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ARBOR FOR ACCURATELY SUPPORTING ROTATABLE ARTICLES

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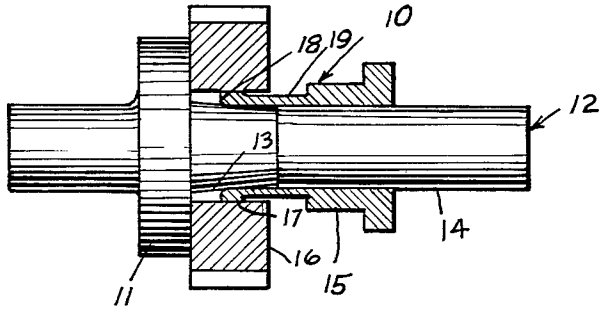


FIG 1

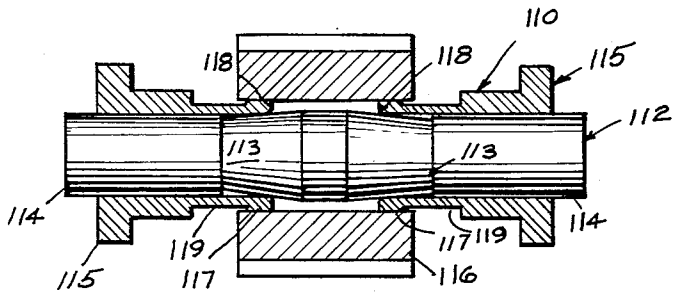


FIG 2

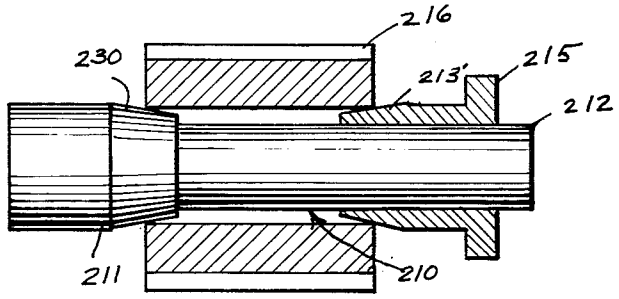


FIG 3

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ARBOR FOR ACCURATELY SUPPORTING ROTATABLE ARTICLES

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This invention relates to arbors and, more particularly, to arbors for accurately holding gear blanks for rotation and other rotatable members in position during test, inspection, and the like.

In arbor collet arrangements for supporting rotatable members previously made, the sleeve would often expand the article or be compressed to grip it. These sleeves were invariably hollow members which were split longitudinally so that the metal of the hollow members themselves was not strained but, rather, the segments of the ends of the hollow members were bent outwardly, thereby forcing the ends into engagement with the internal surface of a member or with the external surface of a member.

The present invention contemplates the use of an arbor like shaft or the like having a slight taper thereon which can be received in a relatively thin hollow member and when a member to be held rotatably on the arbor is slipped over the sleeve, the sleeve is compressed around its entire periphery.

The invention can also be carried out by providing an internal taper on a hollow cylindrical member and drawing a sleeve into engagement therewith into the hollow tapered member to compress the material of the sleeve and thereby reduce the internal diameter thereof to cause it to grip the outside of a round cylindrical member. This action of actually deforming the material by compressive deformation or by tensile deformation gives a much more accurate gripping action on rotatable members than where the material of a collet, for example, is slotted and the parts thereof are merely bent outwardly or inwardly to grip a piece of work. This accuracy obtained by the present invention is important where work is to be done to extremely fine accuracies such as are required in some present day experimental and highly scientific works.

It is, accordingly, an object of the present invention to provide an improved arbor for holding work.

Another object of the invention is to provide an arbor which will support members to be held thereon at extreme accuracies.

Still another object of the invention is to provide an improved action in a work holding device.

A further object of the invention is to provide an arbor which is simple in construction, economical to manufacture, and simple and efficient in operation.

With the above and other objects in view, the present invention consists of the combination and arrangement of parts hereinafter more fully described, illustrated in the accompanying drawing and more particularly pointed out in the appended claims, it being understood that changes may be made in the form, size, proportions, and minor details of construction without departing from the spirit or sacrificing any of the advantages of the invention.

In the drawing:

FIG. 1 is a cross sectional view of one embodiment of the invention;

FIG. 2 is a cross sectional view of another embodiment of the invention; and

FIG. 3 is a view of yet another embodiment of the invention.

Now with more particular reference to the drawing, in the embodiment shown in FIG. 1, an arbor generally indicated at **10** has a stop **11** which is in the form of a circular disk integrally formed with a shaft **12**. The

shaft **12** has a tapered portion **13** which diverges in a direction away from the shaft and joins a cylindrical portion **14** of the shaft. It will be noted that the small end of the tapered portion **13** is smaller than the diameter of the cylindrical portion **14**.

A sleeve **15** is slidably receiving on the cylindrical portion **14** and fits this portion to a very close tolerance. A fit suitable for this application is sometimes referred to in the trade as a slip fit. The sleeve **15** has a finely finished inside cylindrical surface which terminates at an end **17** in a radiused end **18** which is provided so that the end of the sleeve will not dig into the tapered surface when the sleeve slides up over the taper.

The outside of the sleeve **15** is relieved at **19** so that the end **17** has a greater diameter than the portion adjacent thereto and a flat cylindrical surface is provided on the outside surface which engages the inside of a member **16** to be rotated. This causes a greater amount of the force of the taper to be exerted on the inside of the gear.

The sleeve **15** is generally in the form of a hollow cylinder and the end **17** is in the form of a continuous hollow cylinder which will be stretched outwardly when the sleeve is forced to slide up over the taper **13**. The taper **13** is a gentle taper of the order of the taper which is frequently used in machine spindles and the like so that the sleeve will be held in position on the taper by friction. The material of the end **17** will stretch and it will expand in a uniform manner around its circumference and will hold the gear blanks in precision arrangement.

In the embodiment of the invention shown in FIG. 2, an arbor **110** has two sleeves **115** slidably received on a cylindrical portion **114** on each end thereof. The shaft **112** has two tapered portions **113** diverging away from each other and terminating in a small end slightly smaller than the cylindrical portion **114**. The sleeves **115** slide along the shaft **112** and the ends thereof are radiused at **118** so that the ends thereof will not dig into the tapered portions **113**.

The outer circumferences of the sleeves are relieved slightly at **119** so that they provide ends **117** which are perfectly cylindrical and which are finished to engage the internal diameter of a gear blank **116**. In either case, one sleeve acts as a stop on the mandrel while the other acts as in FIG. 1.

In the embodiment of the invention shown in FIG. 3, an arbor **210** is provided with a stop **211** on a cylindrical portion **213**. A sleeve **215** is slidably received on a shaft **212** and makes a slip fit thereon. The sleeve has a tapered portion **213'** which has a slight taper in the order of magnitude of the tapers on machine spindles and the like. In the same manner, the taper at **230** on the stop **211** is generally a gentle taper so that it fits into the internal diameter of a gear blank **216** or rotatable member to hold it in position when the gear blank **216** is put on the shaft **212** and put into the position shown. The sleeve **215** is forced into the other end of the rotatable member and is held therein by friction and since there is a very slight clearance between the sleeve and the outside diameter of the shaft, the sleeve will be compressed between the gear and the shaft and it will be stressed by compressive deformation to hold it in position.

The foregoing specification sets forth the invention in its preferred practical forms but the structure shown is capable of modification within a range of equivalents without departing from the invention which is to be understood is broadly novel as is commensurate with the appended claims.

I claim:

1. A support for a rotatable member comprising an

arbor, a stop on said arbor, a shaft extending from said stop, said shaft having a tapered portion adjacent said stop converging in a direction away from said stop, said shaft having a cylindrical portion adjacent said tapered portion and slightly larger in diameter than said tapered portion, a sleeve on said cylindrical portion extending over a part of said tapered portion, and a round member adapted to be supported on said arbor against said stop, sid sleeve end adjacent said tapered portion being adapted to be received in said round member, the outside diameter of said sleeve spaced slightly from said end adjacent said tapered portion being smaller in size than the part adjacent the said end, said end defining a continuous uninterrupted band around said tapered portion, said tapered portion straining the material of said end of said sleeve to increase the outside diameter thereof and to then grip the inside of said round member.

2. A support for a rotatable member comprising an arbor having a shaft with a stop thereon, a tapered portion on said shaft adjacent said stop, a cylindrical portion outside said tapered portion, said tapered portion converging in a direction away from said stop, said cylindrical portion being slightly larger in diameter than the adjacent end of said tapered portion, a sleeve on said cylindrical portion extending over a part of said tapered portion, said sleeve making a precision slip fit with said cylindrical portion, and a round member adapted to be supported on said arbor adjacent said stop, said sleeve end adjacent

said tapered portion being adapted to be received in said round member, the outside of said sleeve spaced slightly from the end of said tapered portion being undercut to leave said end in the form of a cylindrical portion defining a continuous uninterrupted path around said tapered portion, said tapered portion being strained in compressive deformation by said sleeve and said tapered portion straining said sleeve outwardly and compressing it between said rotatable member and said tapered portion whereby said sleeve positively engages the inside of said rotatable member, said tapered portion being of a very slight degree whereby friction on said tapered portion holds said sleeve thereon.

3. The support recited in claim 2 wherein said stop comprises a second sleeve spaced from said first mentioned sleeve and a second tapered portion diverging away from said first mentioned tapered portion on said shaft, said second sleeve being substantially of identical structure to said first mentioned sleeve.

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