

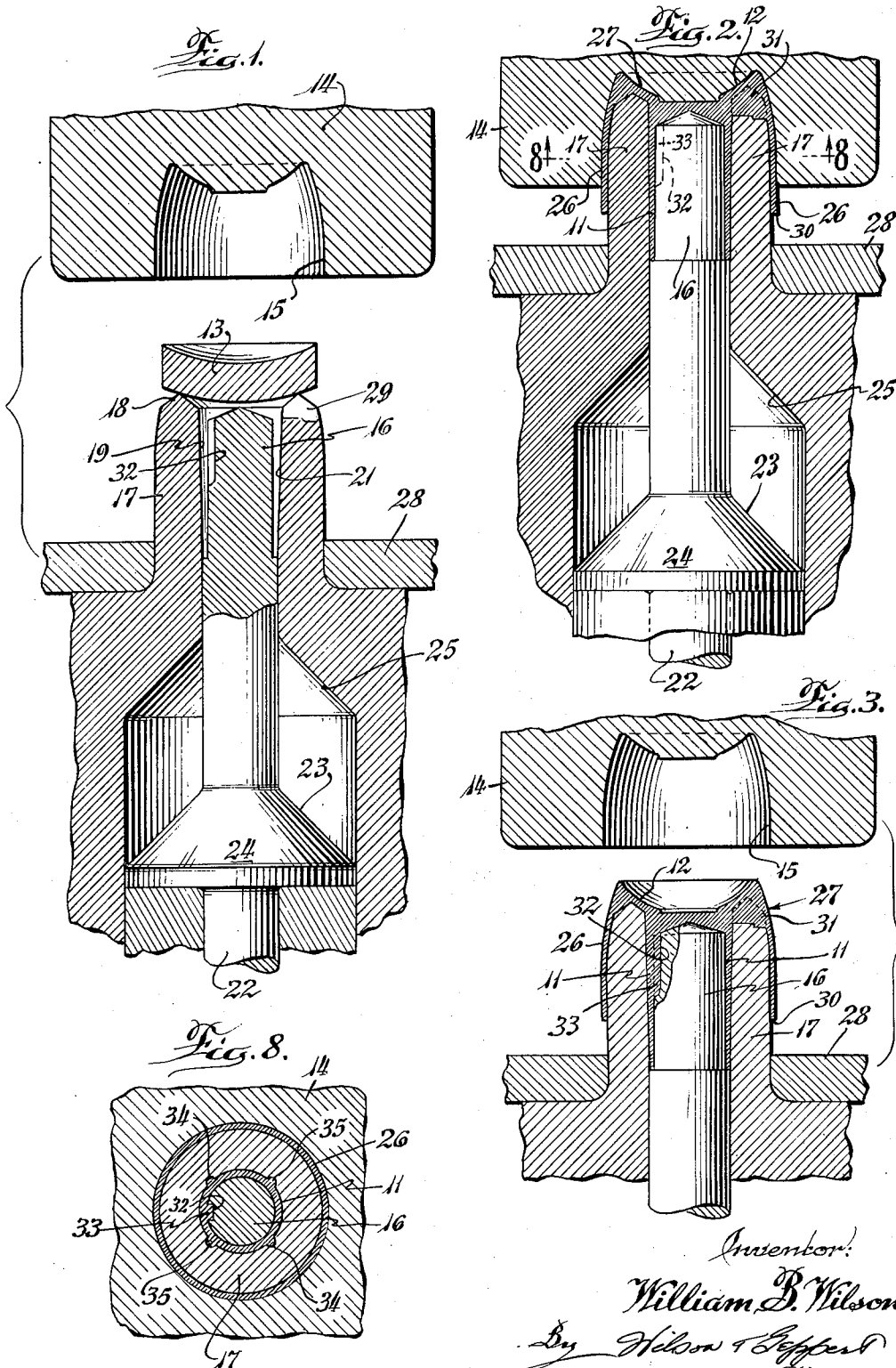
Aug. 17, 1965

W. B. WILSON
INTEGRAL HEAVY DUTY DOOR KNOB AND METHOD
OF FORMING THE SAME

3,200,630

Filed Nov. 20, 1962

2 Sheets-Sheet 1



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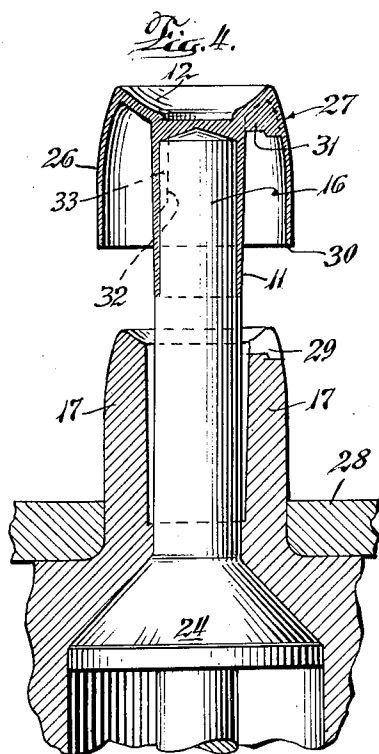
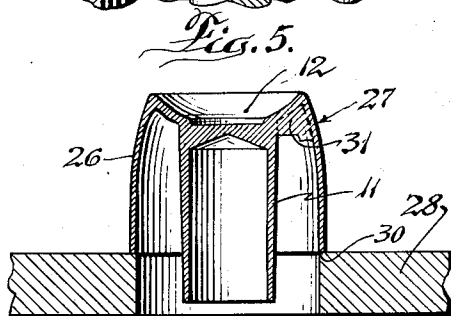
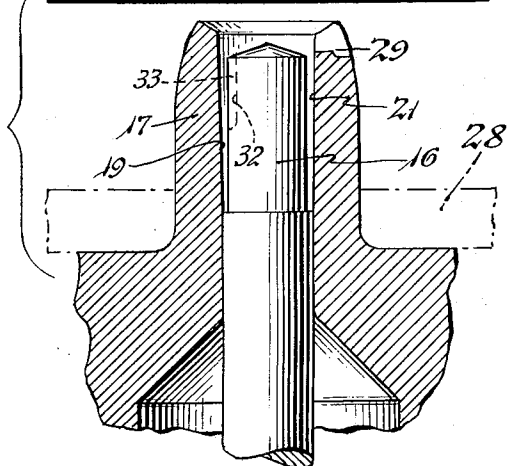
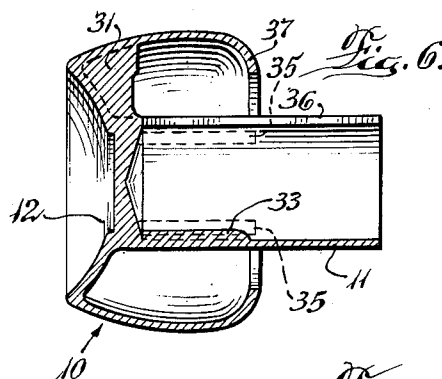
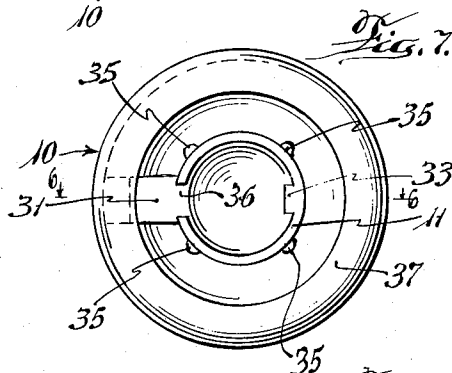
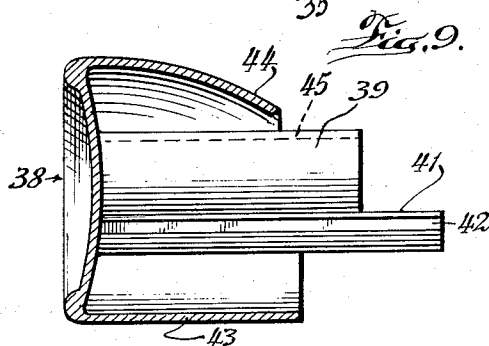
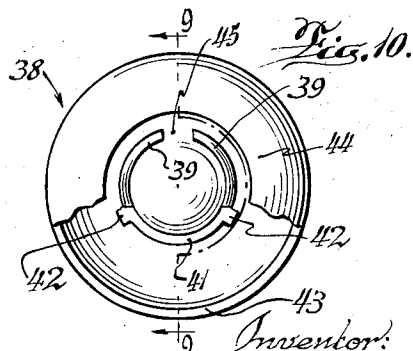
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2 Sheets-Sheet 2



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INTEGRAL HEAVY DUTY DOOR KNOB AND METHOD OF FORMING THE SAME

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7 Claims. (Cl. 72-254)

The present invention relates to the production of one-piece heavy duty door knobs for builders' locks or lock sets, and in which the knob and its integral inner tubular part are extruded of a slug of brass, stainless steel or other suitable metal in a high energy metal working or extrusion press to provide a cupped member having concentric tubular parts the outer of which forms the knob and the inwardly spaced tubular part integrally formed with the end wall or face of the knob.

Although it is common practice to produce door knobs from a round blank of sheet metal by plural drawing or expanding operations resulting in a one-piece sheet metal knob having an external reduced neck portion, such are necessarily of a relatively light weight and incapable of use where a heavy duty knob is desired or required.

It is also common practice to reinforce such knobs formed by plural drawing or expanding operations with a separate insert, such as a die casting, capable of joining the knob to the spindle of a door lock. Such production not only requires plural parts but also plural operations to nest these parts together and then securely join them against disassembly.

Manufacturers of heavy duty knobs vary somewhat in the methods employed in their production, but generally such heavy duty knobs consist of an outer shell, an inner shell, an inner tube and a dished washer all joined together in rigid assembly. A typical commercial production of such heavy duty knobs requires approximately five stages of draws in forming the outer shell; a similar number of stages or draws are required to form the inner shell which is nested within and substantially conforms to the inner contour of the outer shell; the inner tube requires a milled slot and side operations; and the dished washer requires a blanking and forming stage. Next, the separate inner tube, washer and inner shell are soldered and their assembly inserted into the outer shell after which the nested inner and outer shells are rolled in and retained assembled by frictional contact.

Such prior methods of producing heavy duty knob assemblies necessarily embody multiple parts and require multiple operations in their assembly, are expensive to produce and lack the inherent strength and rigidity of an integral or one-piece knob unit produced in accordance with the novel method and manner of the present invention.

Although one-piece door knobs have been produced as pointed out above from sheet metal blanks by plural drawing operations or hydraulic expansion, so far as I am aware integral or one-piece heavy duty knobs are incapable of being produced in any similar or equivalent manner. Furthermore, only recently have metal working presses been developed with sufficiently high energy to be capable of extruding from a slug or billet of brass or stainless steel for use in the production of heavy duty knobs.

In the present novel method and manner of producing a heavy duty door knob having an integral inner tubular part, I employ a high energy extrusion press in which a preformed slug or billet of metal such as brass or stainless steel, heated or unheated, is centered on top of the outer of a pair of concentric extrusion punches and in alignment with an opening in a downwardly opening die

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carried by a depending ram and thereby providing a simple method of centering the preformed slug for the extrusion operation as the ram descends and lowers the die about the upper end of the concentric punches.

The inner or center punch if of reduced diameter adjacent its upper end to provide an annular space for flow of the extruded metal between it and the outer or encompassing punch, and this center punch is longitudinally or vertically movable relative to the outer or encompassing punch by means of an ejector a distance sufficient to insure removal of the resulting extruded knob unit from the extrusion press by such movement and a stripper located beneath the outer tubular part of the cup.

Thus the present invention comprehends the manufacture of a novel cupped extrusion unit for producing a one-piece heavy duty knob, and the novel method or manner of producing such a unit by extruding a slug of the metal by means of a high energy press.

While the drawings disclose the die on the upper platen, the parts may be reversed so that the die is disposed on the lower platen in which event the slug or billet of metal is centered or disposed in the die, or the die and extrusion punches may be horizontally arranged and moved horizontally relative to each other.

The present invention further comprehends forming the inner tube for receiving an operational tubular part of the lock assembly, or alternately forming the inner tubular part operational by providing the inner end or portion thereof with a roll back for retracting the latch bolt of the lock assembly.

Further objects are to provide a construction and method of maximum simplicity, efficiency, economy and ease of assembly and operation, and such further objects, advantages and capabilities as will later more fully appear and are inherently possessed thereby.

In the drawings:

FIGURE 1 is a fragmentary view, part in vertical cross section and part in side elevation, of the separated components of a high energy press including a female die and concentric extrusion punches employed in the novel method or manner of forming a cupped member for the production of an integral or one-piece knob and its inner tubular part, the slug of metal being shown centered on the outer of the concentric punches.

FIG. 2 is a view similar to FIG. 1 but showing the upper platen carrying the die lowered to impact the metal slug and form the integral knob unit with its concentric cylindrical parts.

FIG. 3 is a fragmentary view, part in vertical cross section and part in side elevation, showing the next step in the method of procedure in which the upper forming die has been elevated or withdrawn from the formed knob unit on the concentric extrusion punches.

FIG. 4 is a fragmentary view, part in vertical cross section and part in side elevation, of the inner and outer concentric extrusion punches but showing the inner punch in its raised position in the bore of the outer concentric punch to eject or withdraw the formed outer cylindrical knob part from the outer concentric punch.

FIG. 5 is a view similar to FIG. 4 but with the integral knob unit and its inner tubular part ejected or stripped from the inner punch.

FIG. 6 is an enlarged horizontal cross-sectional view of the completed knob and integral tube assembly formed by impact in the manner shown in FIGS. 1 to 5, inclusive, the view being taken on the line 6-6 of FIG. 7.

FIG. 7 is a view in end elevation of the integral knob and tube assembly of FIG. 6, the view being taken from the inner end thereof.

FIG. 8 is a view in horizontal cross section taken on the line 8-8 of FIG. 2.

FIG. 9 is a vertical cross-sectional view of an alternate integral knob and tube assembly formed by impact but with the integral inner tube formed with a roll back to make it operational, the view being taken on the line 9—9 of FIG. 10.

FIG. 10 is a view in end elevation of the integral knob and tube assembly of FIG. 9, the view being taken from the inner end thereof.

Referring to the disclosure in the drawings and to the novel illustrative embodiments therein shown, the present invention comprehends a novel heavy duty knob unit and the novel method of forming such unit by impacting a slug or billet of metal, such as brass or stainless steel, to form a one-piece knob unit consisting of the knob 10 and its integral inner tubular part 11 projecting rearwardly through the knob from its end wall 12. Unlike prior means and methods of producing heavy duty knobs requiring the assembly and attachment of preformed plural parts, after which the outer and inner shells are rolled together to maintain tight frictional engagement, the present invention comprehends extruding a cupped member having concentric tubular parts in a high energy press to form an integral knob and tube.

In the novel embodiment of the present invention shown in FIGS. 1 to 8, inclusive, a preformed slug or billet 13 (FIG. 1) of the desired metal, heated or unheated, is impacted and extruded in a high energy, extrusion press having a ram 14 provided with a downwardly opening female die 15 having the contour of the intended extrusion, and upstanding concentric extrusion punches 16 and 17 with the slug of metal 13 centered on the projected end 18 of the outer punch 17, such press having sufficient energy to form the knob and tube integral upon impact.

The inner or center punch 16 is reduced in diameter along its upper or outer end to provide an annular space 19 between it and the inner wall of the outer or encompassing punch 17 for the flow of the extruded metal to form the inner tubular part 11. This inner wall has a slight upward and outward taper at 21 to facilitate removal of the tubular part 11. The inner punch 16 is longitudinally movable relative to the outer punch 17 by means of an ejector 22 a distance permitted by the spacing between the inclined surface 23 on the enlarged end 24 of the inner punch 16 and the complementary inclined surface 25 of the outer or concentric punch 17, sufficient to remove the resulting outer tubular or cylindrical part 26 of the extruded cupped member 27 from the outer concentric extrusion punch 17 (FIG. 4), after which a stripper mechanism 28 engages the lower or free end 30 of the outer tubular part 26 and longitudinally moves the cupped member 27 so formed from both extrusion punches. That portion of the cupped member 27 within the die has sufficient draft or taper downwardly and outwardly to be readily released from the die when the latter is raised or withdrawn from the punches as in FIG. 3.

As shown in FIGS. 1 to 5 inclusive, the projected or outer end 18 of the outer or encompassing punch 17 is milled or formed with a radial slot at 29 whereby to form a stop 31 for an encompassing operational part such as a cylinder of the lock mechanism for actuating the latch bolt. Also as shown in FIG. 8, the inner punch 16 is provided with a longitudinal slot 32 to form a stop 33 on the inner tubular part 11, and the outer concentric punch 17 with spaced notches 34 to form external embossments 35.

The cylindrical open end of the outer and/or inner tubular part 11 and 26 may be trimmed of any flash or excess material. Thereafter, the extended inner tubular part 11 is then milled to provide a longitudinal slot 36 for a key lock assembly and whatever other side operations are required for mounting the finished integral knob and tube assembly (FIGS. 6 and 7) to the projected end

of a tubular cam member or spindle of a lock assembly in a door.

The outer tubular part 26 forming the knob of the integral unit 27 is rolled in at 37 to give the finished knob 10 the desired shape. It is to be understood that where the knob is intended for use with a passage door devoid of any locking means, the outer face or end wall 12 of the knob may be retained devoid of an opening, but in the event the knob is intended to receive a cylinder lock, push or turn button, this face 12 is provided with a central opening conformably receiving and mounting the cylinder, push or turn button. Or this face may be provided with an access opening or slot for insertion of a key or other suitable instrument capable of releasing in an emergency the latching means of a privacy lock such as used in the door of a bathroom.

In the embodiment of FIGS. 9 and 10, the knob unit and integral tube 38 therein shown is formed by impact in the same manner as the embodiment of FIGS. 1 to 7, inclusive, but is of slightly different contour. In this embodiment, the integral inner tubular part 39 is provided at its inner end with an arcuate projection 41 and spaced longitudinally extending ribs 42. The arcuate projection 41 with its ribs 42 forms a roll back for actuating a latch bolt by turning of the knob.

In FIG. 9, the upper portion shows the inner end of the outer cylindrical part 43 forming the knob of the integral knob and tube assembly rolled inwardly from its impacted or extruded cylindrical form as shown at 44 in the lower portion of FIG. 9. As in the embodiment of FIGS. 6 and 7, the inner tubular part 39 is provided with a longitudinal slot 45.

It will be appreciated that the simplified procedure in making the knob and its inner tubular part integral in this novel manner not only eliminates the necessity for the plural parts previously required but also the numerous steps in forming and uniting of plural parts as required in prior methods of producing knobs capable of heavy duty use, thus effecting a substantial saving in material, time and labor.

Having thus disclosed the invention, I claim:

1. The method of forming an integral heavy duty knob assembly including a knob and an integral internal tubular part in a high energy press which comprises the steps of inserting a slug of metal of lesser diameter than that of the cavity of a female die forming the external contour of the knob, and impacting the outer face of the slug by means of a ram containing the female die with the latter having an internal contour conforming to the outer contour of the knob and concentric extrusion punches contacted by the inner face of the slug and over which the metal of the slug flows, the outer of said punches having a central bore receiving a center punch having a reduced free end spaced from the interior of the outer concentric punch to provide an annular space therebetween and during impact the exterior of said outer concentric punch is encompassed by the female die with the latter spaced from the interior of the die to cause metal of said slug to flow into said annular spaces to form an internal hollow tubular part and an external concentric knob, withdrawing the female die from the formed cupped extruded knob assembly, withdrawing the inner punch relative to the outer punch for removing said assembly from the outer punch, and removing said assembly from the inner punch.

2. The method of forming a one-piece heavy duty door knob assembly as set forth in claim 1, including the step of rolling the open inner end of the outer concentric knob part of the knob assembly inwardly to reduce its diameter.

3. The method of forming a one-piece heavy duty door knob assembly as set forth in claim 1, including the step of longitudinally slotting the inner tubular part.

4. The method of forming a one-piece heavy duty door knob assembly as set forth in claim 1, including the steps

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of rolling the open inner end of the outer concentric knob part of the knob assembly inwardly to provide a rolled inner edge, and longitudinally slotting the inner tubular part.

5. The method of forming an integral heavy duty door knob assembly from a slug of metal in a high energy press having a ram provided with a female die and separate concentric extrusion punches including a solid central punch and an encompassing punch having a reduced outer end with said punches being spaced apart to form an annular recess therebetween for the flow of metal, said knob assembly consisting of an outer tubular part having a depressed closed end and an integral cylindrical part formed integral with said closed end and projecting through the open end, comprising the steps of locating the slug of metal on the outer end of concentric punch, extruding said slug of metal by impact of said cupped female die and between the latter and the pair of separate but concentric extrusion punches with the inner punch having a reduced outer end spaced from the encompassing outer punch to provide an annular space for the flow of the extruded metal to form the inner tubular part and forming the outer tubular part between said outer concentric punch and the female die, and stripping said knob assembly from the female die and concentric punches.

6. The method of forming an integral heavy duty knob assembly as set forth in claim 5, including the step of rolling the free end of the knob part inwardly to reduce its diameter.

7. The method of forming a one-piece heavy duty door knob assembly provided with spaced concentric tubular parts with the outer part providing the knob formed with a depressed outer end and the inner part providing an integral tubular projection extending inwardly from the interior of the knob, comprising the steps of forming a cupped female die with the external contour of the knob

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part, forming concentric extrusion punches entering the female die upon impact with the inner punch encompassed by but spaced from the interior of the outer concentric punch and the outer concentric punch spaced from the interior of the female die to direct the flow of the extruded metal about the outer concentric punch and within the annular space between the latter and the exterior of the inner punch, locating a slug of metal upon the projected end of the concentric punch, impacting said slug in a high energy extrusion press carrying the female die, flowing the metal of said slug about the concentric punch and between the latter and the inner punch to conform the metal to the internal contour of the die and the external contour of the concentric punch and also flowing the metal into the annular space between the said extrusion punches to form the concentric tubular parts of the knob assembly, and in sequence removing the formed extruded member from the concentric punch and stripping the formed extruded member from the inner punch.

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