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EXPANDING ARBORS

Filed April 12, 1965

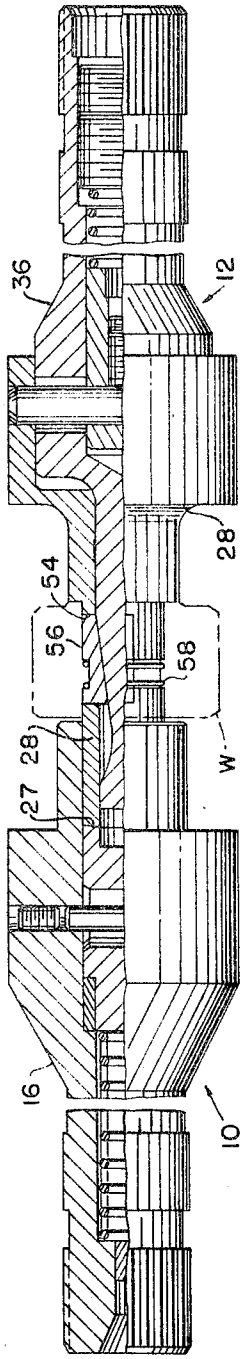


FIG. 1

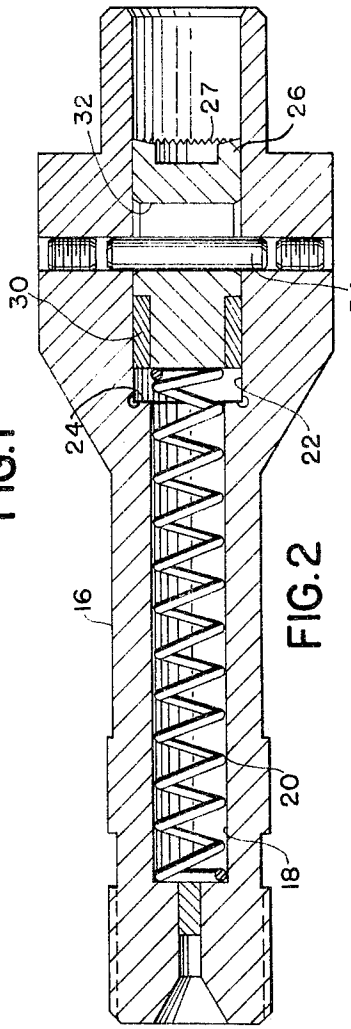


FIG. 2

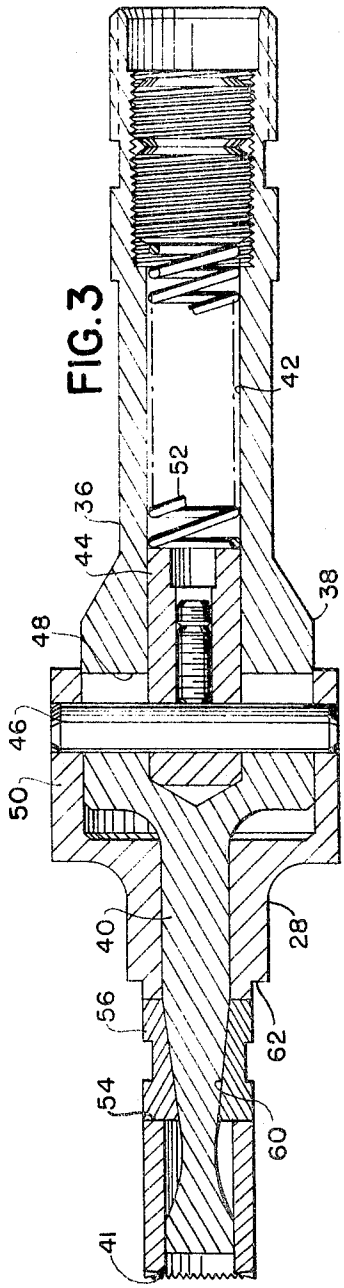


FIG. 3

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EXPANDING ARBORS

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This is a continuation-in-part of application Serial No. 220,165, filed August 29, 1962 now Patent No. 3,212,374.

The present invention relates to expanding arbors.

It is an object of the present invention to provide an expanding arbor including radially outwardly movable keys, wedge means for moving the keys outwardly, and means for limiting the force applied to move the keys outwardly.

More specifically, it is an object of the present invention to provide in an expanding arbor, means responsive to approach between work supporting stocks for mechanically camming the keys outwardly, and abutment means for limiting approach between the stocks.

Still more specifically, it is an object of the present invention to provide a cup assembly including a cup, a plug assembly including an element slidably received in the cup, and abutment means engageable by the element to limit movement thereof into the cup.

It is a further object of the present invention to provide an expanding arbor as described in the preceding paragraph which includes interengaging drive means between the cup and the element of the plug assembly to effect rotation of the cup and plug assembly independently of the work piece.

It is a further object of the present invention to provide an expanding arbor of the character described in the preceding paragraph in which the drive means includes serrated surfaces one of which is formed on an element in the cup which is yieldable axially thereof to facilitate interengagement between serrations thereof.

It is a further object of the present invention to provide an expanding arbor comprising a pair of generally similar assemblies each of which includes a set of radially movable work engaging keys, wedging cams slidably associated with the keys, springs connected to the wedging means urging them in a direction to cam the keys outwardly, and means responsive to engagement with a work piece for releasing the wedging means for operational movement by said springs.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating preferred embodiments of the invention, wherein:

FIGURE 1 is a side elevational view, partly in section, of an expanding arbor constructed in accordance with the present invention.

FIGURE 2 is an enlarged sectional view of the cup assembly of the expanding arbor seen in FIGURE 1.

FIGURE 3 is an enlarged sectional view of the plug assembly of the expanding arbor seen in FIGURE 1.

Referring first to FIGURES 1–3, there is illustrated an expanding arbor comprising a cup assembly **10** and a plug assembly **12**, said assemblies being carried for rotation by head and tail stock spindles (not shown) capable of approach and separation to load and unload a work piece W, such as the gear shown on the arbor in phantom.

The cup assembly comprises an elongated body **16** having a spring chamber **18** receiving a compression spring **20**. An enlarged chamber **22** is formed in the cup body **16**, defining an annular abutment or seat surface **24** therein. Longitudinally slidable in chamber **22** is a driver **26** having teeth **27** at one end forming an annular

serrated connection with the end of a sleeve **28**. Driver **26** is recessed at its inner end and receives a hardened spacer ring **30** which is adapted to seat against abutment surface **24**. Driver **26** has an elongated through slot **32** therein receiving a pin **34** carried by cup **16**.

A spring normally retains driver **26** to the right as seen in FIGURE 2, so that pin **34** abuts the left edge of slot **32**.

The plug assembly comprises elongated plug **36** having an enlarged head **38** and a reduced camming end **40**. Slidable on the head **38** and end **40** is the sleeve **28**, previously referred to, having teeth **41** at its left end, as seen in FIGURE 3, cooperating with similar teeth **27** on the driver **26** to constitute the torque transmitting connection previously referred to.

Plug **36** has an elongated chamber **42** therein in which a plunger **44** is slidable. The plunger has a pin **46** fixed therein which extends through slot **48** in the head **38** and fits within openings in an enlarged cup **50** at the end of the sleeve **28**. Plunger **44** is biased by a compression spring **52** to the left in FIGURE 3, and this normally urges pin **46** against the left end of the slot **48**.

Sleeve **28** has a plurality of slots **54** receiving keys **56** retained in the slots by spring means **58**. The radially inner edges of the keys **56** are inclined, as indicated at **60**, and are received in correspondingly inclined slots in plug end **40**.

In use a gear is placed on the reduced end portion of the sleeve in the position shown, preferably located axially thereon by shoulder **62**. This may be accomplished manually or as a consequence of automatic loading. Thereafter, the assemblies are caused to approach. The reduced end of the sleeve **28** moves into the chamber **22** in the cup body **16**, and its serrated end engages the similarly serrated end of the driver **26**. Continued relative movement pushes driver **26** to the left against spring **20** until the hardened ring engages seat **24**. Further movement of approach causes the plug **36** to move to the left relative to the sleeve **28**, thus camming keys **56** radially outwardly and clamping the work piece W in position.

At this time it will be noted that while the work piece is located by the shoulder **62**, it is not clamped against this shoulder, and in fact, clearance exists between the left end of the work piece W and the right hand end of the cup member **16**. Torque is transmitted between the cup assembly **10** and the plug assembly **12** through pin **34**, slot **32**, driver **26**, the serrated connection to sleeve **28**, pin **46**, and slot **48** to the plug **36**.

The spring **20** permits the driver **26** to yield if the serrations at **27** do not interfit at first contact and facilitates interfitting thereof during travel of the driver toward its seat **24**.

The drawings and the foregoing specification constitute a description of the improved expanding arbors in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. An expanding arbor comprising an elongated cup member having an open recess of circular cross-section at one end, drive means in said recess for establishing a driving connection with said cup member, a plug assembly comprising an elongated plug member having a free end extending toward said cup member, a sleeve slidable on the free end of said plug member, rotary drive means between said plug member and sleeve, work engaging keys movable radially in slots in said sleeve, cam surfaces on said plug member engaging said keys and operable to cam said keys radially outwardly on movement of said plug member into said sleeve, said sleeve having an end portion movable into the recess in

said cup member and engageable with said drive means therein to establish driving connection therethrough to said cup member and to prevent further movement of said sleeve to provide for movement of said plug member in said sleeve to cam said keys outwardly.

2. An arbor as defined in claim 1 comprising resilient means acting between said plug member and sleeve to urge said sleeve toward the free end of said plug member to relieve said keys for radial inward movement.

3. An arbor as defined in claim 1 in which said drive means in said cup comprises a driver keyed to said cup in driving relation and slidable longitudinally therein, an abutment in said cup limiting sliding of said driver therein, and driving serrations on the adjacent ends of said driver and said sleeve to establish the driving connections between said plug assembly and cup assembly.

4. An arbor as defined in claim 3 comprising spring means acting between said cup member and driver urging said driver outwardly of said recess and away from said abutment.

5. An expanding arbor construction comprising a plug assembly and a cup assembly and means for relatively moving said assemblies to support an annular work piece thereon, said plug assembly comprising an elongated plug, a sleeve slidable on the end of said plug adjacent said cup assembly, slots in said sleeve, keys in said slots, and camming means on said plug within said sleeve engaging said keys, said cup assembly comprising a cup having an opening in the end thereof adjacent said plug assembly in which the end of said sleeve is slidably receivable in fitting relation, stop means in said cup limiting movement of said sleeve therein, a shoulder on said sleeve engageable with one end of a work piece, said stop means being positioned to limit movement between said plug and cup assemblies to prevent clamping of the work piece between said shoulder and the end of said cup.

6. A construction as defined in claim 5 in which said stop means comprises a seat within said cup, a driver within said cup slidable toward and away from said seat, spring means connected to said driver urging said driver away from said seat, the end of said driver adjacent said plug having driving elements cooperable with the end of said sleeve.

7. A construction as defined in claim 6, said sleeve having means thereon preventing rotation relative to said plug, said sleeve having driving elements cooperable with the drive elements on the adjacent end of said driver.

8. An expanding arbor construction comprising a plug assembly and a cup assembly and means for relatively moving said assemblies to support an annular work piece thereon, said plug assembly comprising an elongated plug, a sleeve slidable on the end of said plug adjacent said cup assembly, slots in said sleeve, keys in said slots, and camming means on said plug within said sleeve engaging said keys, said cup assembly comprising a cup having an opening in the end thereof adjacent said plug assembly in which the end of said sleeve is slidably receivable in fitting relation, stop means in said cup limiting movement of said sleeve therein, a shoulder on said sleeve engageable with one end of a work piece, said stop means being positioned to limit movement between said plug and cup assemblies to prevent clamping of the work piece between said shoulder and the end of said cup, said plug being movable in said sleeve to cam said keys outwardly to engage the opening in the annular work piece and thereby serve as the means for limiting approach between said cup and plug assemblies.

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