Sept. 21, 1954 G. A. LYON 2,689,539

APPARATUS FOR MAKING WHEEL COVERS

Filed Feb. 5, 1949

3 Sheets-Sheet 1

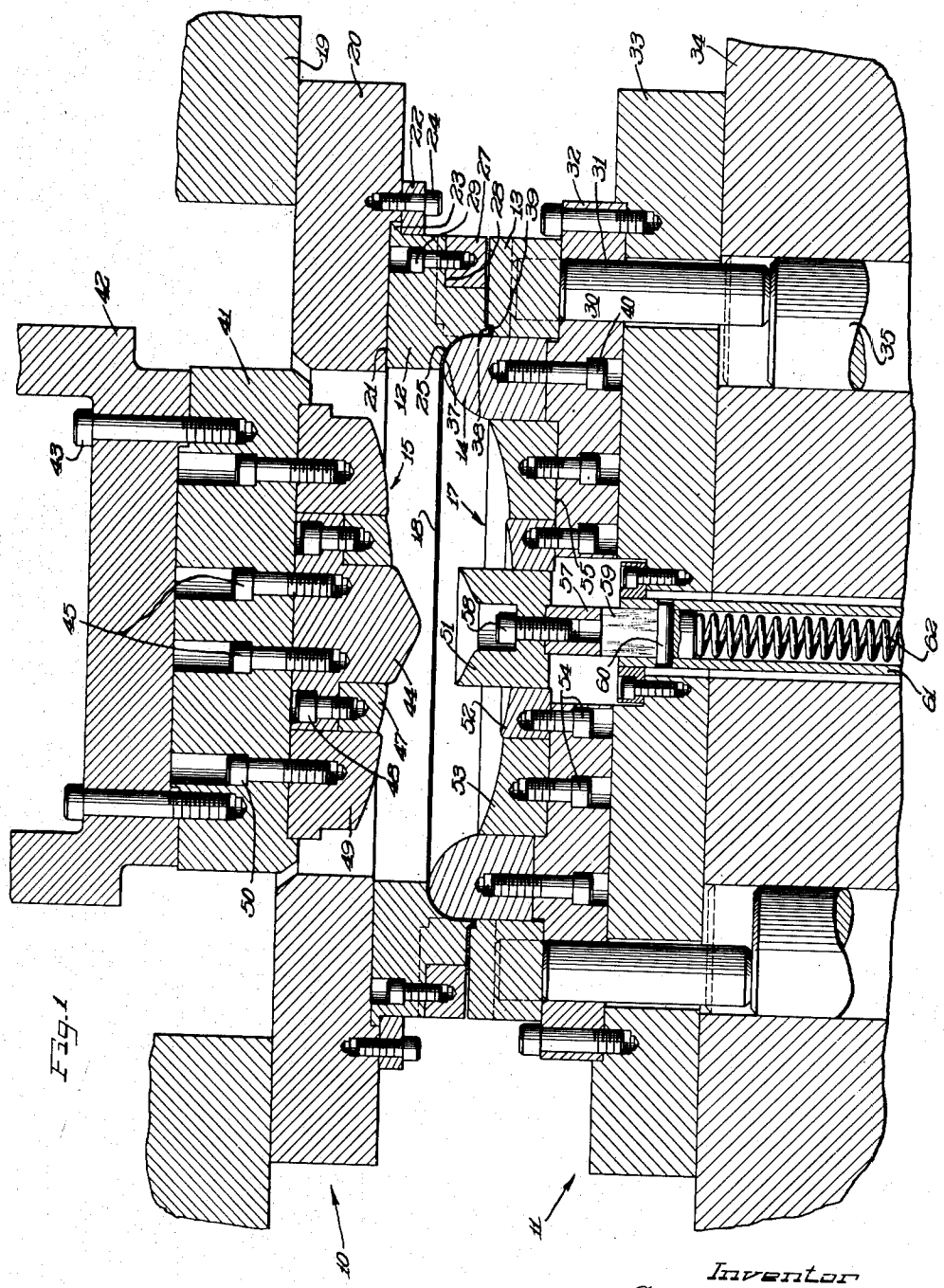


Fig. 1

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APPARATUS FOR MAKING WHEEL COVERS

Filed Feb. 5, 1949

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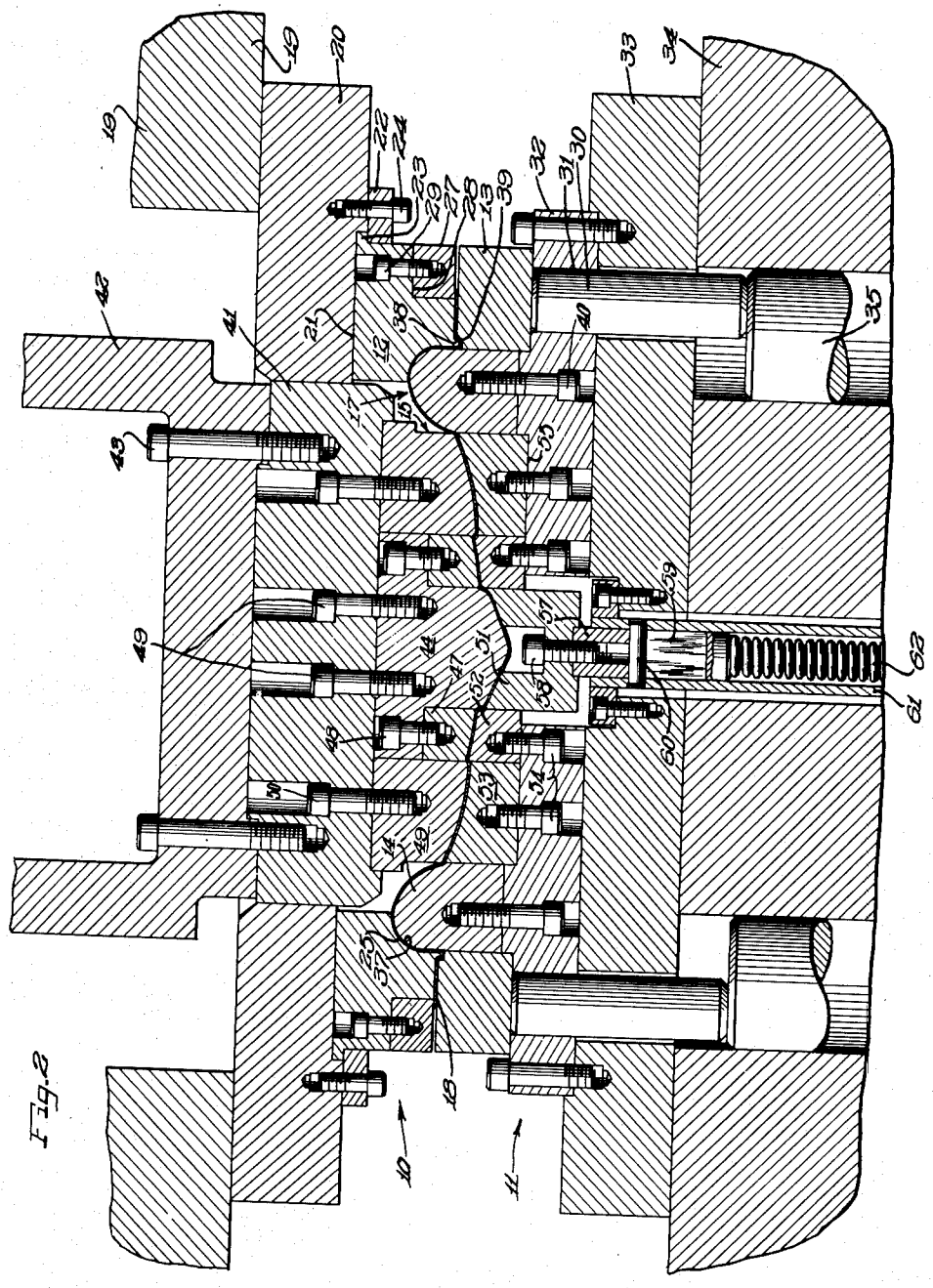


Fig. 2

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Sept. 21, 1954 G. A. LYON 2,689,539

APPARATUS FOR MAKING WHEEL COVERS

Filed Feb. 5, 1949 3 Sheets-Sheet 3

Fig. 3

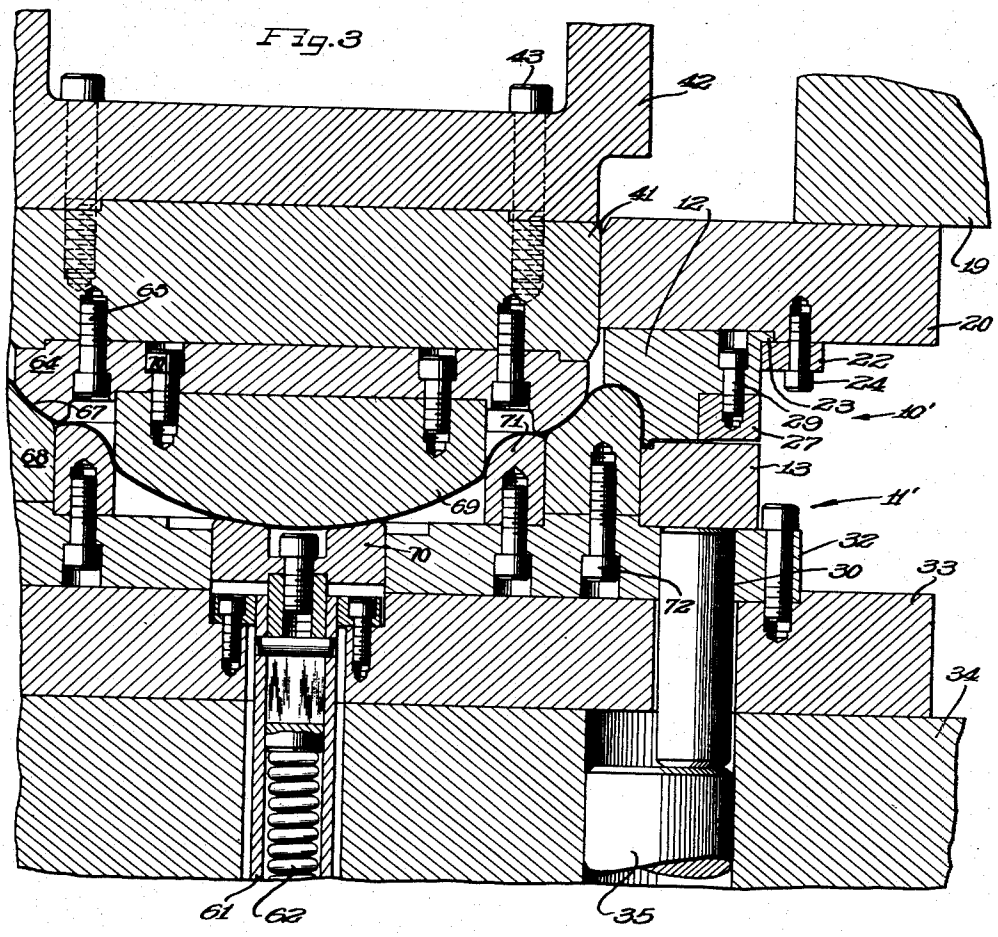
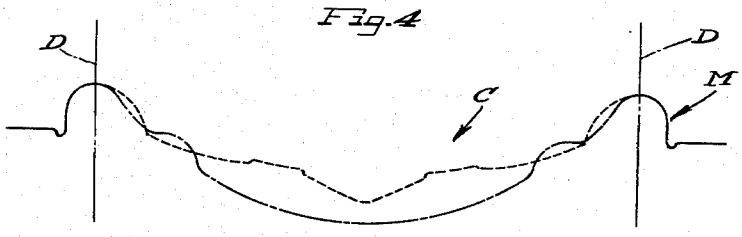


Fig. 4



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APPARATUS FOR MAKING WHEEL COVERS

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2 Claims. (Cl. 113—49)

1

The present invention relates to improvements in apparatus for making wheel covers and more particularly relates to a sheet metal pressing or drawing die assembly adapted for making wheel covers of the large disk type.

An important object of the present invention is to provide improved apparatus for making sheet metal articles such as wheel covers and which is readily interchangeable with respect to certain portions of the apparatus.

Another object of the invention is to provide in apparatus for drawing sheet metal articles such as wheel covers improved means for drawing certain portions of a sheet metal blank to a predetermined standard shape while other portions of the blank can be drawn to various selective shapes.

A further object of the invention is to provide a sheet metal drawing die assembly having selectively interchangeable portions.

According to the general features of the present invention there is provided in apparatus for drawing sheet metal blanks in the formation of articles such as wheel covers, an assembly including upper and lower die sections, each of the die sections comprising a plurality of circular interfitting members cooperating to provide a forming surface complementary to the forming surface provided by the other section of the die assembly, certain of said members being removable and replaceable in each of the die sections.

According to other general features of the invention there is provided in a sheet metal drawing die assembly upper and lower separable die sections for receiving therebetween a sheet metal blank to be drawn, each of said sections including an annular outer pressing ring portion and a central crown portion, the crown portion in each instance being in the form of replaceable plug structure, whereby the crown portion of the blank can be given various selective contours by selection and replacement of the plug structures of the die sections.

Other objects, features and advantages of the present invention will be readily apparent from the following detailed description of certain preferred embodiments thereof taken in conjunction with the accompanying drawings, in which:

Figure 1 is a vertical sectional view through a sheet metal drawing die apparatus assembly embodying features of the invention;

Figure 2 is a vertical sectional view like Figure 1 but showing the die assembly in a different operative relation.

Figure 3 is a fragmentary vertical sectional

2

view similar to Figure 1 but showing a different crown forming structure in the die assembly; and

Figure 4 is a diagrammatic view showing by way of illustration how the same marginal formation can be combined with various crown formations by the use of the present invention.

As shown on the drawings:

Apparatus embodying the features of the invention comprises a drawing die assembly including an upper section 10 and a lower section 11. The upper section 10 as is customary with dies of this character is vertically reciprocable relative to the lower section 11 so that a sheet metal blank 18 may be interposed between the die sections and drawn to shape.

According to the present invention the upper and lower die sections 10 and 11, respectively, are so constructed and related that various complementary portions of the die sections are selectively replaceable so that a variety of different production shapes are attaintbale. This is especially desirable in the mass production of a plurality of different styles or configurations of drawn sheet metal articles such as vehicle wheel covers in which either the inner or crown portion or the marginal portion of the finished article will vary substantially in cross-sectional shape in various cover designs while the remainder of the cover may remain the same throughout a series of designs. To this end, the central or crown portion of each of the die sections, as well as the marginal portion of each of the die sections is constructed to be replaceable.

Having reference to Figures 1 and 2, the upper die section 10 includes a margin shaping and hold down die ring 12 which is formed complementary to and cooperates with die rings 13 and 14 of the lower die section 11. A crown forming plug structure 15 of the upper die section is provided with complementary contour to and cooperates with a lower die plug structure 17. In the operation of the die sections a sheet metal blank 18 is drawn to shape.

Means are provided for reciprocably actuating the marginal forming ring die portion 12 relative to the crown forming plug structure 15. Herein such means comprises a reciprocable ram member 19 of a press assembly to which is attached a die head ring 20 carrying the forming and hold down die ring 12. A seating groove 21 in the lower inner marginal portion of the member 20 centers the ring die 12 and a clamping ring 22 engages a retaining flange 23 on the ring member 12 and is secured to the die member 20 by means of screws 24.

On its lower face, the forming die ring 12 is shaped to afford the desired configuration for the margin of the blank 18 as indicated at 25. The radially outer portion of the forming surface 25 is provided by a ring member 27 set into a rabbet groove 28 in the lower face of the ring member 12 and removably secured by means of screws 29.

The lower ring die member 13 slidably encircles the lower ring die member 14 and serves not only to cooperate in forming a hold down relation with the upper die member 12 but also serves as a stripper. To this end, the die member 13 is thinner or of lower elevation than the inner die member 14 and is arranged to be lifted by a series of stripper pins 30 slidably guided for vertical reciprocation in respective bores 31 in a die set plate 32 removably mounted upon a die base block 33 supported by a press bed 34. Actuating plungers 35 engage the lower ends of the stripper pins 30. At the commencement of a drawing operation or while the die assembly is idle, the lower die ring member 13 is supported by the pins 30 in the elevated position shown in dash outline in Figure 1, to which position the die member 13 is moved at the end of a drawing operation for blank stripping purposes and to receive a subsequent blank to be drawn.

The lower inner margin forming ring die member 14 has an annular upwardly protruding rounded forming surface complementary to the forming surface 25 of the upper ring die member and cooperative at its radially outer side with a downwardly extending annular rib-like forming projection 38 on the upper ring die 12 which in operation cooperates with an annular upper inner marginal groove 39 in the lower ring die member 13 for pressing an annular rib in the blank.

In operation the upper ring die member 12 presses the margin of the blank to shape and into hold down relation to the lower ring die member 13 and the inner ring die member 14, both of the lower ring die members bottoming against the die plate 32. This forms the margin of the blank to be desired contour, and the blank is then held while the crown forming plug structures 15 and 17 of the die assembly operate to shape the central crown portion of the blank. Screws 40 secure the inner marginal ring die member 14 to the die plate 32.

For supporting the upper crown forming die plug structure 15, a die block or plate 41 is secured to a reciprocable ram 42 removably as by means of screws 43.

Various crown contours are formed by the plug structure 15 and for this purpose the plug structure 15 includes a central plug portion 44 secured to the die block 41 by means of screws 45 and having a marginal forming face recess within which is carried a ring die member 47 secured to the die member 44 by means of screws 48. Annularly surrounding the central portion of the plug assembly is a ring die member 49 which is secured by means of screws 50 to the die block 41.

The lower die plug structure 17 comprises die elements complementary to the several component elements of the die plug 15. Thus, a central die member 51 is arranged to cooperate with the die member 44, a ring die member 52 cooperates with the ring die 47, and a ring die 53 cooperates with the ring die 49. The ring dies 52 and 53 are secured to the die block or plate 32 by means of screws 54, the die plate 32 having a

central recess 55 for supporting the die members 52 and 53 in accurately centered position.

By preference the central lower die member 51 serves also as a stripper and is thus slidably vertically reciprocable within the ring die member 52, having a stem 57 depending therefrom and secured thereto by means of a screw 58. The stem has a vertical slot 59 through which extends a horizontal reciprocal limit pin 60 carried rigidly by a stem guiding tube 61 concentrically secured to and depending through the die base 33. The die pin 57 is normally urged upwardly by a stripper spring 62 to carry the die and stripper member 51 upwardly to stripping position as shown in Figure 1.

In operation, after the margin forming and hold down die members have engaged and clamped the margin of the blank 18, the ram 42 is depressed to bring the die plug structure 15 into crown shaping cooperation with the lower die plug structure 17 as shown in Figure 2. When the upper die section 10 is raised following the blank forming or drawing operation, the lower outer die ring 13 and the central die plug member 51 are elevated to strip the formed blank and raise the same to a position wherein the formed blank can be conveniently removed from the die assembly.

In Figure 3 is shown a drawing die assembly which in the margin forming portion is substantially the same as the assembly of Figures 1 and 2 but shows how a different central or crown design can be attained in a blank which will provide a cover having a standardized marginal formation but a different crown shape or design. Elements in the form of Figure 3 which are substantially identical to elements in the form of Figure 1 are identified by the same reference numerals. Thus, an upper die section 10' while having the same marginal forming die arrangement as in the form of Figure 1, has a different crown forming plug structure including a forming plate member 64 secured by screws 65 to the die block 41 and having a peripheral forming rim 67 cooperative with a stationary ring die 68 of a lower stationary die section 11'. Carried by the die plate member 64 is a central die plug member 69 removably secured as by means of screws 70 and having a convex forming surface contour cooperative with a lower forming and stripper die member 70 as well as a ring die 71 carried fixedly by the lower die plate 32. The lower ring die member 68 is fixedly secured to the die plate 32 as by means of screws 72 and serves as a guide for the reciprocal outer marginal forming die and stripper member 13 with which the upper hold down and margin forming die 12 cooperates. The ring die 68 also cooperates with the upper forming die 12 in forming the margin of the blank.

It will thus be apparent that very substantial savings can be effected in die costs in the production of drawn sheet metal articles where merely one portion of the design of a series of similar articles differs from the design of other articles in the series. For example, having more particular reference to Figure 4, in the production of wheel covers of the kind that are used on the outer side of automobile wheels, various models or makes of automobiles may use the same general type of cover but may, for various reasons such as differentiation, require differences in the design of the more prominent portions of the covers. Obviously, the crown portion of a wheel cover is generally the center of

ornamental interest. By use of the present invention a standard marginal formation M can be determined upon and an infinite variety of crown designs C can be had within the bounds of a division line D as determined by the interchangeable die plug structures for forming the crown portion, as hereinabove described. On the other hand, different marginal formations M may be had with respect to any standard or series of crown designs merely by changing the margin forming die structures. Furthermore, certain features of the crown shape can be maintained as standard through a series of wheel covers while other features can be changed by selection of particular portions of the crown plug structures of the die sections, as indicated in connection with Figure 1.

Numerous advantages accrue from the use of the present invention, among which may be mentioned the great savings in die costs for various designs since only selected portions of the die assembly need be different for each production run of any particular design while the remaining portions of the die remain the same. In making a change in the forming structures of the die assembly, the entire assembly need not be removed from the press but only such portions of the die sections, as for example the central plug structures or the marginal forming structures or some portion of either of such structures as may be required to effect the change, thereby saving much time in die set-up. Moreover, relatively small production runs can be economically made because of the foregoing factors of economy and speed in die costs and set-up.

I claim as my invention:

1. In a die apparatus for making wheel covers of fixed marginal shape, an upper die assembly, a lower die assembly, said die assemblies having circumferential portions of fixed shape for holding and forming the marginal portions of a wheel cover blank placed therebetween and having central portions thereof constituting replaceable die forming elements for forming variously shaped crown portions in said wheel cover blank, the replaceable die forming elements of the lower die assembly defining a central opening, a reciprocable plunger die member slidably guided in said opening, a stem depending from said plunger die member, a vertically extending slot in said

stem, a sleeve mounted below said lower die assembly within which said stem is slidingly guided, limiting means fixed relative to said sleeve and disposed in said slot, and biasing means acting on the stem, whereby said last mentioned means act to normally bias the plunger into stripping relation to said lower die assembly when said upper die assembly is raised and said limiting means cooperate with said slot to define the limits of reciprocation of said plunger.

2. In die apparatus for making wheel covers, separably cooperable die assemblies, one of said die assemblies having a central opening, a reciprocable stripper die member slidably guided in said opening, a stem extending from said stripper die member opposite to the cover-engaging end of said member, a longitudinally extending slot in said stem, a sleeve mounted in fixed coaxial relation to said stem and within which said stem is slidably guided, limiting means fixed relative to said sleeve and disposed in said slot, and means acting on the stem normally to bias the stem and plunger into stripping relation to said one die assembly when the other die assembly is separated therefrom, said limiting means cooperating with said stem in said slot to define the limits of reciprocation of said stem and stripper.

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