

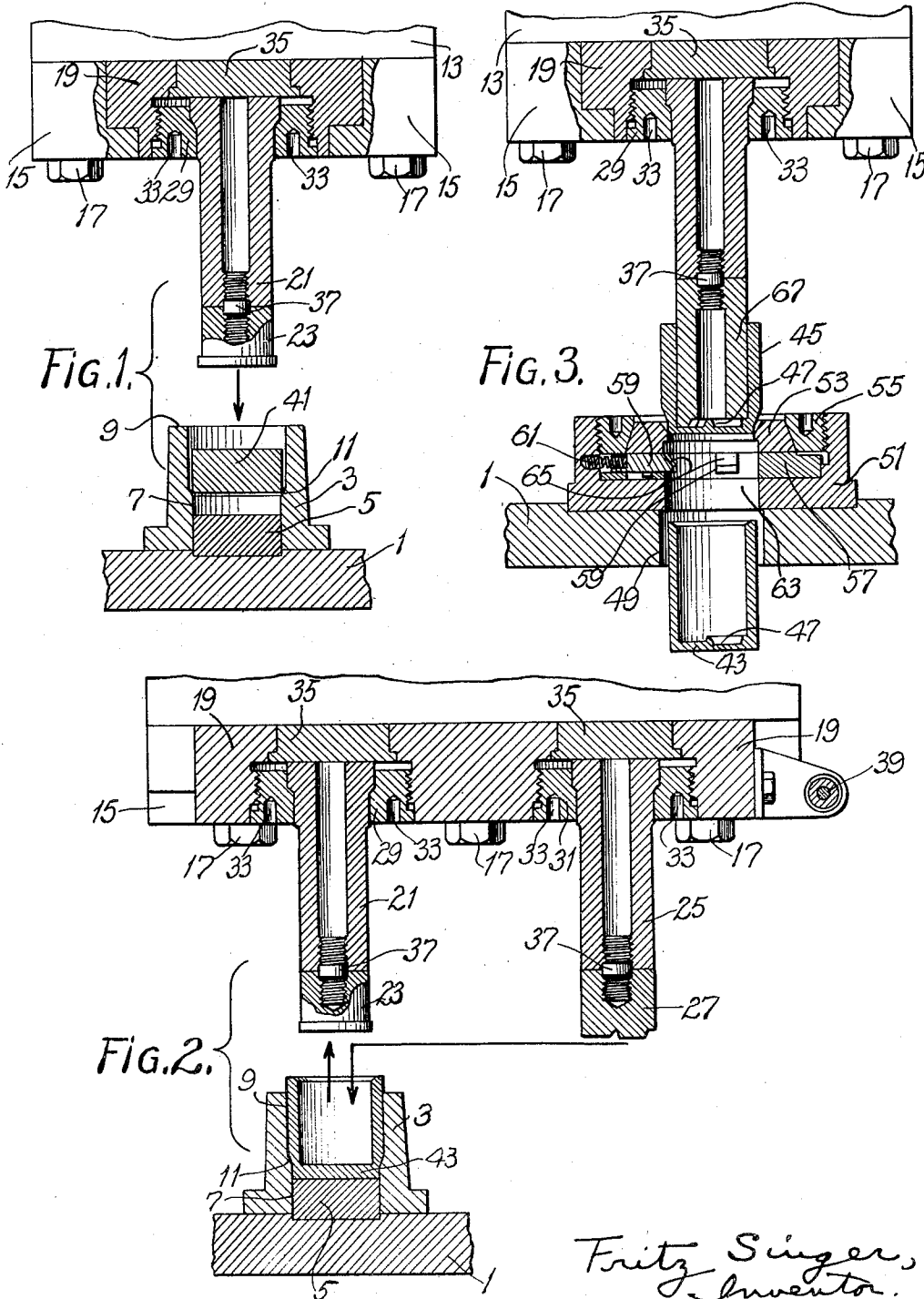
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MANUFACTURE OF CASINGS

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MANUFACTURE OF CASINGS

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This invention relates to the manufacture of casings, and with regard to certain more specific features, to a method of, and apparatus for, producing casings for electrical machines and the like.

Among the several objects of the invention may be noted the provision of a method of, and apparatus for making casings for electrical machines and the like in which a plastic billet is formed into a finished casing or the like in a single heat; the provision of apparatus for accomplishing the end described which will effect in said heat an extrusion to form a casing and also a swaging operation to form certain projections and the like; the provision of a method of, and apparatus of the class described, in which the said casings and the like are produced by a simple hot deformation process with a cold drawing, no other steps being used; and the provision of a method and apparatus of the class described which will provide a stronger, more dependable and accurate structure at minimum cost. Other objects will be in part obvious and in part pointed out hereinafter.

The invention accordingly comprises the elements and combinations of elements, feature of construction, and arrangements of parts which will be exemplified in the structure hereinafter described, and the scope of the application of which will be indicated in the following claims.

In the accompanying drawing, in which is illustrated one of various possible embodiments of the invention.

Fig. 1 is a front elevation, for the most part broken away to show a section of a pressing device for performing the first step in making a casing for small electric machines, the device being shown in its initial position and prior to an extrusion operation;

Fig. 2 is a left side elevation, partly in section, of the device, showing said device in the position after extruding a casing; and,

Fig. 3 is a cross section showing the performance of a third or drawing operation.

Similar reference characters indicate corresponding parts throughout the several views of the drawing.

Casings produced according to this invention have many advantages over known casings consisting of a tube part and a pair of bearing covers. For instance, there is effected a considerably higher resistance against deformation, which resistance is of importance in order to obtain the highest possible efficiency.

Referring more particularly to Fig. 1, there

is illustrated at numeral 1 a press table to which is fastened a matrix die 3. A hardened steel plate 5 is inserted into a recess of the press table 1 and closely fits into the bore of the matrix die 3. The steel plate 5 is positioned in a smaller part 7 of said bore, the larger part 9 of the bore joining with said smaller part 7 by way of a tapered portion 11.

At numeral 13 is indicated the reciprocating member of a press on which is located a slide holder 15, suitably secured by cap screws 17. A slide 19 is movably mounted within the slide holder 15 and carries punches 21, 23 and 25, 27 (see also Fig. 2). Chucks 29 and 31 hold the pairs of punches 21, 23 and 25, 27 respectively. The chucks 29 and 31 may be tightened and loosened by means of the application of a spanner wrench to the openings shown at numerals 33. Hardened steel plates 35 are used behind the punches 21 and 25 for sustaining the loads applied to the punches. The punch 23 is in effect a head piece for the punch 21 and the punch 27 is head piece for the punch 25, the respective head pieces 23 and 27 being connected to the supporting pieces 21 and 25 by suitable studs 37.

The punch 21, 23 shall be hereinafter referred to as the extruding punch, and the punch 25, 27 shall be hereinafter referred to as the swaging punch. As shown in Fig. 2, both the extruding punch and the swaging punch are located on the slide 19 so that by means of a suitable handle such as shown at numeral 39, said punches may alternatively be brought into alignment with the matrix die 3. Suitable abutments insure proper positioning of the punches with respect to the die.

The operation of extruding and swaging is performed as follows:

A suitable billet, such as indicated at numeral 41, is heated to a plastic condition and inserted into the matrix die 3 (see Fig. 1). At this time the extruding punch 21, 23 is in position above the matrix die 3. The press is then set to work, whereby the extruding die 21, 23 is brought from the Fig. 1 position down into the matrix die 3, thus forcing the billet 41 to be extruded from the Fig. 1 shape to the shape shown in Fig. 2. One stroke of the punch effects this result.

While the extruding or pressing punch 21, 23 is returning to the initial position shown in Figs. 1, and 2 the slide 19 is moved by means of a handle 39 so that the swaging punch 25, 27 is brought into position over the matrix die 3. At the second stroke, the head 27 of the swaging

punch enters the semi-finished casing 45 and forms the bottom 43 thereof so that it has the proper and desired shape for using it as an electrical machine or like casing. The formation 47 (see Fig. 3) is representative of any formation that may be required in the end wall 43 of the casing when it is put to subsequent use.

In Fig. 3 is shown the method of finally drawing the casing 45 so that it may have a proper finish and dimension. In this view, similar reference characters indicate the same parts as shown Figs. 1 and 2. It is understood that for the operation represented in Fig. 3, use may be made of the press used for extruding and swaging but it is used relatively to the table 1 in a new position, either the table or punch being actually movable to effect the re-location. In the present example the table 1 is shown provided at another location with an opening 49 about which is located a die-holder 51 for holding a drawing die 53, holding of the die 53 being effected by means of a chuck 55.

In order to prevent the casing 45 from sticking to the punch, there is arranged a tappet mechanism between the bottom of the die-holder 51 and the die 53, comprising a plate 57, in recesses of which are several tappets 59 together with springs 61 so coordinated that parts of said tappets 59 project inwardly into the bore 63 of the plate 57. The projecting parts of the tappets are tapered as shown at 65 so that they may be pushed back radially when the casing is passed through the bore of the plate 57 and to return into their normal position when the finishing drawing has been done. As the tappets at their underside are not tapered, upon the return stroke, the casings which stick on the punch are stripped off by said tappets. The head piece 67 of the stripper punch is interchangeable on either of the punches 21 or 25 of the extruding and swaging punches.

From the above it will be seen that after the extruding and swaging operation of Figs. 1 and 2 are completed the unfinished casings may be transferred to the stripper mechanism shown in Fig. 3. This is done after cooling of the metal and after it has been freed from scale. The drawing operation is then finished as shown. In Fig. 3 a finished product is shown as passing through the opening 49 after having been drawn. The drawing operation insures a proper and accurate finish, the bottom of the head 67 being so formed that it does not mutilate the formation 47 or its equivalent.

Among the advantages of the invention will be noted the provision of means for effecting a cup-shaped or closed-end tube shape from which cases of electric machines and the like may be accurately and cheaply made. I am aware that casings for magnetos, dynamos, starters, and motors and the like have been punched and drawn from sheet, but this method is more expensive than the one herein disclosed, because in punching the sheet there is waste. Also, the drawing operation requires heavy presses because it effects a substantial amount of the shaping. All shaping in the present invention is done during the hot period, the cold drawing providing finished primarily.

Another advantage of the present invention is that advantage is taken of a single heat for extruding and for swaging, thus saving a reheat and/or producing a stronger product.

My use of two steps for extruding and swaging has advantages over forming the inside of the

bottom of the closed-end tube during the extruding step, because if this is attempted, the moulding of the bottom is not so readily rendered perfect. With my process the moulding of the bottom is performed within the same heat and without taking out the extruded closed-end tube from the die and still the extruding die is not depended upon to effect the moulding although it may effect moulding if desired. Also, machining of the outside of the case is saved by reducing the closed-end, extruded tube to its exact measurements by the subsequent drawing process.

Casings produced according to this invention have advantages over casings consisting of a tube part and a pair of bearing covers because of the higher resistance against deformation. This permits the armatures to be more closely fitted, as well as the bearings, thus provided for greater efficiency of the machine, both electrically and mechanically. Magnetic gaps and bearing clearances may both be made less because of the greater rigidity.

In view of the above, it will be seen that the several objects of the invention are achieved and other advantageous results attained.

As many changes could be made in carrying out the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

I claim:

1. A method of forming a casing of the class described comprising heating a solid billet, extruding said billet to form a cup shape, swaging the extruded cup shape to mould the bottom thereof and subsequently drawing the exterior of the cup-shaped article without deforming said moulded bottom.

2. A method of forming a casing of the class described comprising heating a solid billet, extruding said billet to form a cup shape, swaging the extruding cup shape to mould the bottom thereof and subsequently drawing the exterior of the cup-shaped article without deforming said moulded bottom, said extruding and swaging operation being accomplished during a single heat.

3. A method of forming a casing of the class described comprising heating a solid billet, extruding said billet to form a cup shape, swaging the extruded cup shape to mould the bottom thereof and subsequently drawing the exterior of the cup-shaped article without deforming said moulded bottom, said extruding and swaging operation being accomplished during a single heat, and said drawing operation being performed cold after said heat.

4. A method of forming cup-shaped casings comprising heating a billet to plasticity, extruding the hot billet to form a cup, interiorly moulding said cup while yet plastic, cooling the cup and subsequently drawing said cup to final exterior size.

5. A method of forming cup-shaped casings comprising heating a billet to plasticity, extruding the hot billet to form a cup, interiorly moulding said cup in a second operation while said cup is yet plastic, cooling the cup and subsequently drawing said cup to final exterior size.