draw ring the opposite hand will be the result. In instances of open or closed flanges, however, one draw ring can be used for right and left-hand parts but two form blocks will be necessary, one for each hand. While a single form block could be used to form right and left-hand parts with open or closed flanges, the form block might be so high that it would be injurious to the rubber in the hydro-press platen, as it will be obvious that a reversible form block shaped to form other than 90° flanges could not have flange forming surfaces that could be used in either position. The 90° flange forming block, however, can have surfaces usable for either hand. It is therefore preferred to utilize two form blocks, one for each hand, when open or closed flanges are to be formed.

It will thus be seen that the draw ring assembly shown, described and claimed herein is ideally adapted to form either open, closed or 90° flanges without wrinkling of flanges, thereby greatly minimizing hand finishing.

I claim:

1. A flanging die assembly comprising, in combination with a work sheet, a form block having a periphery of predetermined contour, and having portions of its work sheet engaging surface in different planes, a pair of draw rings having registering apertures therein, means for locking said draw rings together with a portion of said work sheet to be flanged included therebetwen, means for positioning said work sheet on said form block with one of said draw rings surrounding said form block, the inner edges of said apertures following the contour of said form block with a clearance therebetween, and a pressure plate positioned within the other of said draw rings and having a surface facing said form block and complementary thereto.

2. In combination, a flanging die assembly comprising, in combination with a work sheet, a form block having a periphery of predetermined contour, a pair of draw rings having registering apertures therein, means for locking said draw rings together with a portion of said work sheet to be flanged included therebetween, means for positioning said work sheet on said form block with one of said draw rings surrounding said form block, the inner edges of said apertures following the contour of said form block with a clearance

therebetween, a pressure plate positioned over said work sheet within the other of said draw rings and having a surface facing said form block and complementary thereto, a resilient platen positioned over said assembly, means for forcing said platen against said assembly to force said draw rings over said form block, and baffle means disposed on said pressure plate at regions of normally lower resistance to said platen.

3. A flanging die assembly comprising, in combination with a work sheet, a form block having a periphery of predetermined contour and an upper surface of varying contour, a pair of draw rings having registering apertures therein, a plurality of locks spaced around the peripheries of said rings for locking said draw rings together with a portion of said work sheet to be flanged included therebetween, a spacer plate of work sheet thickness between said draw rings and apertured to clear said work sheet, and means for positioning said work sheet on said form block with one of said draw rings surrounding said form block, the inner edges of said apertures following the contour of said form block with a clearance therebetween, and a pressure plate positioned over said work sheet and having a surface of varying contour facing the upper surface contour of said form block and complementary thereto.

4. A flanging die assembly comprising, in combination with a work sheet, a form block having a periphery of predetermined contour, and having portions of its work sheet engaging surface in different planes, a pair of draw rings having registering apertures therein, a plurality of spaced locks around the peripheries of said rings for locking said draw rings together with a portion of said work sheet to be flanged included therebetween, means for positioning said work sheet on said form block with one of said draw rings surrounding said form block, the inner edges of said apertures following the contour of said form block with a clearance therebetween, a base beneath said flanging die assembly, a pressure plate positioned over and in contact with said work sheet only and having a surface facing said form block and complementary thereto, a resilient platen positioned over said assembly, and means for forcing said platen against said assembly to force both of said draw rings over said form block thereby flanging the included portion of said work sheet.

5. A flanging die assembly comprising, in combination with a work sheet, a form block having a periphery and an upper surface of predetermined contours, a pair of draw rings having registering apertures therein, a plurality of spaced locks around the peripheries of said rings for locking said draw rings together with a portion of said work sheet to be flanged included therebetween, means for positioning said work sheet on said form block with one of said draw rings surrounding said form block, the inner edges of said apertures following the contour of said form block with a clearance therebetween, a base beneath said flanging die assembly, a pressure plate positioned over and in contact with said work sheet, said pressure plate having a lower surface contour coperating with the upper surface of said form block to form said work sheet, a resilient platen positioned over said assembly, means for forcing said platen against said assembly to force both of said draw rings over said form block thereby flanging and forming the included portion of said work sheet, said pressure plate having baffle means extending laterally over said draw rings in varying amount to reduce the platen pressure in accordance with flanging resistance around the contour of said form block.

6. Apparatus in accordance with claim 4 wherein said pressure plate is provided with a laterally extending baffle bar following the contour of work sheet edges offering less resistance to flanging than other edges of said work sheet.

7. In a flanging die assembly having a work sheet locked in apertured draw rings and forced over a form block by a resilient platen, a pressure plate positioned above and in contact with said work sheet as it rests on said form block, said pressure plate having means extending laterally therefrom over predetermined portions of said draw ring for reducing platen pressure on said draw ring portions.

8. In a flanging die assembly having a work sheet locked in apertured draw rings and forced over a form block by a resilient platen, a pressure plate positioned above and in contact with said work sheet as it rests on said form block, said pressure plate having an extension overhanging a predetermined portion of said draw rings to reduce platen pressure on said predetermined portion of said draw rings as the work sheet and draw rings are forced over such form block by such platen.

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