April 25, 1967 W. KIND ET AL 3,315,333

METHOD OF PRODUCING BASE ASSEMBLIES FOR IGNITION DISTRIBUTORS

Filed Aug. 20, 1964

FIG. 1

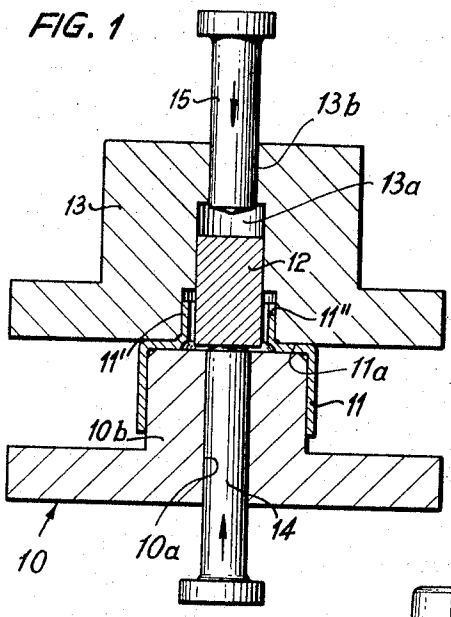


FIG. 2

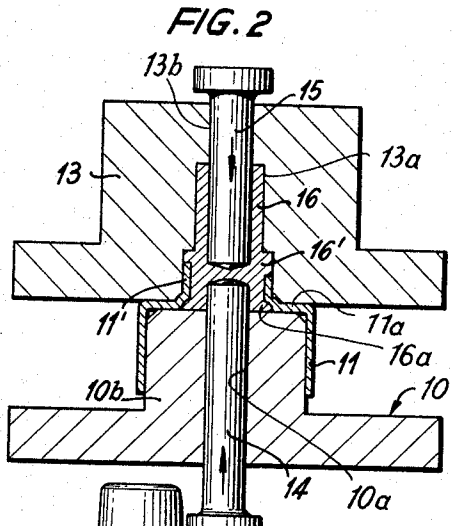


FIG. 4

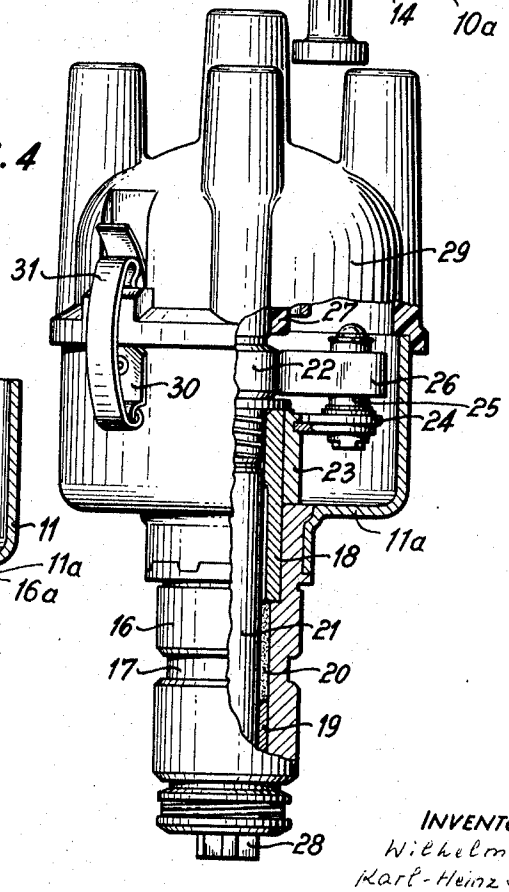
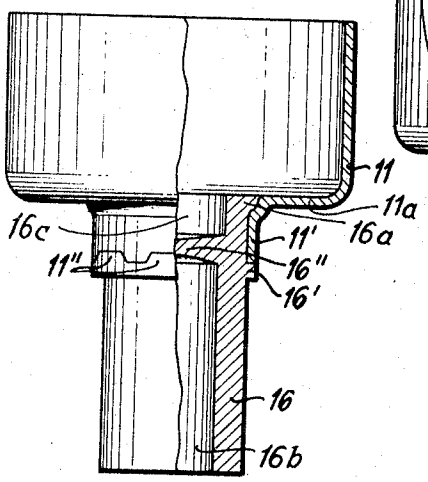


FIG. 3



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METHOD OF PRODUCING BASE ASSEMBLIES FOR IGNITION DISTRIBUTORS

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7 Claims. (Cl. 29—155.5)

The present invention relates to ignition distributors for automotive vehicles or the like, and more particularly to an improved method of producing base assemblies for such ignition distributors.

It is known that ignition distributors for internal combustion engines of automotive vehicles normally comprise a base assembly and a cap which is detachably coupled to the open end of the base assembly. The latter includes a cupped portion whose bottom wall is provided with a cylindrical sleeve to receive the drive shaft of the ignition distributor. Such base assemblies are normally produced by casting which means that the factory in which the ignition distributors are assembled must have a casting plant and expensive conveyors which deliver castings to the assembling station. The castings must undergo a series of secondary treatments which add considerably to the cost of the ultimate product. As a rule, the castings consist of gray iron, but it is also known to make the base assembly of aluminum alloys

It is an important object of the present invention to provide an improved method of mass-producing base assemblies for ignition distributors in such a way that the casting operation may be dispensed with, that the cup and the bearing sleeve of the base assembly invariably form an integral unit, and that the resulting article requires minimal aftertreatment.

Another object of the invention is to provide a method of producing base assemblies for ignition distributors of automotive vehicles or the like by resorting to a process known as impact extrusion.

A further object of the invention is to provide a method of the above outlined characteristics which may be practiced with the help of a comparatively simple and inexpensive apparatus.

An additional object of the invention is to provide an improved base assembly which is produced in accordance with our method.

A concomitant object of the invention is to provide a method of producing base assemblies for ignition distributors according to which different materials may be combined to form an integral unit so that each portion of the base assembly may consist of such material which is best suited for its intended purpose; for example, the bearing sleeve may consist of a material which is highly resistant to wear whereas the cup may consist of less resistant material.

Still another object of the present invention is to provide a method of producing base assemblies for ignition distributors in such a way that the bearing sleeve may be readily calibrated to take the drive shaft of the ignition distributor without any desirable play.

With the above objects in view, one feature of our invention resides in the provision of a method for the production of base assemblies for ignition distributors of the type wherein the base assembly comprises a cup and a bearing sleeve for the drive shaft of the ignition distributor. The method comprises the steps of drawing a cup-shaped metallic blank from a sheet of steel stock or the like so as to provide the bottom wall of the cup with a tubular extension, placing the extension into a female die having a cavity whose outline corresponds to the outline of the bearing sleeve, introducing into the extension a solid cylindrical slug of aluminum or other malleable metallic material, and applying to the opposite axial ends of the slug a compressive force to deform and to thereby transform the slug into a cylindrical body which fills the cavity of the female die and forms with the extension an integral unit which constitutes the bearing sleeve of the thus obtained base assembly.

It is preferred to provide the extension with at least one slot, groove or a similar recess which is filled with the material of the slug whereby the cylindrical body is non-rotatably secured to the extension. Also, some material of the slug may be caused to form an annular collar which overlies the inner side of the bottom wall to prevent axial movement of the cylindrical body. The punches which deform the slug to form a cylindrical body are preferably withdrawn at the time the cylindrical body has been provided with two blind bores which are separated by a radial partition or diaphragm. This partition is then drilled to be provided with a bore which is calibrated to accommodate the corresponding portion of the drive shaft or a bushing which surrounds the drive shaft.

The novel features which are considered as characteristic of the invention are set forth in particular in the appended claims. The improved method itself, however, will be best understood upon perusal of the following detailed description of the accompanying drawings, in which:

FIG. 1 is an axial section through a portion of an extruding apparatus which is utilized for practicing the method of our invention, the apparatus being shown in a position in which it is ready to begin the extruding operation.

FIG. 2 is a similar axial section but showing the component parts of the apparatus in the last stage of the extruding operation;

FIG. 3 is an enlarged side elevational view of the base assembly as it appears upon removal from the extruding apparatus, a portion of the base assembly being shown in section; and

FIG. 4 is a side elevational view of an ignition distributor which comprises a base assembly resembling the one shown in FIG. 3, a portion of the ignition distributor being shown in section.

Referring to the drawings, and first to FIG. 1, there is shown a portion of an apparatus for cold impact extrusion of base assemblies for ignition distributors of the type which may be used in the internal combustion engines of automotive vehicles and other types of conveyances. The apparatus comprises a male die or base **10** which is provided with an axial bore **10***a* for a reciprocable punch **14**. The base **10** is provided with a cylindrical boss **10***b* whose axis coincides with the axis of the bore **10***a* and which supports a cup-shaped metallic blank **11**. The blank **11** has been prefabricated in a drawing machine by deformation of a sheet of steel stock or the like. The bottom wall **11***a* of the blank is provided with a coaxial cylindrical extension **11'** having at its free end one or more axially extending notches **11''**, see also FIG. 3. The extension **11'** projects into the cavity **13***a* of a female die **13** which is placed onto the outer side of the bottom wall **11***a*. The cavity **13***a* has a larger-diameter outer portion which receives the extension **11'** and a smaller-diameter inner portion whose outline corresponds to the desired outline of the corresponding part of the bearing sleeve.

A slug **12** of malleable metallic material is placed into the cavity **13***a* in such a way that it extends close to the top face of the boss **10***b* and that it also extends into the smaller-diameter inner portion of the cavity. The female die **13** is further provided with a central bore

13*b* which receives a reciprocable punch **15**. The slug **12** may consist of a piece of solid cylindrical aluminum rod stock.

Once the base **10** is assembled with the die **13** in a manner as shown in FIG. 1, the punches **14**, **15** are caused to move toward each other in the axial direction of the extension **11'** whereby the slug **13** undergoes deformation and forms a cylinder **16**, see FIG. 2, which fills the remainder of the cavity **13***a* and is automatically connected to the extension **11'**. This is due to the fact that the material of the slug **12** fills the slots **11''**, as at **16'**, and also because some of the impact-extruded malleable material forms a collar **16***a* which overlies the inner side of the bottom wall **11***a* whereby the cylinder **16** is held against axial and/or angular movement with reference to the extension **11'**. Of course, the mass of the slug **12** is selected in such a way that the resulting cylinder **16** completely fills the cavity **13***a*, i.e., that portion of the cavity which is not filled by the front portions of the punches **14**, **15** and the extension **11'**.

In the next step, the punches **14**, **15** are moved axially and away from each other, the base **10** is separated from the female die **13**, and the thus obtained partially finished base assembly is removed from the cavity **13***a*, see FIG. 3. It will be noted that the punches **14**, **15** leave in the cylinder **16** a short radial partition or diaphragm **16''** which extends between two blind bores **16***b*, **16***c* and is thereupon drilled and calibrated to form an accurate passage for the drive shaft **21** or for a bushing **18** of the ignition distributor, see FIG. 4. Also, the periphery of the cylinder **16** is then provided with a circumferential groove **17** and its axial bore receives two press-fitted bushings **18**, **19** which are separated by a self-lubricating annular spacer **20**. The bushing **18** extends inwardly and beyond the bottom wall **11***a* to carry a cylindrical bearing **23** for an angularly adjustable breaker plate **24**. The plate **24** carries the bolt **25** of a primary distributor lever which is biased by a spring **26**. The upper end portion of the drive shaft **21** carries a rotor **27** and the lower end portion of this drive shaft carries a coupling **28**.

The open end of the cup **11** is closed by a cap **29** which is secured to the base assembly by a pair of cap clamp springs **31** (only one shown) which engage suitable projections **30** on the outer side of the cup **11**. The cap **29** normally consists of rigid synthetic plastic material.

A very important advantage of our improved method is that the base assembly of the ignition distributor may be produced at a very low cost and with utmost precision so that, once the impact extrusion of the slug **12** is completed, the base assembly is ready to be drilled and milled and to be thereupon assembled with the remaining component parts of the ignition distributor. Also, the manufacturing establishment need not include a casting plant and the manufacturer may dispense with costly and complicated conveyors which feed base assemblies in the form of gray iron castings when the base assemblies are produced in accordance with conventional methods. By changing from a casting method to a method which includes mechanical deformation of solid metallic material, we achieve substantial savings in space, material and equipment so that the improved base assembly may be manufactured at a cost which is substantially below the cost of heretofore known base assemblies.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can, by applying current knowledge, readily adapt if for various applications without omitting features which fairly constitute essential characteristics of the generic and specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. A method of cold forming base assemblies for ignition distributors of the type wherein the base assembly includes a cup and a bearing sleeve for the drive shaft of the ignition distributor, comprising the steps of drawing a sheet of metallic stock to form a cup-shaped blank with a bottom wall having a tubular extension; placing the extension into a female die whose cavity has an outline corresponding to the desired outline of the bearing sleeve; introducing into the extension a slug of malleable metallic material not completely filling said cavity; and applying to each axial end of the slug a compressive force acting in the axial direction of the extension to transform the slug into a hollow tubular body which fills the cavity and is simultaneously connected with said tubular extension to form therewith said base assembly.

2. A method of producing base assemblies for ignition distributors of the type wherein the base assembly includes a cup and a bearing sleeve for the drive shaft of the ignition distributor, comprising the steps of drawing a sheet of metallic stock to form a cup-shaped blank with a bottom wall having an open-ended tubular extension; placing the extension into a portion of a female die the remainder of whose cavity has an outline corresponding to the desired outline of the bearing sleeve; introducing into the end of the extension and extending therefrom into the cavity, a slug of malleable metallic material; applying to the opposite ends of the slug a compressive force acting in the axial direction of the extension to transform the slug into a hollow substantially cylindrical body which fills the cavity and interlocks with the tubular extension and is provided with an internal diaphragm located in a plane which is perpendicular to the axis of the body; removing the thus obtained bearing sleeve from the cavity of the female die; and drilling a bore through the diaphragm to provide a passage for the drive shaft of the ignition distributor.

3. A method of cold forming base assemblies for ignition distributors of the type wherein the base assembly includes a cup and a bearing sleeve for the drive shaft of the ignition distributor, comprising the steps of drawing a sheet of metallic stock to form a cup-shaped blank with a bottom wall having a tubular extension; placing the extension into a female die whose cavity has an outline corresponding to the desired outline of the bearing sleeve; introducing into the extension a slug of malleable metallic material not completely filling said cavity; and applying to each axial end of the slug a compressive force acting in the axial direction of the extension to transform the slug into a hollow tubular body which fills the cavity and constitutes with the tubular extension the bearing sleeve of the thus obtained base assembly and is simultaneously connected to the tubular extension so that the cup-shaped blank and the hollow tubular body form an integral unit.

4. A method as set forth in claim 2, wherein the sheet of metallic stock is drawn in such a way that the extension is provided with at least one recess to accommodate some material of the slug whereby the cylindrical body is non-rotatably united with the extension.

5. A method of cold-forming base assemblies for ignition distributors of the type wherein the base assembly includes a cup and a bearing sleeve for the drive shaft of the ignition distributor, comprising the steps of drawing a sheet which consists of a first metallic material to form a cup-shaped blank with a bottom wall having a tubular extension; placing the extension into a female die whose cavity has an outline corresponding to the desired outline of the bearing sleeve; introducing into the extension a malleable slug of a second metallic material not completely fitting said cavity; and applying to each axial end of the slug a compressive force acting in the axial direction of the extension to transform the slug into a hollow tubular body which fills the cavity and is simultaneously connected with said tubular extension to constitute therewith the bearing sleeve of the thus obtained base assembly.

6. In a method of producing base assemblies for ignition distributors of the type wherein the base assembly includes a cup and a bearing sleeve for the drive shaft of the ignition distributor, the steps of forming a cup-shaped metallic blank with an open-ended tubular extension which extends from the outer side of the bottom wall of the blank; inserting into the cup-shaped blank a portion of a male die and inserting the tubular extension into a portion of a female die the remainder of whose cavity has an outline corresponding to the desired outline of the bearing sleeve; introducing into one end of the tubular extension a cylindrical slug of malleable metallic material so that the slug partially extends into and fills the remainder of the cavity in the female die; driving through each of said dies a punch in the axial direction of the tubular extension so that the punches penetrate into the slug and deform the malleable material to fill the remainder of the mold cavity whereby the thus deformed slug and said tubular extension together constitute the bearing sleeve of the resulting base assembly and the punches remain separated by a diaphragm of malleable material; withdrawing the punches from the bearing sleeve; separating the base assembly from the dies; and drilling a bore into the diaphragm to provide a passage for the drive shaft of the ignition distributor.

7. In a method of cold-forming base assemblies for ignition distributors of the type wherein the base assembly includes a cup and a bearing sleeve for the drive shaft of the ignition distributor, the steps of forming by a drawing process a cup-shaped metallic blank with a tubular extension which extends from the outer side of the bottom wall of the blank and is provided with at least one recess; inserting into the cup-shaped blank a portion of a male die and inserting the tubular extension into a female die whose cavity has an outline corresponding to the desired outline of the bearing sleeve; introducing into the tubular extension a cold cylindrical slug of malleable metallic material so that the slug extends into and partially fills the remainder of the cavity in the female die; and driving through each of said dies a punch in the axial direction of the tubular extension so that the punches penetrate into the slug and deform the malleable material to fill the remainder of the mold cavity and to penetrate into said recess whereby the thus deformed slug and said tubular extension are non-rotatably joined and together constitute the bearing sleeve of the resulting base assembly.

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