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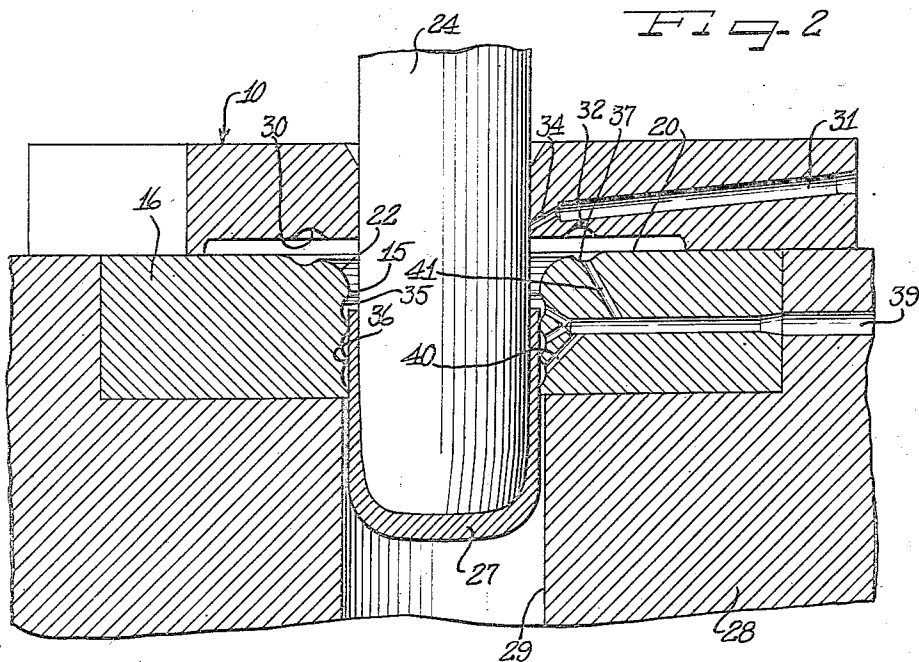
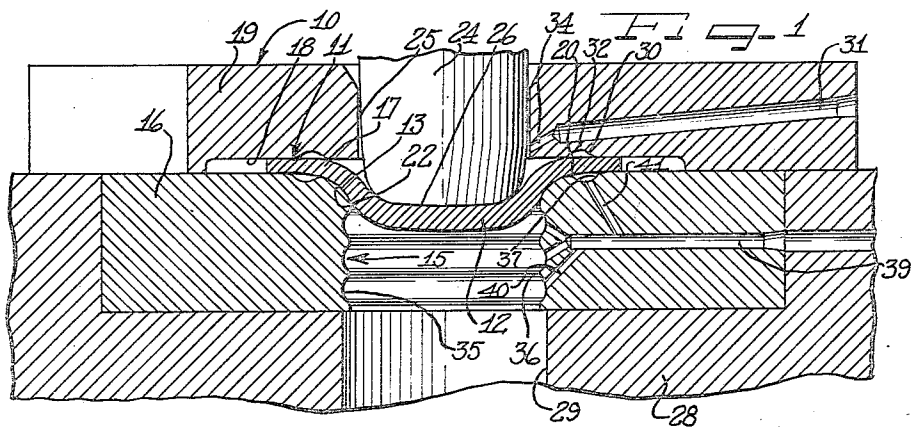
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2,821,156

DIE

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Inventor

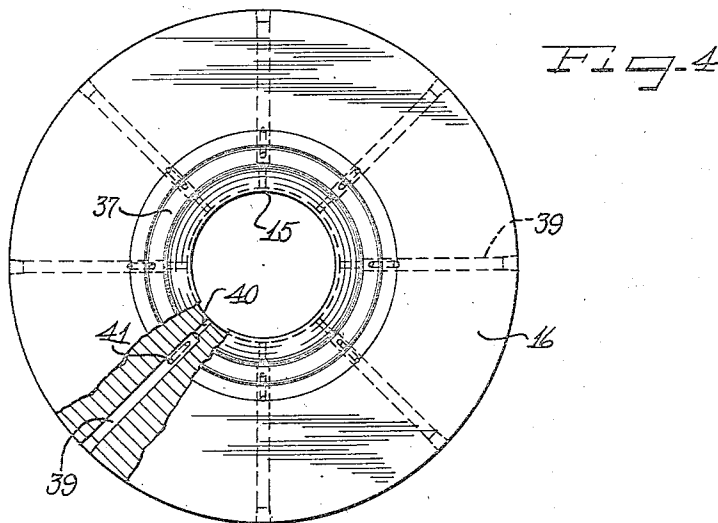
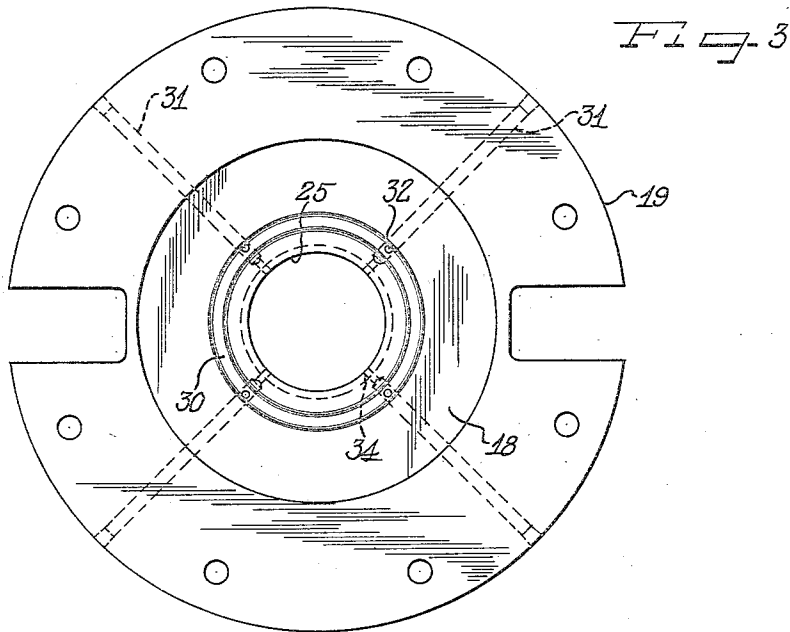
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3 Claims. (Cl. 113—49)

This invention relates to dies and more particularly to drawing dies adapted for use in making cartridge casings.

The dies of the present invention are particularly adapted for use in a first drawing operation on a blank which has been bulged centrally and coined at its margin in a previous operation. In the first drawing operation, the bulged center of the blank is driven through a recess in the female die member by means of a plunger to move the outer coined portion of the blank between the opposing hold-down faces of the dies and into the recess, where it is drawn out by virtue of the clearance between the plunger and the walls of the female die. In such an operation, a great amount of friction and heat is generated between the surfaces of the blank and the opposing faces of the dies, and the walls of the recess in the female die member.

It is an important object of the present invention to provide novel means for reducing the heat and friction generated during a first drawing operation on a bulged and coined blank, particularly in forming a cartridge casing.

It is another object of the present invention to provide a novel female die member for use in such a drawing operation.

It is a further object of the present invention to provide a pair of novel cooperating drawing dies for executing a first drawing operation on a coined centrally bulged blank of a cartridge casing.

In accordance with the general features of this invention there is provided a pair of cooperating dies having opposing faces for receiving therebetween the outer marginal portion of a coined and bulged blank, the female die member having a central recess for receiving the bulged portion of the blank and having rounded surfaces accommodating the same and positioning the blank centrally of the recess, the opposing die faces having annular grooves therein for distributing lubricating fluid to opposed surfaces of the blank outer margin, the grooves being supplied by male die radiating passageways and said female die member having a plurality of annular grooves formed in the walls defining the central recess, the grooves being longitudinally spaced along the recess and being supplied by female die radiating passageways.

A further feature relates to a female die member having a drawing recess provided with a plurality of annular concentric inwardly projecting ribs defining the drawing surfaces of the die, the ribs serving to alternate a drawing force with a lubricating and cooling treatment on the surfaces of the blank being drawn.

Other objects and features of this invention will more fully appear from the following detailed description, taken in connection with the accompanying drawings which illustrate a single embodiment thereof, and in which:

Figure 1 is a fragmentary vertical sectional view through the dies according to the present invention, with a blank in position for the first drawing operation;

Figure 2 is a fragmentary vertical sectional view similar

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to Figure 1 and showing the blank after the first drawing operation;

Figure 3 is a bottom plan view of the upper die member; and

5 Figure 4 is a top plan view of the lower female die insert.

As shown on the drawings:

As best seen in Figures 1 and 2, the die assembly 10 of the present invention is adapted to draw a blank 11 into a cup shape. The blank is preferably coined to a generally polygonal shape in a previous operation and is also bulged centrally as indicated at 12 to provide an annular centering shoulder 13 by means of which the blank is self-centered at the mouth of the recess 15 defined by the female die insert 16. The initial coining and bulging operation is preferably such that the blank can be substantially uniformly drawn in successive drawing operations without necessitating any edge trimming until a later stage in the drawing. Prior to the first drawing operation the outer margin portions 17 of the blank are held between the opposing upper die hold-down face 18 of the upper die 19 and the lower die hold-down face 20 of the lower die insert 16.

During the drawing operation the blank margins 17 are drawn over the curved shoulder 22 connecting the hold-down face 20 of the lower die member with the recess 15. The shoulder is adapted to be complementary to the generally concave shoulder 13 provided by the bulge portion of the cartridge blank. A plunger 24 centered in an aperture 25 in the upper die member has a working face 26 adapted to engage on the inner side of the bulge 12 of the cartridge blank and to drive the blank progressively down into the recess in the female die insert 16. Continued downward movement of the punch causes the progressive pulling of the margin of the blank into the recess, thus forming the blank into the cup 27 shown in Fig. 2.

The lower die holder 28 has a bore 29 registering with the recess 15 through the female die insert 16 to accommodate the ejection of the cupped cartridge casing. It will be observed that the drawing surfaces of the recess 15 project inwardly and have a smaller diameter than the bore 29, so that the walls of the bore 29 have no drawing function.

After the first drawing operation the cup 27 may be subjected to a series of progressive drawing operations for elongating the walls thereof and to form a casing, such as a cartridge casing. Such progressive drawing operations are shown in my previously issued Patent No. 2,360,354.

For cooling and lubrication of the blank during the drawing operation, the upper die 19 is provided with an annular groove 30 in its working face 18 and concentric with the opening 25. As seen in Figure 3, four fluid ducts 31 symmetrically radiate from the groove 30 and have 50 small passages 32 communicating with groove 30 to supply lubricating or cooling fluid to the cartridge blanks during drawing. The ducts 31 also communicate with the opening 25 in which the plunger 24 moves by means of passages 34.

For further cooling and lubrication of the blank during the drawing operation, the female die insert 16 is provided with a plurality of annular grooves 35 opening into the recess 15 and defining projecting annular ribs 36 which comprise the actual drawing surfaces of the female die insert 16. Further, the upper surface 20 of the female die insert 16 is provided with an annular groove 37 opposing the groove 30 of the upper die member. The grooves of the female die insert 16 are supplied by eight fluid ducts 39 symmetrically radiating from the recess 15 as shown in Figure 4. These ducts communicate with the grooves in the recess by means of passageways 40 and 60

with the groove in the surface 20 by means of a passage-way 41.

By virtue of the ribs 36 and grooves 35, and the opposing grooves 30 and 37 in the upper and lower dies, the outer margin portions of the blank are alternately subjected to opposed shearing surfaces (faces 18 and 20 of the dies), to a lubricating and cooling area (annular grooves 30 and 37), to a further bending or shaping surface (shoulder 22), to drawing surfaces (the lower portion of shoulder 22 and the plunger 24), to a lubricating area (uppermost groove 35), etc. This alternate working and lubricating of the blank during the drawing operation greatly enhances the efficiency of the operation and makes possible a very effective control of the uniformity of the end product.

It will be understood that modifications and variations may be effected without departing from the scope of the novel concepts of the present invention.

I claim as my invention:

1. In a drawing die assembly for cupping a metallic blank, cooperating upper and lower die members having cooperating opposed hold-down faces, the upper die member having a center plunger portion and the lower die member having a recess in which the plunger portion is adapted to enter, said upper die member having an annular groove in the cooperating hold-down face thereof in surrounding relation to said center plunger portion and said lower die member having an annular groove in the cooperating hold-down face thereof and a plurality of annular grooves opening into said recess and longitudinally spaced therealong to define alternate working surfaces and lubricating areas, means defining fluid ducts radiating from the upper die annular groove and affording communication with said upper die groove, and means defining fluid ducts radiating from said recess in said lower die member and affording communication with said lower die member grooves.

2. In a drawing die assembly for cupping and drawing

a metallic blank, a unitary female die member having internal drawing surfaces defining a recess and a hold-down surface about the mouth of said recess, said hold-down surface having an annular groove in surrounding spaced relation to said recess and said drawing surfaces having a plurality of longitudinally spaced grooves therebetween to define alternate drawing surfaces and lubricating areas in said recess, and means defining a plurality of fluid supply ducts communicating at spaced intervals about the periphery of said grooves for supplying a lubricating fluid to the lubricating areas, said drawing surfaces all being of substantially the same diameter.

3. In a drawing and cupping die assembly for a metallic blank, a female die insert comprising a disk having a central circular aperture therethrough and having a hold-down surface at one axial end thereof, said die insert having a curved shoulder between said hold-down surface and said recess and having an annular groove outwardly of said curved shoulder in said hold-down surface and having a plurality of axially spaced concentric annular grooves opening into said recess to define alternate drawing surfaces and lubricating areas, and means defining fluid ducts communicating with said grooves to supply fluid thereto.

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