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Shultz

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[54] **APPARATUS AND METHOD FOR REMOVING BEARINGS**

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Related U.S. Patent Documents

Reissue of:

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Issued: **Oct. 26, 1993**
Appl. No.: **960,726**
Filed: **Oct. 14, 1992**

[51] **Int. Cl.**^{6} **B23P 19/04**

[52] **U.S. Cl.** **29/898.08**; 29/259; 29/263; 29/426.5

[58] **Field of Search** 29/256, 258, 259, 29/263, 265, 898.08, 426.5

[56] **References Cited**

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3,887,989 6/1975 Maynard 29/898.08
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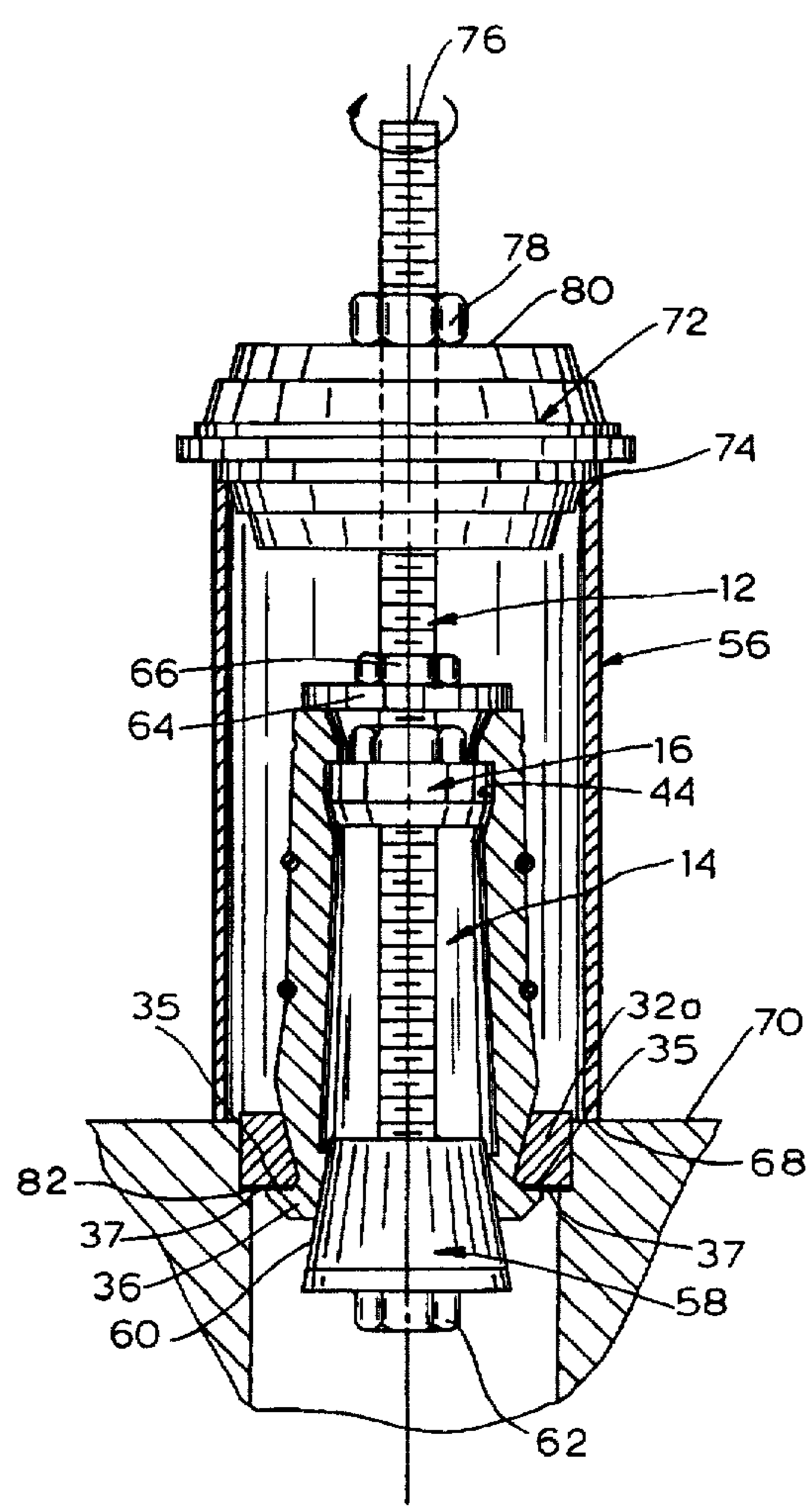
Primary Examiner—S. Thomas Hughes
Attorney, Agent, or Firm—Marshall, O'Toole, Gerstein, Murray & Borun

[57] **ABSTRACT**

Apparatus and method for removing a bearing. More particularly, the apparatus and method are designed to simplify the removal and replacement of all bearing cups and cones in an automotive automatic transmission. The apparatus includes an elongate bearing drive shaft; an adjustably sized mandrel which includes one or more bearing drive shoulders; a mandrel spreader for adjusting the mandrel drive shoulder to a predetermined dimension; and a collar or clamp ring for limiting the mandrel to a maximum outer dimension surrounding an outer surface of the bearing, without substantial slippage, during the removal and insertion steps, in one embodiment.

21 Claims, 3 Drawing Sheets



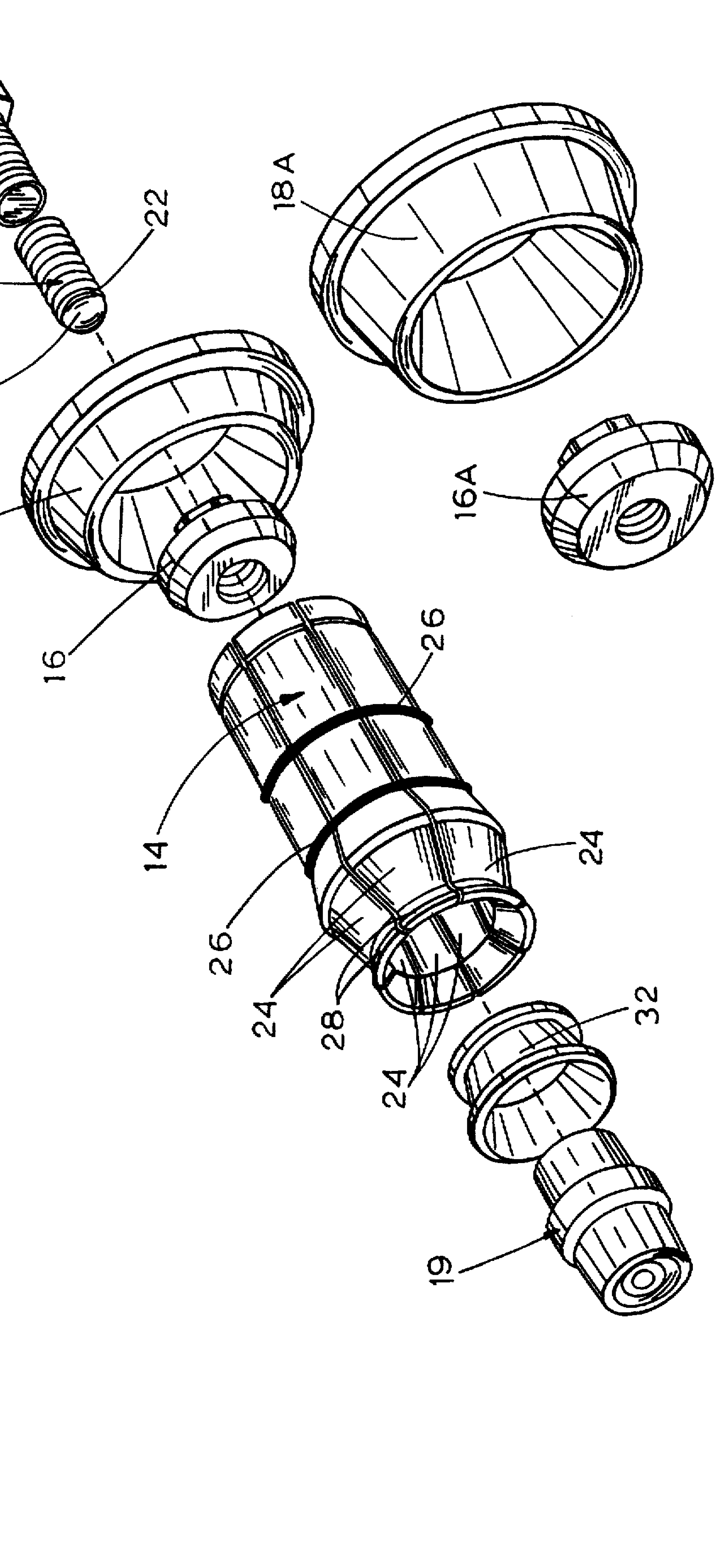
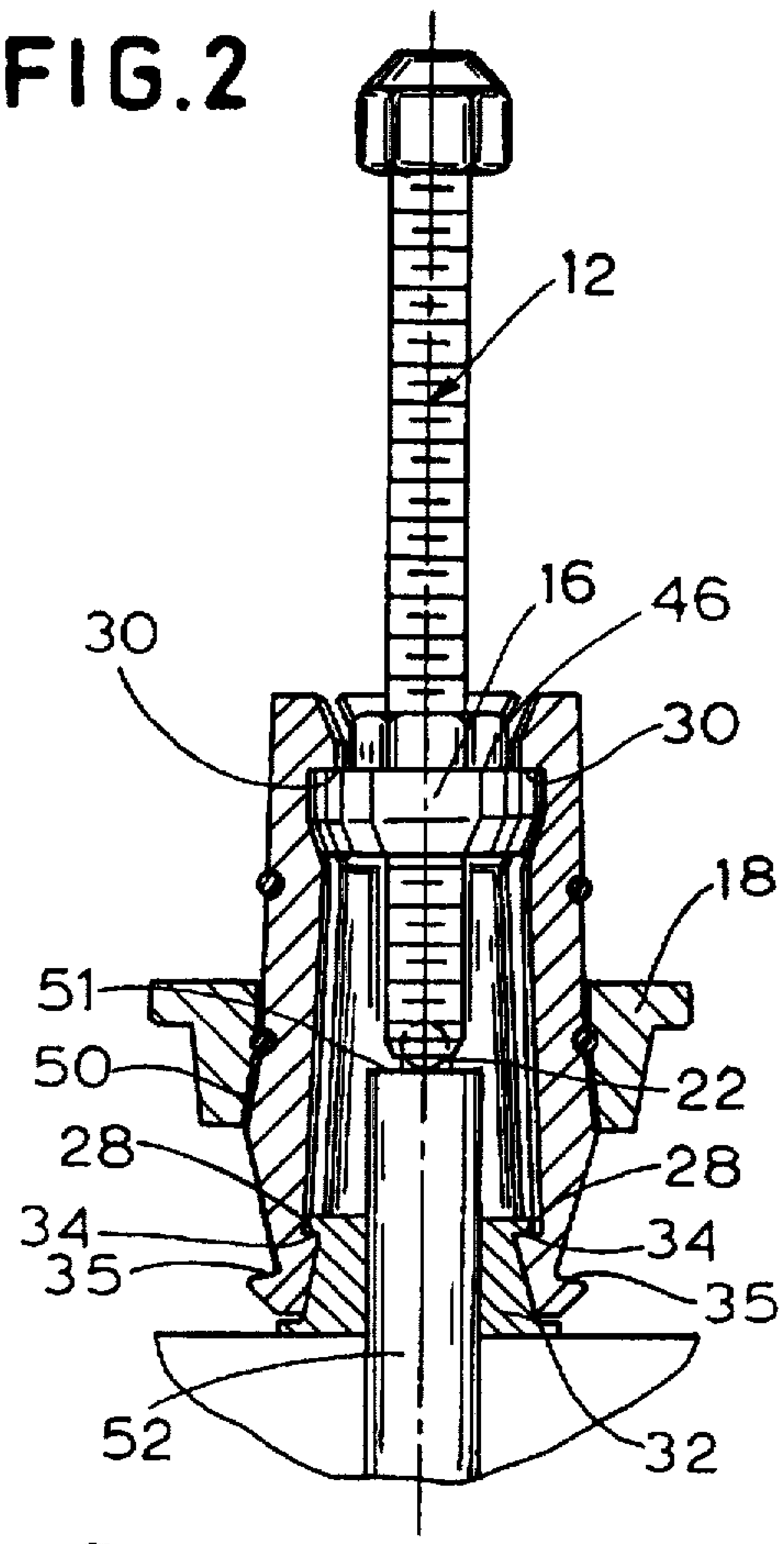


FIG.1

FIG.2



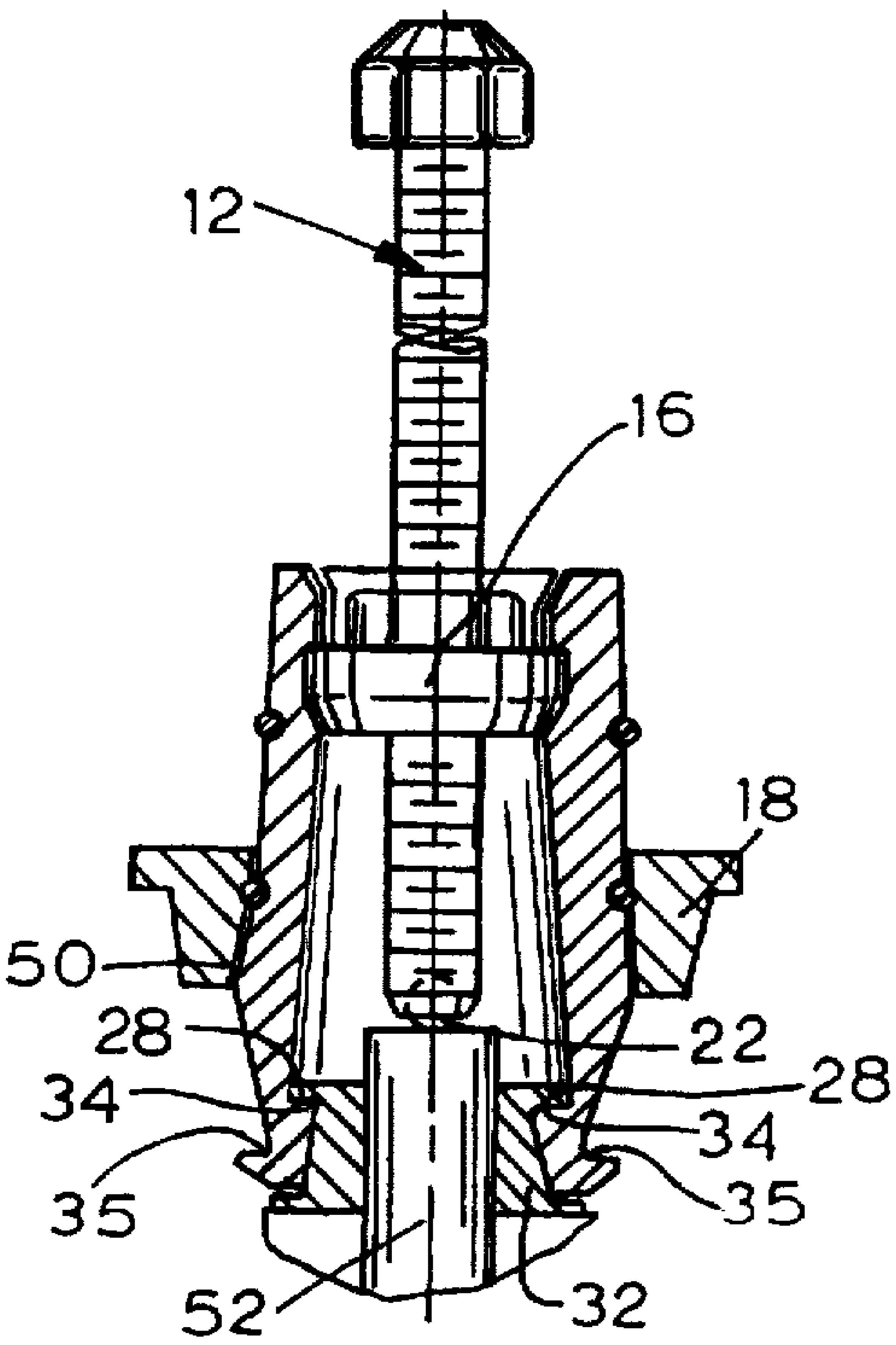


FIG. 2A

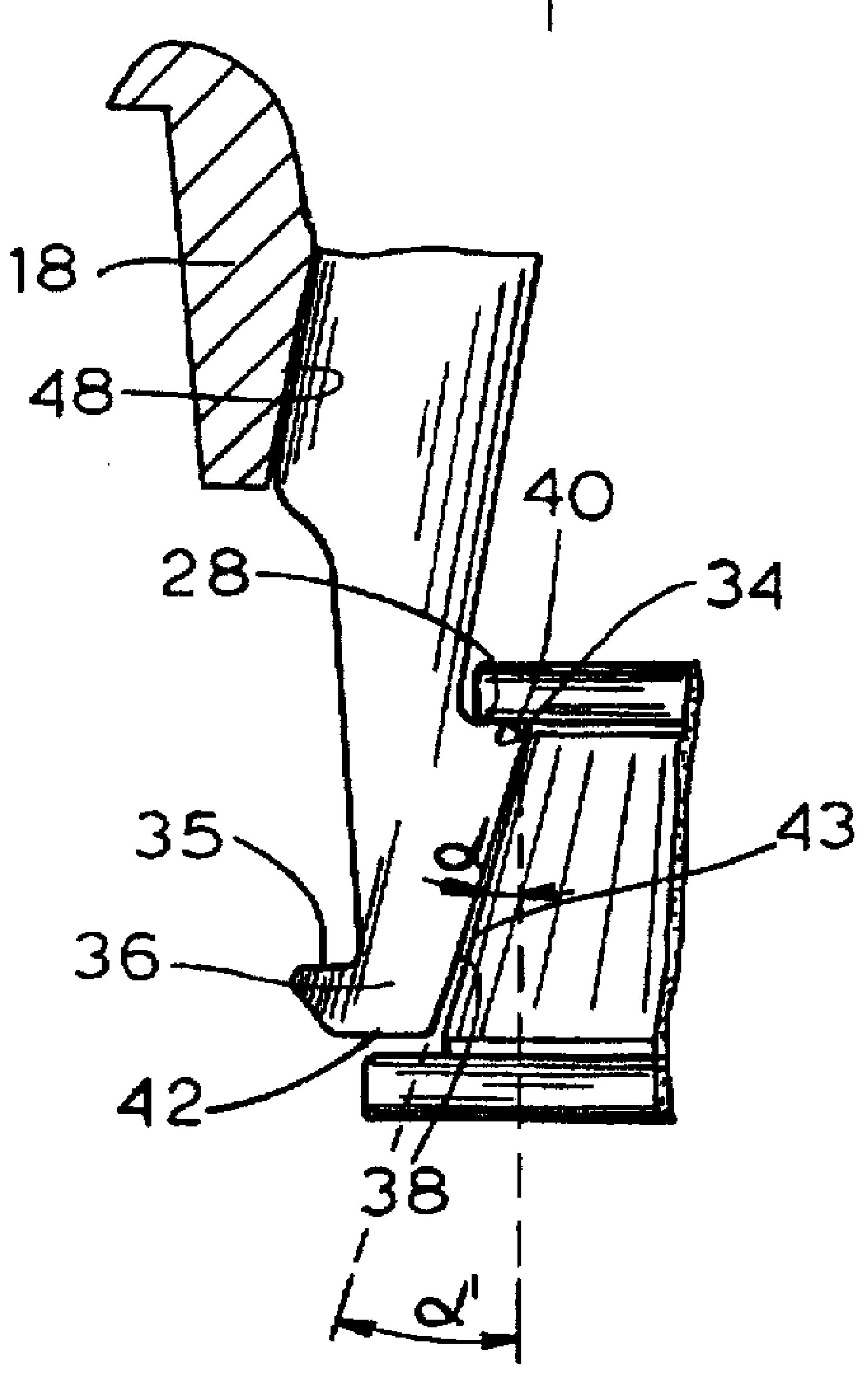


FIG.3

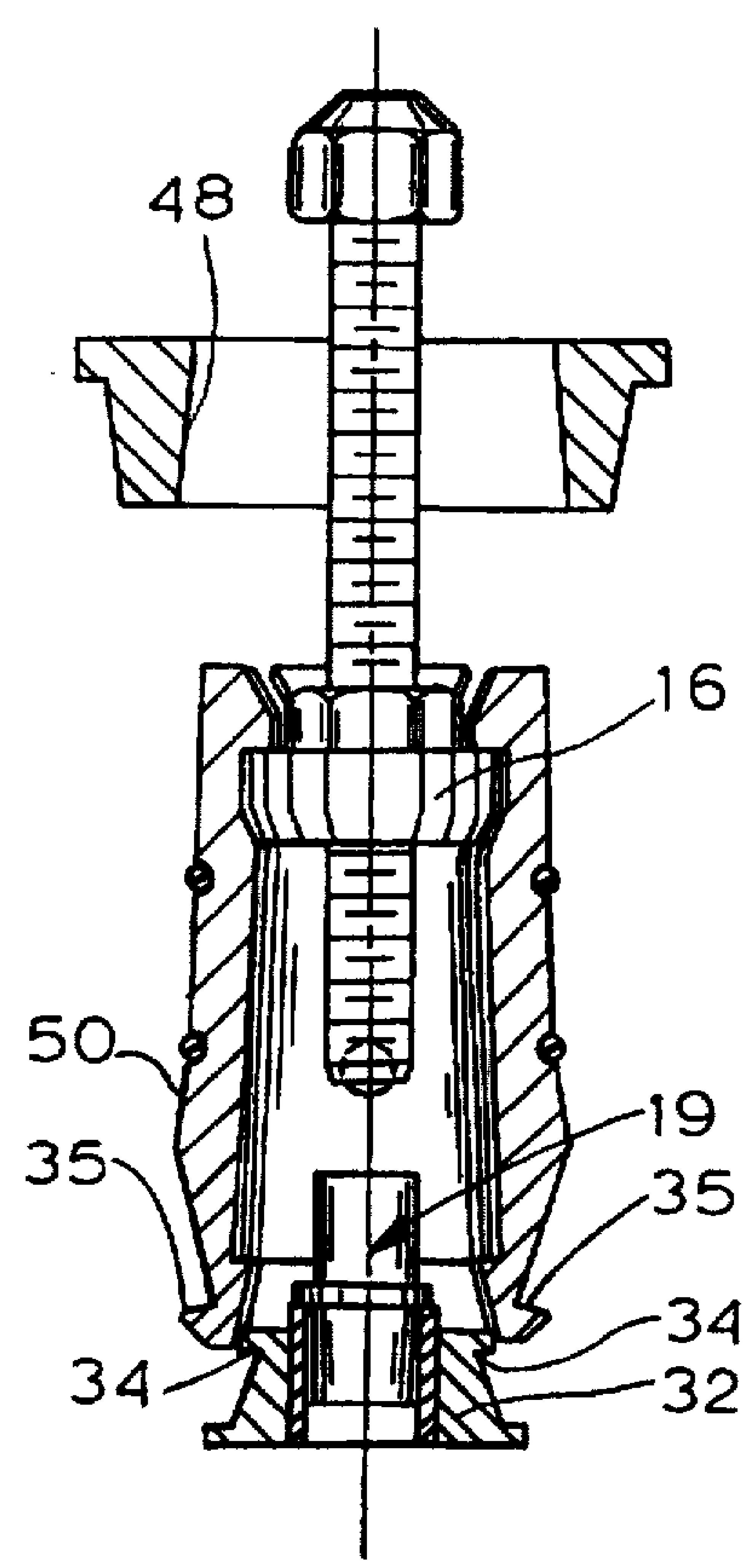


FIG.4

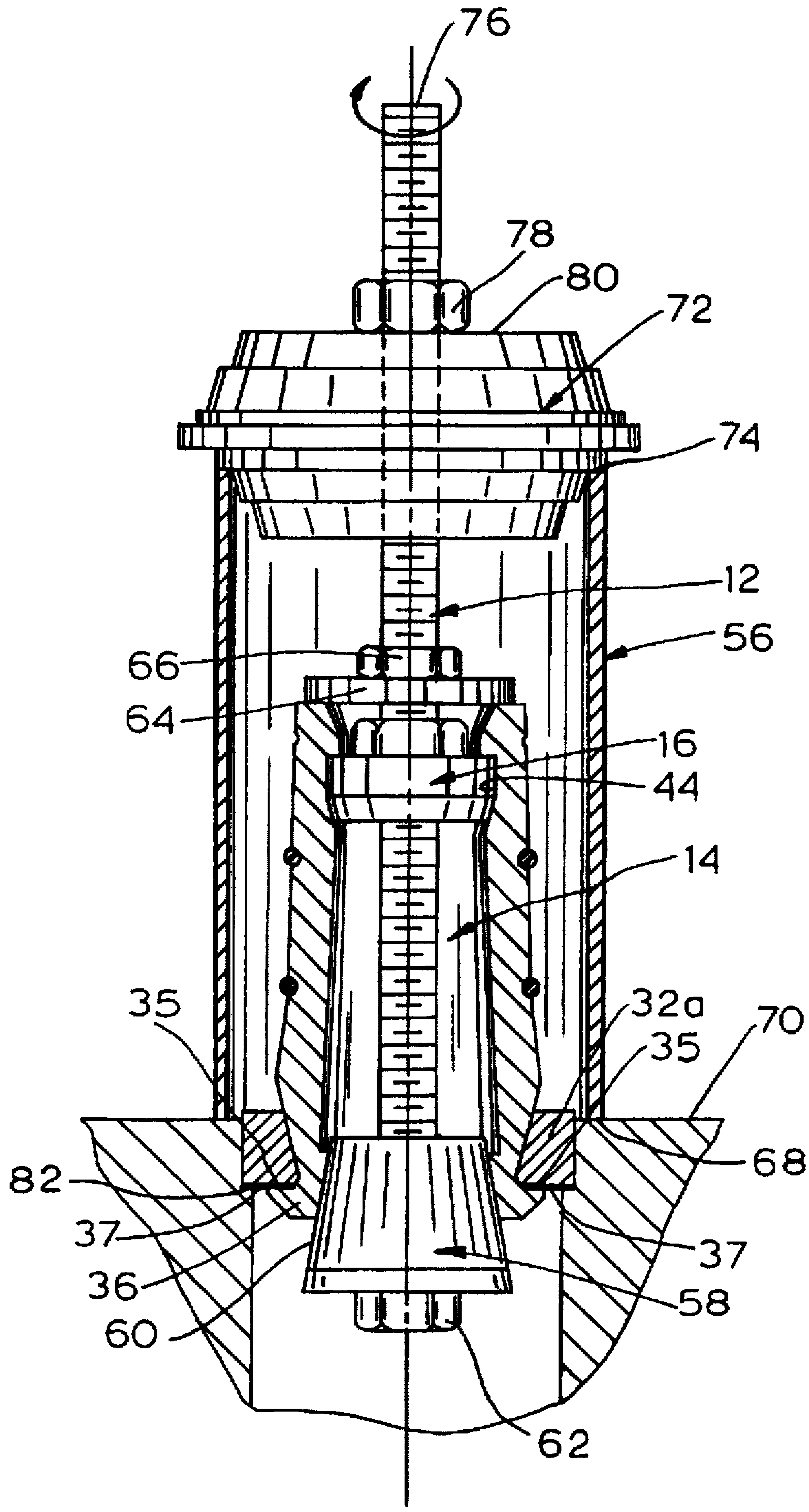


FIG.5

APPARATUS AND METHOD FOR REMOVING BEARINGS

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

FIELD OF THE INVENTION

The present invention relates to a method and apparatus for removing bearings. More particularly, the present invention relates to a method and apparatus for removing bearings, such as automatic transmission bearing cones or bearing cups wherein the apparatus is adjustable to accommodate bearings of any size or diameter for removal by contacting the cup or cone on inner or outer surfaces thereof.

BACKGROUND OF THE INVENTION AND PRIOR ART

An automobile transmission includes a number of bearing cups and cones that carry rotating bearings. The rotating bearings can be removed easily with snips, leaving the bearing cup or cone, which is difficult to remove and replace because of other, closely oriented structure, such as a transmission case.

In the case of a transmission bearing cone or bearing cup, the cones and cups often times surround a transmission shaft that is very difficult and time consuming to remove and replace. Presently, tools are available for contact against an inner surface of bearings, including transmission cones, for removal and replacement after the transmission shaft is removed, such as disclosed in my U.S. Pat. No. 4,339,865. While such tools are extremely useful for removal and replacement of bearings when the inner diameter is unencumbered by a shaft or other transmission part, there exits a need in the transmission repair art, and generally, for a tool capable of removal of bearings, wherein an upwardly extending shaft or other mechanical device extends upwardly through the bearing cup or cone, by contacting the bearing cup or cone from an outer diameter, thereby eliminating the step of transmission shaft removal. Further, the apparatus of the present invention includes a pressure pad for insertion onto the structure that the bearing cone surrounds where there is no upwardly extending shaft or other mechanical part, so that the bearing cone can be removed over the pressure pad with the pressure pad in position. In another embodiment, the apparatus is designed to remove bearings by contact from an unencumbered internal diameter of the bearing cup.

Presently, bearings, such as automatic transmission bearing cups or cones, are removed by first removing an internally disposed transmission shaft so that the cone can be grasped from an inner diameter with a tool such as disclosed in U.S. Pat. No. 4,339,865; or the bearing cups and cones are removed very crudely, after shaft removal, by impacting the cup or cone with a hammer, sometimes after first heating the cup or cone with a torch to loosen the bearing from a surrounding transmission case.

In one embodiment, the present invention relates to a method and apparatus capable of bearing removal by contact of the bearing from an outer diameter so that internal parts, such as a transmission shaft, can remain in working position during the removal and replacement process. The apparatus is adjustable to accommodate bearings of various sizes and provides constant removal force around the entire periphery of the bearing for aligned removal without scoring internally disposed apparatus, such as an upwardly extending transmission shaft.

A patent to McCord, U.S. Pat. No. 2,646,619, describes a bearing removing tool which includes a plurality of bearing-contacting shoulders that are flexibly biased radially so that the shoulders can be initially disposed behind a bearing by compressing the shoulders radially to spread behind the bearing when the tool is inserted to the proper depth. Such a tool is inefficient because, depending upon the size of the bearing, the shoulders which should be flush against an annular bearing surface, and aligned to provide a maximum and non-slipping driving force, usually are not in full contact with the annular bearing surface. The driving shoulders of a tool such as that disclosed in the McCord patent have only a single unbiased diameter and therefore are flush against the bearing for removal only when the bearing is of the exact same diameter as that of the tool driving shoulders when manufactured. My prior U.S. Pat. No. 4,339,865 is incapable of removal or insertion of a bearing without insertion of the tool through an existing central open area in the bearing.

The apparatus of the present invention provides an adjustable bearing drive shoulder that, in one embodiment, is maintained in full contact with an outer surface of the bearing to be removed to provide maximum driving force, without slippage, and without removal of an internally disposed mechanism from its working position. In another embodiment, the apparatus is inserted into the bearing cup from an unencumbered internal diameter and spread to any desired diameter, for bearing cup removal, by threadedly raising a lower inverted cone that is carried on a driving shaft and disposed under the bearing cup.

SUMMARY OF THE INVENTION

In brief, the apparatus of the present invention includes an elongate bearing driving shaft; an adjustably sized mandrel, which includes one or more bearing drive shoulders; a mandrel spreader for adjusting the spacing between mandrel drive shoulders to provide drive shoulders having essentially any desired dimension; and a tapered collar insertable over the adjustable mandrel, in one embodiment, to maintain a tight fit of the mandrel drive shoulder against an outer surface of the bearing during removal; and in another embodiment including a tubular structure fitting loosely about the mandrel to provide an upper drive surface to threadedly pull a lower, inverted cone-shaped member into a lower center of the mandrel, thereby uniformly spreading outer mandrel drive shoulders against a lowermost annular surface of the bearing cup and thereafter lift the bearing cup out of its working position.

Accordingly, one aspect of the present invention is to provide a new and improved method and apparatus capable of removing bearings of any size by contact against an outer diameter of the bearing.

Another aspect of the present invention is to provide a new and improved apparatus including size adjustable bearing drive shoulders capable of being expanded to any desired size and maintaining flush contact against an outer or lowermost surface of a bearing, for removal.

Another aspect of the present invention is to provide an apparatus for removing bearings including a removable tapered collar capable of surrounding an adjustable mandrel to maintain a constant contact of an adjustable mandrel shoulder against an outer surface of the bearing for removal while maintaining the bearing in constant axial alignment with a driving shaft during removal.

Still another aspect of the present invention is to provide an apparatus and method for removal of a mechanical bearing including an expandable mandrel having adjustable bearing drive shoulders, and including a driving (removing) shaft that threadedly carries a tapered cone upwardly into the mandrel, from a bottom end of the mandrel, to spread the mandrel drive shoulders against a lowermost annular, planar surface of the bearing. Thereafter, further rotation of the driving shaft lifts the bearing out of position for complete removal.

These and other aspects, features and advantages of the present invention will be apparent to those of ordinary skill in the art in view of the detailed description of the preferred embodiments, made with reference to the drawings, a brief description of which is provided below.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a partially exploded, perspective view of the apparatus of one embodiment of the present invention;

FIG. 2 is a partially elevated side view of the apparatus of FIG. 1, showing the apparatus secured around an outer periphery of a bearing cone (after removal of the rotatable bearings from the cone), and in position for removal of the bearing cone, while maintaining a centrally disposed transmission shaft in working position;

FIG. 2A is a view similar to FIG. 2, showing the bearing cone during removal;

FIG. 3 is a partially broken away elevated view of a portion of a single mandrel segment showing the contact of the mandrel segment shoulder against an upper, outer shoulder of a bearing cone during removal with the apparatus of FIG. 1;

FIG. 4 is a partially elevated side view showing the apparatus of FIGS. 1 and 2 during spreading of the mandrel segments to surround the outer bearing cone surface, after a pressure pad has been inserted internally within and extending upwardly from structure that the bearing surrounds to simulate an internal shaft (when no shaft is found extending upwardly from the bearing cone), prior to fitting the mandrel drive shoulders under the upper outer shoulders of the bearing cone; and

FIG. 5 is a partially elevated side view of another embodiment of the apparatus of the present invention used to remove a bearing by contact on an undersurface thereof after insertion through an internal diameter in the bearing.

DETAILED DESCRIPTION OF THE PRESENT INVENTION

Turning now to FIG. 1, the apparatus of the present invention is generally designated by reference numeral **10**. The apparatus includes an elongate driving shaft, generally designated by reference numeral **12**; a bearing driving mandrel, generally designated by reference numeral **14**; an internally threaded mandrel spreader generally designated by reference numerals **16** or **16A**; and a mandrel securing collar, generally designated by reference numeral **18** or **18A**. A bearing pad, generally designated by reference numeral **19**, is provided to fit within, and upwardly extending from structure that the bearing surrounds, whenever there is no upwardly extending device, such as transmission shaft **52**. Preferably, the elongate driving shaft **12** includes a ball bearing **20** freely rotatable about, and extending outwardly from, a transmission-contacting threaded end **22** of the driving shaft **12**.

The mandrel **14** is formed from a plurality of annular segments **24** expandably held together, as shown in FIG. 1, with a plurality of elastomeric O-rings **26**. The mandrel **14** also includes a planar, lower bearing-contacting removal shoulder **28** and a planar upper mandrel spreader-contacting removal shoulder **30** on each expandable segment to transmit force from the driving shaft **12** through the mandrel spreader **16** to shoulders **28** and **30** against an upper, outwardly extending annular bearing cone shoulder **34**, for removal of a bearing, such as transmission bearing cone **32**.

In accordance with an important feature of one embodiment of the present invention, each bearing-contacting shoulder **28** of each mandrel segment **24** extends inwardly from an internal surface of each spreader segment **24** for contact against an outer shoulder **34** of transmission cone **32**, as shown in FIG. 2.

In accordance with another important embodiment of the present invention, for removal of bearings by contact from an unencumbered internal diameter, the mandrel spreader segments **24** include a plurality of outwardly extending shoulders **35**, outwardly extending from lower, outer surfaces of the mandrel segments **24**, for contact against a lowermost planar surface **37** of the bearing cup **32A**, as shown in FIG. 5, and explained in more detail hereinafter.

For bearing cone removal, as shown in FIGS. 2–4, the mandrel spreader **16** is threadedly disposed over the lower end **22** of driving shaft **12** for initially spreading the segments **24** about the internally disposed spreader **16**, thereby outwardly extending the lower spreader segment internal drive shoulders **28** sufficiently to easily slide all segments **24** downwardly over the upper bearing cone shoulders **34** to interfit segment shoulders **28** under upper bearing cone shoulder or lip **34**, and the segments are then tightened for flush engagement, as shown in FIG. 3. As best shown in FIG. 3, an upper portion of the segments **24** of the mandrel **14** are spread radially outwardly with mandrel spreader **16**, and a lower, bearing-contacting portion of the segments **24** are compressed against an outer diameter of the cone **32**, with tapered collar **18**, for flush contact of shoulders **28** against the inwardly projecting annular bearing cone shoulder or lip **34**. The tapered collar **18** tapered at 2°–10° from vertical, downwardly and outwardly, is forced downwardly over an outer diameter of the segments **24**, to surround the mandrel **14**, at a position lower than spreader **16** to lock the shoulders **28** and **34** together. The collar **18** is slid over the outside of mandrel **14** so that a bearing-contacting end **36** of each mandrel segment **24** is held tightly against the outer surface of bearing cone **32**, as best shown in FIG. 3.

In accordance with another important feature of the present invention, the shoulders **28** extending inwardly from each segment **24** of the mandrel **14** (FIG. 2) are essentially planar and lie substantially horizontal (±20°) when in working contact with bearing cone shoulder **34**, as best shown in FIG. 3. Further, the lower end **36** of each mandrel segment **24** includes a tapered inner segment wall **38** extending downwardly from an innermost surface **40** of shoulders **28**, tapered outwardly and downwardly (as best shown in FIG. 3) to an essentially horizontal lowermost surface **42**, for relatively flush contact of segment drive shoulder **28** against upper bearing cone shoulder or lip **34** for removal without interference from tapered outer bearing cone surface **43**. The angle α of tapered outer bearing cone surface is usually about 15°±5° and the angle α', defining the outer taper on the spreader segments (FIG. 3) should correspond, e.g., 10°–20° for best contact of the segment shoulders against the undersurface **34** of the upper bearing lips. The angle α' on the spreader segments preferably is at least 2° greater in taper than α.

When a bearing is being removed, in the embodiment shown in FIGS. 2–4, the mandrel spreader **16** is slid into a spreader-receiving slot or groove **44**, formed in an upper portion of each spreader segment **24**, thereby spreading the bearing-contacting end **36** of each mandrel segment sufficiently for engagement with mandrel segment shoulders **28**, under the outer cone shoulder **34**, for removal of cone **32**. To provide force transmittal from the threaded driving shaft **12** to the internal lower segment drive shoulders **35**, each segment **24** includes an upper, internal, planar surface forming internal shoulder **30**, for contact against an upper, planar surface **46** on each mandrel spreader **16**. At this point, the driving shaft **12** carrying threaded mandrel spreader **16**, together with the mandrel **14**, in position over the spreader **16**, are together dropped into position such that bearing-contacting end **36** of each mandrel segment **24** is in position with segment shoulders **28** under bearing cone shoulder **34**, as shown in FIG. **3**. The driving shaft **12** then is rotated to elongate the shaft **12** into the mandrel **14** with ball bearing **20** in contact with an upper end **51** of transmission shaft **52**.

In accordance with an important feature of the embodiment shown in FIGS. **2–4**, a tapered cylindrical collar **18** is slid over an exterior of mandrel **14** to compress and maintain the spreader segments **24** against an exterior of the cone **32**, with mandrel segment shoulders **28** disposed directly beneath the exterior cone shoulder **34**, as shown in FIGS. **2** and **3**. As shown in FIGS. **2–4**, the collar **18** includes a downwardly and outwardly tapered internal surface **48** for compression against an outwardly extending lower, downwardly and outwardly tapered outer surface portion **50** of each spreader segment **24**.

In accordance with a preferred embodiment, as shown in FIG. **2**, the rotating bearing **20**, rotatably mounted within the shaft end **22**, contacts an upwardly extending end **51** of transmission shaft **52**. Shaft **12** can be threadedly adjusted vertically by rotating shaft **12** so that, after mandrel spreading, the shaft **12** is extended toward transmission shaft end **51** for engaging the ball bearing **20** of driving shaft **12** against the upper surface **51** of transmission shaft **50**, or shaft-simulating pressure pad **19** (FIG. **4**), after alignment of mandrel segment shoulders **28** directly beneath bearing annular cone shoulder **34**. After insertion of tapered collar **18** to surround the mandrel **14**, the driving shaft **12** is rotated with respect to mandrel spreader **16**, as shown in FIG. **2**, thereby contacting the upper spreader surface **46** against the upper segment shoulders **30**. Thereafter, further rotation of driving shaft **12** raises all mandrel segments **24** in unison by contact of upper mandrel segment shoulders **30** against the upper, planar surface **46** of spreader **16**. The vertical lifting of the mandrel segments **24**, in alignment, and in unison, raises the bearing cone **32** via upward force applied by segment shoulders **28** against the cone shoulder **34** for complete removal of the bearing cone **32**.

A plurality of differently sized mandrel spreaders **16**, **16A** are provided for spreading the mandrel segments **24** to different diameters to accommodate different diameter bearing cones **32**. It is to be understood that a single spreader, having a plurality of different diameter annular surfaces, or a plurality of mandrel spreaders of different outer diameters can be provided. FIG. **1** shows the disposition of the mandrel **14** prior to being spread by mandrel spreader **16** while FIGS. **2** and **4** show the disposition of the mandrel **14** when spread by the mandrel spreader **16**. The elastomeric O-rings **26** of mandrel spreader **16** maintain the segments **24** of mandrel **14** evenly spaced when spread. Once the bearing is removed, the tapered collar **18** is removed to allow outward movement of the ends **36** of each mandrel segment **24** so that bearing cone **32** can be removed from the mandrel **14**. One or more mandrel segments **24** can be added or removed while maintaining the segments **24** in generally annular alignment to accommodate interfitting about larger or smaller diameter bearing cones **32**, respectively.

Referring now to FIG. **5**, in accordance with this embodiment of the present invention, the apparatus shown in FIG. **1**, with some modifications or additions, is used to remove a bearing, such as bearing cup **32A** that has an unencumbered internal diameter, by contacting the planar, annular undersurface **37** of the bearing cup **32A** after insertion of the mandrel **14** through the unencumbered internal diameter, for contact of outwardly extending mandrel drive shoulders **35** against the bearing cup undersurface **37**. In the embodiment shown in FIG. **5**, the same mandrel **14**, including the same plurality, e.g., **5** to **7**, mandrel segments **24** and the same one or more mandrel spreaders **16**, **16A** are used to initially position the mandrel segments **24** in position for contact of the outer segment shoulders **35** against the annular undersurface **37** of the bearing cup **32A**. In this FIG. **5** embodiment, however, the lower end **36** of the mandrel segments **24** contact the bearing cup **32A** from an internal diameter, without a transmission shaft **52** and without a pressure pad **19**, since the central opening within the bearing cup **32A** must be free for insertion of the mandrel **14** therein. Additional structure, including a loosely fitting tubular structure **56**, and an inverted truncated cone **58**, threadedly received on the lowermost end **22** of driving shaft **12**, are included for spreading the mandrel segments **24** into working position, as shown in FIG. **5**, and to provide a thrust transmitting bearing surface to lift the bearing cup **32A** upwardly and evenly out of position, as will be explained in more detail hereinafter.

As shown in FIG. **5**, when a bearing is being removed from an internal diameter, the inverted cone **58**, having an evenly-tapered outer surface **60** tapered upwardly and inwardly from a lower integral hex nut **62**, is threaded over the lowermost driving shaft end **22** for spreading the mandrel segments **24** from the lower ends **36** thereof. Like the FIGS. **2–4** embodiments, the mandrel spreader **16** is slid into a spreader-receiving slot or groove **44**, formed in an upper portion of each spreader segment **24**, thereby providing a fulcrum on outer surfaces of spreader **16** over which the spreader segments can be compressed inwardly, from their lowermost ends, to fit the lower ends **36** of the mandrel segments **24**, and the cone **58**, centrally within the internal diameter of the bearing cup **32A** from the upper surface thereof. After disposing the cone **58** and all outwardly projecting segment shoulders **35** vertically beneath the lowermost bearing cup undersurface **37**, driving shaft **12** is rotated, through a washer **64** and upwardly contacting threaded member, e.g., nut **66**, to raise the inverted cone **58** with respect to the mandrel **14**, thereby forcing the inverted cone **58** upwardly between the lower ends **36** of the mandrel segments **24** to spread all mandrel segments **24** and seat upper, planar surfaces of mandrel shoulders **35** against the lower, planar shoulders or surfaces **37** of the bearing cup **32A**.

To provide force transmittal from the threaded driving shaft **12** to the outwardly extending lower segment drive shoulders **35**, the loosely fitting tubular member **56** is disposed around the outer diameter of the bearing cup **32A** so that a lowermost annular tubular member surface **68** contacts bearing-surrounding structure, such as transmission case **70**. A washer **72** having an axial, central aperture larger than the outer diameter of driving shaft **12**, is disposed over an upper annular surface **74** of tubular member **56** and over an upper end **76** of driving shaft **12**. Threaded nut **78** then is threaded downwardly over upper end **76** of driving shaft **12** against an upper planar surface **80** of the washer **72**. At this point, the driving shaft **12** carrying threaded mandrel spreader **16**, together with the mandrel **14** in position over the spreader **16**, and carrying the inverted cone **58**, are in position for lifting the bearing cup **32A** out of the transmission case **70** or other surrounding structure. Further rotation of nut **78**, with a wrench (not shown) will raise segment shoulders **35**, and bearing cup **32A** for complete and even aligned removal of bearing cup **32A**, and any shim **82** thereunder, in tact with the cup **32A**.

Many modifications and variations of the present invention are possible in light of the above teachings. Thus, it is to be understood that, within the scope of the appended claims, the invention may be practiced other than as specifically described above.

What is claimed and desired to be secured by Letters patent of the United States is:

What is claimed is:

1. Apparatus for removing a bearing without removal of an internal mechanical part comprising:

an elongate bearing driving shaft;

contacting means for contacting an annular outer bearing surface, said contacting means having a tapered outer surface and including a bearing-contacting shoulder, said contacting means being connected to said elongated driving shaft when operatively assembled for removing a bearing;

adjusting means for adjusting said bearing driving shoulder to a desired dimension to contact at least a portion of said annular outer bearing surface; and

maintaining means for maintaining said bearing contacting shoulder in engagement with said outer bearing surface, said maintaining means having a tapered inner surface for contact against said tapered outer surface of said contacting means.

2. Apparatus as defined in claim **1**, wherein said contacting means comprises a plurality of segments expandably connected, at least two of said segments including a bearing driving shoulder for contacting an outer annular surface of a bearing.

3. Apparatus as defined in claim **[1]** 2, wherein said segments are expandably connected by an expandable elastomeric material.

4. Apparatus as defined in claim **2**, wherein said maintaining means comprises a tubular ring having dimensions closely corresponding to an other diameter of said segments, wherein said segments are expanded to surround said outer surface of said bearing, with said driving shoulders engaging said bearing on opposite outer surfaces.

5. Apparatus as defined in claim **1**, wherein said elongate driving shaft includes an end surface adapted for contact with a mechanical part disposed within and upwardly extending from said bearing.

6. Apparatus as defined in claim **5**, wherein said driving shaft end includes a rotatable bearing extending outwardly therefrom.

7. Apparatus as defined in claim **2**, wherein said adjusting means comprises an annular collar mounted on said driving shaft along a longitudinal axis of said annular collar, said collar adapted for insertion between said segments, and longitudinally adjustable on said driving shaft.

8. Apparatus as defined in claim **7** including a plurality of exchangeable collars, each separately mountable to surround said driving shaft to expand said segments to a plurality of dimensions.

9. Apparatus for removing a bearing comprising:

an elongate bearing driving shaft;

contacting means for contacting an outer annular bearing surface, said contacting means having a tapered outer surface and including a bearing-contacting drive shoulder, said contacting means being connected to said driving shaft when operatively assembled for removing a bearing;

means for adjusting said bearing drive shoulder to a desired dimension to contact at least a portion of an annular bearing outer surface;

means for applying a removing force to said outer annular bearing surface through said bearing-contacting shoulder; and

clamp means for clamping said drive shoulder against said outer bearing surface, said clamp means having a tapered inner surface for contact against said tapered outer surface of said contacting means.

10. Apparatus as defined in claim **9**, wherein said clamp means comprises a tubular member adapted to surround said contacting means to prevent further expansion of said contacting means.

11. A method of removing a bearing in a device comprising:

expanding an expandable mandrel by inserting a mandrel expansion collar within the expandable mandrel, said expansion collar being threadedly mounted on a driving shaft and having an upper surface in contact with an interior drive shoulder within said mandrel;

disposing the mandrel about the exterior of the bearing so that one surface of said bearing is in contact with a driving shoulder of said mandrel;

compressing a lower portion of the mandrel to clamp the mandrel about the exterior of the bearing to secure the mandrel drive shoulder under an outwardly extending lip of said bearing;

threadedly extending said driving shaft within said mandrel so that a mandrel-received end of said driving shaft contacts a mechanical part extending upwardly from a longitudinal axis of said bearing;

continuing the extension of the driving shaft within the mandrel to lift the bearing upwardly, thereby removing the bearing from its seated position.

12. A method as defined in claim **11**, wherein said mandrel is compressed by forcing a clamping means over an outer surface of the mandrel from an upper end of said mandrel.

13. A method as defined in claim **12**, wherein the collar is removed after bearing insertion to collapse said mandrel for removal of the bearing from the mandrel.

14. Apparatus for removing a bearing without removal of an internal mechanical part comprising:

an elongate bearing driving shaft;

contacting means axially and internally insertable through said bearing for contacting an annular bearing undersurface, said contacting means including a bearing-contacting shoulder, said contacting means being connected to said elongate driving shaft when operatively assembled for removing a bearing;

a mandrel expansion collar threadedly carried on said driving shaft for expanding an upper portion of said contacting means;

[tapered] adjusting means for adjusting said bearing driving shoulder, from an undersurface thereof, to a desired dimension to contact at least a portion of said annular bearing undersurface; and

thrust means for transmitting thrust from said driving shaft to said bearing drive shoulder such that rotation of said driving shaft forces said bearing undersurface upwardly for removal.

15. Apparatus as defined in claim **14**, wherein said contacting means comprises a plurality of segments expandably connected, at least two of said segments including an outwardly extending bearing driving shoulder for contacting an annular undersurface of said bearing.

16. Apparatus as defined in claim **15**, wherein said segments are expandably connected by an expandable elastomeric material.

17. Apparatus as defined in claim **14**, wherein said thrust means comprises a tubular ring having dimensions loosely fitting outside of an outer diameter of said segments, and including a washer disposed over an upper annular surface thereof, said washer including a driving shaft receiving aperture axially positioned therein.

18. Apparatus as defined in claim **14**, wherein said adjusting means comprises an annular collar mounted on said driving shaft along a longitudinal axis of said annular collar, said collar adapted for insertion between said segments, and longitudinally adjustable on said driving shaft.

19. Apparatus as defined in claim **18** including a plurality of exchangeable collars, each separately mountable to surround said driving shaft to expand said segments to a plurality of dimensions.

20. A method of removing a bearing in a device comprising:

inserting a mandrel expansion collar, threadedly carried on an elongate driving shaft, within an expandable mandrel to expand an upper end of said mandrel, said expansion collar being threadedly mounted on a driving shaft and having an upper surface in contact with an interior drive shoulder within said mandrel, said driving shaft carrying an inverted cone on a lower end thereof;

disposing the mandrel and cone within an interior of the bearing so that an annular undersurface of said bearing is in contact with a plurality of driving shoulders extending outwardly from said mandrel;

expanding said mandrel by threadedly raising said inverted cone upwardly into said mandrel to secure the mandrel drive shoulders under said bearing undersurface; and

rotating said driving shaft to lift the mandrel drive shoulders to lift the bearing upwardly, thereby removing the bearing from its seated position.

21. Apparatus for removing a bearing without removal of an internal mechanical part comprising:

an elongate bearing driving shaft;

contacting means axially and internally insertable through said bearing for contacting an annular bearing undersurface, said contacting means including a bearing-contacting shoulder, said contacting means being connected to said elongate driving shaft when operatively assembled for removing a bearing;

a mandrel expansion collar threadedly carried on said driving shaft for expanding an upper portion of said contacting means;

a mandrel spreader for adjusting said bearing driving shoulder, from an undersurface thereof, to a desired dimension to contact at least a portion of said annular bearing undersurface; and

thrust means for transmitting thrust from said driving shaft to said bearing drive shoulder such that rotation of said driving shaft forces said bearing undersurface upwardly for removal.

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