April 9, 1957 J. KAFOWI 2,788,236

PLURAL-PART KNOB CONSTRUCTION

Filed April 27, 1953

Fig. 1.

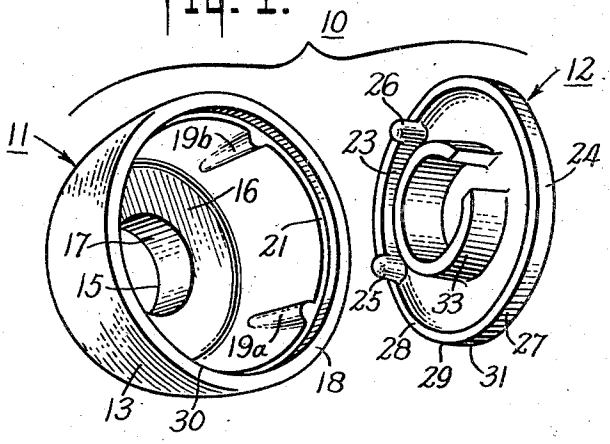


Fig. 2.

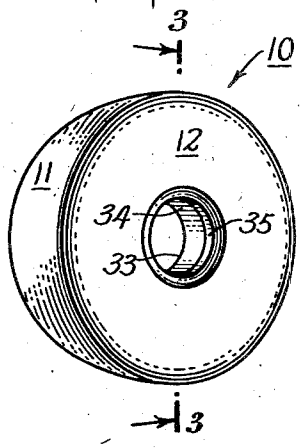


Fig. 3.

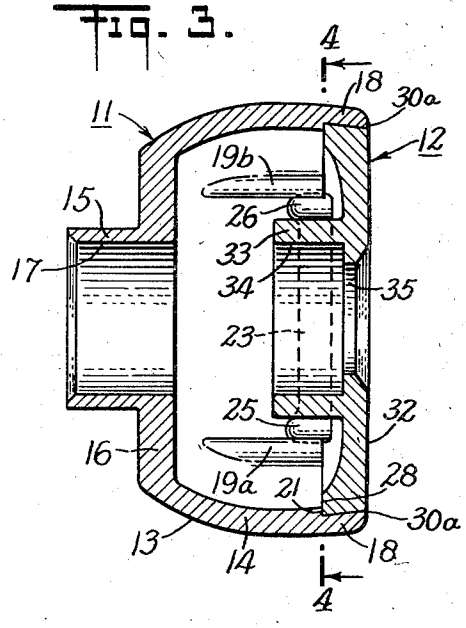


Fig. 4.

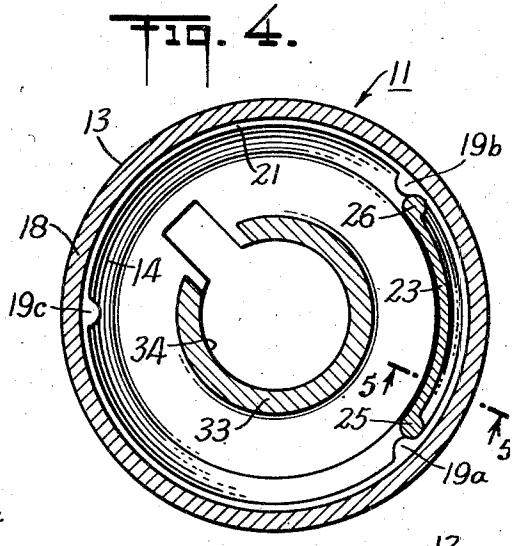


Fig. 5.

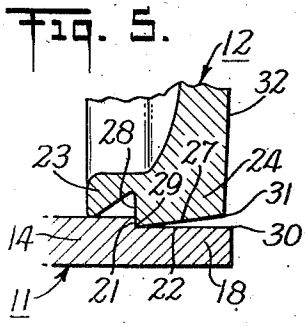


Fig. 5A.

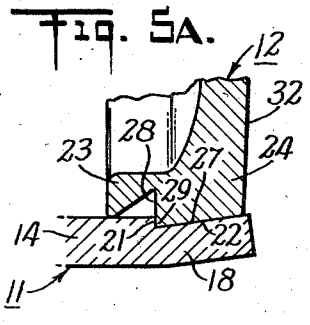
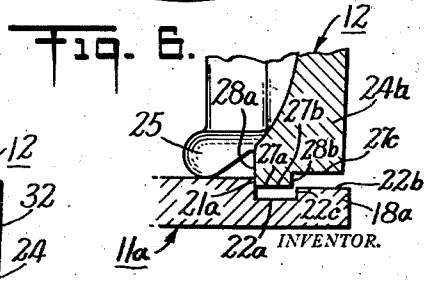


Fig. 6.



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PLURAL-PART KNOB CONSTRUCTION

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3 Claims. (Cl. 292—347)

This invention relates to the production of door knobs; more particularly to multi-part door knobs of forgings and still more particularly to a method for the production thereof.

Known to me is the procedure for making door knobs of a plurality of parts particularly involving the assembly of a knob shell and knob cap, each of which may be formed by metal casting procedure, in a bulk adequate to allow for subsequent turning and finishing operations. In such procedures as are known to me a relatively thin wall knob shell and knob cap made of stampings or castings are formed with interengaging sections which may be overlapped in interlocking relationship by a joint turned with a close fit and assembled by expanding the section having the outermost position under heat and contracting the same thereafter on the innermost section. The influence of contraction tended to induce an interlocking engagement and formed a coupling joint to hold the assembled parts against relative displacement. In such practice a one piece appearance is of no importance. Where the parts are finished by additional manufacturing procedure, such as turning, buffing or drilling to interfit key controlled mechanism difficulties are encountered. Usually these operations involve sufficient stresses due in part to thermal changes and in part to mechanical vibratory or in other mechanical stresses to cause a separation or sufficient relative movement to alter the appearance objectionably. Where these operations are combined with any key controlled mechanism, they render such mechanism unsafe for operation. Such multi-part assemblies could not compete with the more costly solid castings and are particularly unsuitable for metals amenable to formation by drop and press forging.

Likewise unsuitable is the practice of making multi-part door knobs out of shells with nonferrous metal alloys, such as aluminum alloys, bronze and metals having relatively high thermal expansion properties. These materials, while responding to temperature conditions for exerting a contractile tension for uniting the separate parts, are unsuitable for further finishing operations. Especially damaging are the thermal changes incident to turning, buffing and burnishing which so expand the metal, to show a parting line of the seam or joint. This parting line becomes objectionably evident when the final finishing step by lacquering, anodyzing or other ornamentation is applied.

Accordingly, it is an object of this invention to provide hollow knobs of muti-part or plural part construction and a method therefor which permits the production of door knobs the elements of which are made by drop- and press-forging, particularly as applied to non-ferrous metal alloys such as brass, aluminum, bronze, to effect substantial economies without sacrificing appearance or utility of these items.

It is an object of this invention to provide a hollow shell drop-forging and couple with it a shell cap likewise shaped preliminarily by drop- and press-forging and form on the cooperative engaging parts an overlapping joint

with the inter-engaging faces, with the body of the parts interlocked against relative movement mechanically and the abutting exposed surfaces frictionally engaged.

The invention contemplates as its object an assembly of knob shell parts to form a whole door knob in which the body portions of the knob parts are interlocked against relative axial movement internally and have an inter-locked, over-lapping relation to each other at the surface in intimate engagement by applying a clamping pressure to merge the surfaces, with such effectiveness as to eliminate any detectible seam which persists throughout its life as well as in the manufacturing operations.

Thus, in accordance with my invention, it is an object thereof to provide a method for effecting substantial economies by assembling parts of the door knob made by drop- and press-forging with internal mechanical interlocking and surface interlocking engagement, exerted by pressing the parts together, including shrinking stresses due to thermal changes. More particularly, my invention provides a knob in which a surface finish may be applied as by turning, grinding, polishing, burnishing, buffing, leaving no detectible seam even where subjected to lacquering or anodyzing for ornamenting the final product.

To attain these objects and such other objects as may appear herein or be hereinafter pointed out, reference is made to the accompanying drawing, forming a part hereof, in which—

Figure 1 is an exploded perspective view illustrating two segments entering in the construction of a door knob in accordance with my invention;

Figure 2 is a perspective view of an assembled and finished product;

Figure 3 is an enlarged section taken on the line 3—3 of Figure 2;

Figure 4 is a section taken on the line 4—4 of Figure 3;

Figures 5 and 5A are fragmentary sections taken on the line 5—5 of Figure 4 at intermediate stages of assembly;

Figure 6 is a fragmentary view similar to Figure 5 of another embodiment of my invention.

Making reference to the drawing, there is illustrated the knob 10 comprising the knob shell segment 11 and the cap segment 12. These segments are each desirably made of drop- and press-forgings employing non-ferrous metal alloys such as bronze, brass or an aluminum alloy. The knob shell segment is forged to provide a main body cup shaped portion 13 having a relatively thin wall 14 terminating into the axial shank portion 15 extending from the connecting web 16. The shank has a tubular boring 17 for engagement with the spindle sleeve in a manner which will be readily understood.

The body segment 13 terminates in a rim 18, at its mouth normal to the axial line of the forging. A plurality of longitudinally extending ribs 19*a*, 19*b* and 19*c* are forged inwardly of the interior wall 20 and initially extend coterminously with the rim 18. Thereafter upon completion of the body segment by drop-forging steps, a ledge 21 is formed by turning to ream a neck portion 22 of generally cylindrical contour internally.

The cap segment 12 is likewise drop-forged as is the knob shell segment from similar non-ferrous alloy material and of relatively even wall thickness and is substantially flat except to provide an arcuate lug 23 adjacent the rim 24 extending in substantial parallelism to the axial line of the cap segment. The lug 23 terminates in round nose bosses 25 and 26 and these bosses are spaced apart to wedge tightly with friction fit between the ribs 19*a* and 19*b*, for purposes which will appear more clearly as this descripton proceeds. Thereupon the rim 24 of the cap segment is turned to outline a

frusto-conical cross section 27 as shown in magnified form in Figure 5, and to turn thereon a finished shoulder 28 to make flat flush contact with the shoulder 21. The taper of the rim 27 serves and its size provides the edge 29 of a dimension which makes a friction fit with the cylindrical neck 22 and to just clear the rim edge 30 in positioning the cap. The smaller dimensional edge 31 of the rim 27 of the cap will thereby show the existence of a gap at this stage defined by the edges 30 and 31. The edges 30 and 31 or either one of them may, for more malleable metals, in the turning operation be left with a feathered extension without objection. The edge 30 may protrude to one side of the cap segment surface 32 when the cap segment is seated.

With cooperating parts thus provided, the cap segment 12 serving as the male portion is interengaged with the knob shell segment serving as the female portion by wedging the bosses 25 and 26 between the ribs 19*a* and 19*b* and to seat the shoulder 28 against the ledge 21 of the knob shell segment until the protruding position of the edge 30 with respect to the edge 31 is apparent. With the initial assembly thus made, the shell body segment 11 with the cap inserted in position is then subjected to clamping action under pressure, accompanied by swaging elongating action to bring the neck 22 into intimate contact with the rim 27 and thereby deform the cylindrical rim 18 and the neck thereof 22 into interlocking engagement with the frusto-conical rim 27. The rim 18 may be shrunk and spread out in a measure to completely cause seizure over the interengaging surfaces, and further to extend beyond the edge 31 so that its edge 30*a* not only engages the rim 31 but extends slightly over the exterior surface 32 of the cap segment.

The interlocking and seizing surface engagement as produced by pressure deformation of the rim 18 over the cap may be practiced under conditions further to contact the knob shell segment 11 over the cap segment 12 and for this purpose the knob segment 11 may be heated to expand this member and the cap 12 may be frozen or cooled to shrink the same. The heating action to expand the knob shell and the freezing action to contract the cap will, in a measure, be dependent upon the type of alloy from which the knob parts are made, to be susceptible of this action without warping the segments to prevent a good fit or surface engagement between the rim 21 and the shoulder 28.

The employment of a cap segment 12 which is substantially flat may contribute to the effectiveness of the force which may be applied to press the neck into seizing relation to the cap segment 12 without distorting this latter member.

Upon concluding the interlocking engagement of the knob shell segment 11 and the cap segment 12, the assembly may be subjected to operations for effecting the desired contour. Turning, grinding, polishing, buffing or burnishing operations do not appear to effect any relative movement of the knob shell segment and cap segment by reason of the combined mechanical interfit of the ribs and bosses of the shell and cap, respectively. No seam is discernible at the gap previously described and then existing between the knob shell and the cap. Lacquering or anodyzing operations, depending upon the alloys employed, may be carried out without modification of the blending seized edges.

By the method which I have described and the assembly illustrated, the use of drop- and press-forging methods may be employed to first make the knob parts to improve the quality, strength and elongation characteristics of the metal employed in a product of this character and effect large economies as compared with knobs made of said castings in an integral construction. Thus, the objectionable losses due to porosity, uneven wall thicknesses and other defects in the casting are not involved by my method and a smooth impervious continuous surface may be obtained.

While I have shown and described a knob intended to be finished with a continuous uninterrupted exposed surface, it will be understood that I may form the cap 12 with an internal annular flange 33 to centrally brace and receive the knob spindle assembly within the annular passage 34 or, where a key controlled plug is to be assembled in the knob, the cap segment may be turned with the concentric boring 35 axially aligned with the passage 34. Balance in turning for finishing as well as for performing the operations for contouring or boring may be achieved by the relationship of the rib 19*c* to the locking ribs 19*a* and 19*b*, which also give a three point shoulder stop for the cap segment.

While I have shown and described in one embodiment of my invention the formation of rim 27 on the cap segment of frusto-conical contour, I may secure the differential dimension for interlocking engagement in a more positive manner, as illustrated in another embodiment of my invention, shown in Figure 6. In this embodiment the cap 12*a* has its rim portion 27*a* turned with stepped portions 27*b* and 27*c*. This turning operation is accompanied by the formation of a pressure shoulder 28*a* and an outwardly directed shoulder 28*b* stepped from the rim of lesser diameter 27*c*.

With this type of cap, a shell 11*a* is turned to provide a ledge 21*a*, as outlined by the counter borings 22*a* and 22*b* inwardly of the rim 18*a*. The diameter of the boring 22*b* conforms closely to the diameter of the larger diameter 27*b* of the cap 12*a* to outline an undercut shoulder 22*c*. The thickness of the cap adjacent the rim 27*a* is calculated to interfit closely the counter-boring 22*a* of the knob shell.

With the construction described, the method of drawing and pressing the sections together by the forging steps previously described may be practiced with greater positiveness of interlocking, of value particularly at the intermediate stages of pressing the knob shell rim 18*a* about the rim 27*a* of the cap but in other respects having substantially the same advantages previously described in the elongation of the metal of the rim of the knob shell about the cap to result in an undetectible interface of the cap edge and rim edges of the knob shell. In a measure, likewise, the stepped rim and shoulder interengagement may be less apt to disfigurement of any surface ornamentation, lacquer coating or other finish.

The term "multi-part" as used herein is intended in its broadest sense, to mean "more than one" or "comprising a plurality of parts" and accordingly, in the claims the term "plural part" has been used to denote the broader interpretation of "multi-part," to mean two or more than two parts.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent is:

1. A plural-part knob which comprises a knob shell segment and a cap segment, each of which segments is a drop- and press-forging, said first segment having a cup shaped body, a mouth portion to one side thereof, an annulus interiorly of said mouth portion defining a ledge inwardly of said mouth portion, interlocking rib means interiorly of said body adjacent said mouth portion extending toward said ledge, said cap segment having a peripheral rim portion seated on said ledge portion, and said cap having interior lug means interlocking with said rib means, said cap segment having rim edge portions which are differentially dimensioned, with the larger dimensional edge in engagement with said ledge, the mouth portion being in seizing engagement with the rim edge of the cap at their interfaces without any detectible seam when turned.

2. A plural-part knob in accordance with claim 1 wherein said rim edge of said cap segment and the mouth of said knob segment are formed with stepped shoulders.

3. A plural-part knob in accordance with claim 1 wherein said rim edge of said cap segment and the mouth of said knob segment are formed with frusto-conical connecting surfaces.

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