Aug. 4, 1953 W. H. CANNARD 2,647,701

EXPANSIBLE CORE CHUCK

Filed Feb. 2, 1949

2 Sheets-Sheet 1

Fig. 1.

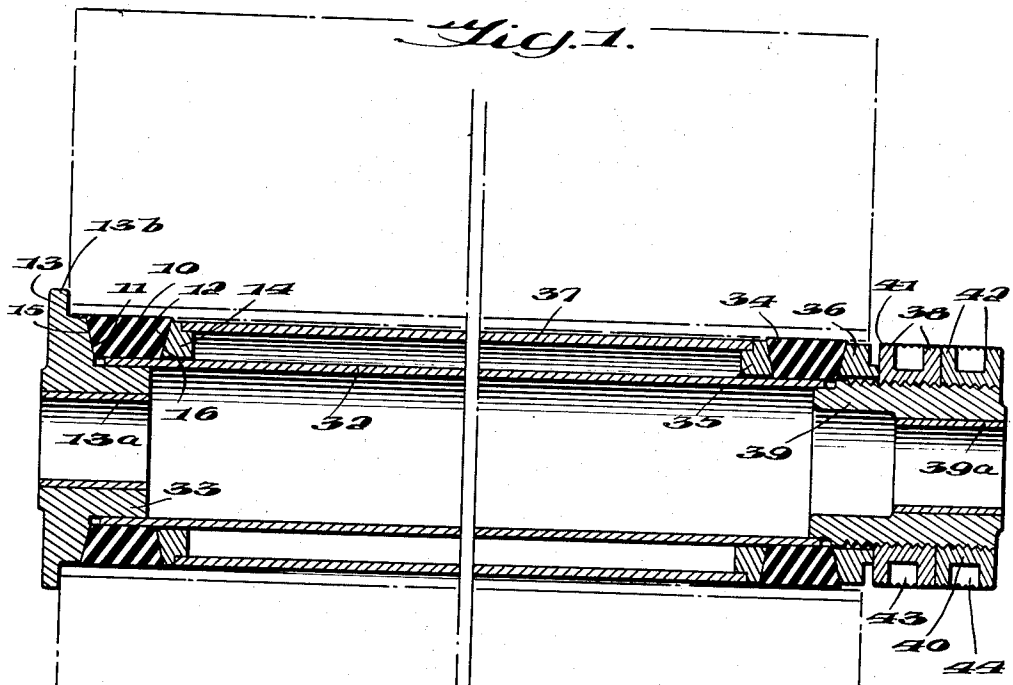


Fig. 6.

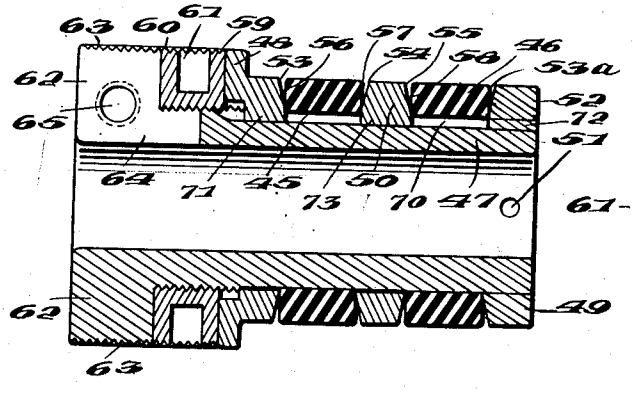
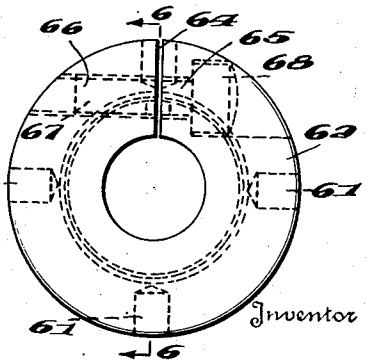


Fig. 7.



Inventor

W. H. CANNARD,

By

Parry & Miller

Attorneys

Aug. 4, 1953 W. H. CANNARD 2,647,701

EXPANSIBLE CORE CHUCK

Filed Feb. 2, 1949

2 Sheets-Sheet 2

Fig. 2.

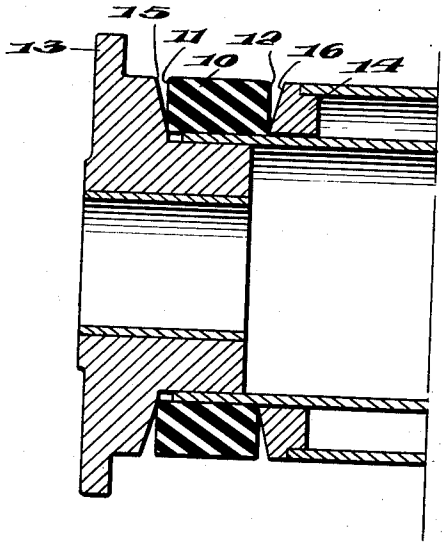


Fig. 3.

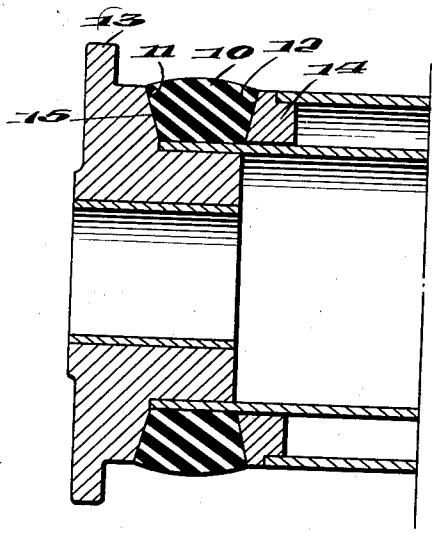


Fig. 4.

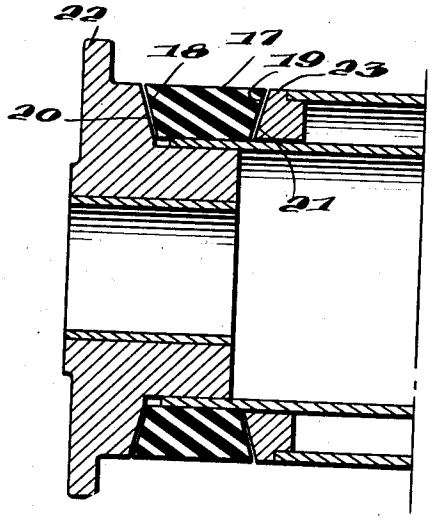
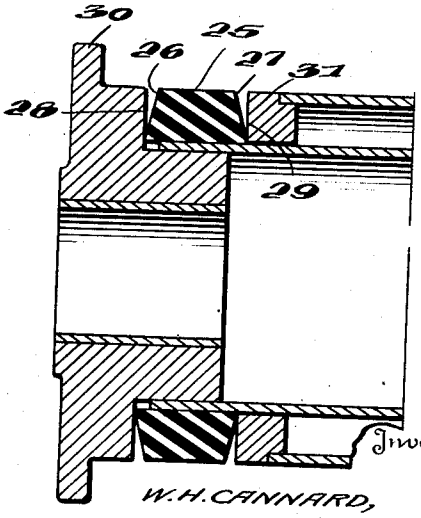


Fig. 5.



Inventor

W. H. CANNARD,

By Parry & Miller

Attorneys

Patented Aug. 4, 1953

2,647,701

UNITED STATES PATENT OFFICE

2,647,701

EXPANSIBLE CORE CHUCK

William H. Cannard, Attleboro, Mass.

Application February 2, 1949, Serial No. 74,112

12 Claims. (Cl. 242—68)

1

This invention relates to core chucks of the type used in paper and textile mills for winding material on or unwinding it from a core and aims to provide improvements in core chucks of the so-called expansible ring type.

Core chucks which are used for winding material on or unwinding it from a core are generally provided with an expansion element which after insertion of the chuck into the core is adapted to be expanded outwardly into contact with the walls of the core. Generally in such devices considerable difficulty has been experienced in producing the desired expansion either because of the size and shape of the expansion element and particularly the length thereof or because of the cooperating shape and design of the expansion element and the elements which produce the expansion. Thus, in accordance with prior art practice expansion has generally been sought by compressing a relatively long compression member along a line substantially parallel to the axis thereof with the result that the application of considerable force and manipulative handling is required to provide a generally inadequate expansion effect. It also frequently happens that the expansion produced is non-uniform in character resulting in the core being insecurely held and/or off center with respect to the center line of the chuck.

It is, therefore, an object of this invention to provide an expansible core chuck which will largely overcome the disadvantages of prior core chucks of this type and which may be easily and uniformly expanded into gripping contact with the wall of the core.

A further object of the invention is the provision of a core chuck of the expansible type having a uniformly greater expansion effect for a given movement of the expanding mechanism and force applied than core chucks of the type now in use.

A still further object of the invention is the provision of an improved core chuck assembly of the expansible type constituting an independent unit which may be mounted on supporting shafts of machines now in use.

Another object of the invention is the provision of an expansible core chuck which may be mounted for rotation on a fixed shaft and on which a roll of material or core may be placed without removing the shaft from its support or the expansible chuck from the shaft.

Still another object of the invention is the provision of a core chuck assembly which may be used with cores of widely varying lengths.

2

A further object of the invention is the provision of an improved expansible core chuck assembly which is simpler in construction, more effective in its expanding effect and easier to operate than the prior art devices used for this purpose.

A still further object of the invention is the provision of an expansible core chuck having an expansible ring element and expanding elements therefor, the cooperating shapes of the expansible ring element and the expanding elements, herein referred to as the shape factor, being such that the expansible ring member is subjected to a ring expanding wedge action, or a ring expanding graduated compression action, or to both a ring expanding wedge action and a graduated compression action.

Another object of the invention is the provision of an expansible core chuck having a relatively thin and short expansion element to facilitate expansion thereof.

Still another object of the invention is the provision of an expansible core chuck having an expansible ring member which may be readily expanded outwardly circumferentially.

A further object of the invention is the provision of an expansible core chuck in which the cooperating expansion ring and expanding elements are shaped to give an increased bulging effect, thus providing a faster operation of applying and tightening the chuck in the core.

Still another object of the invention is the provision of an expansible core chuck wherein means are provided to prevent undesired tightening or loosening of the device while in use.

These and other objects and advantages of the invention will be apparent to those skilled in the art from a consideration of the accompanying drawings and annexed specification illustrating and describing a preferred embodiment of the invention.

In the drawings:

Fig. 1 is a longitudinal cross-sectional view of one form of core chuck in accordance with this invention showing in broken lines a core and roll positioned thereon;

Fig. 2 is a fragmentary sectional view showing the relative positions of the expansion ring and pressure rings shown in Fig. 1 prior to any compression of the expansion ring;

Fig. 3 is a fragmentary sectional view showing the relative positions of the expansion ring and compression rings shown in Fig. 1 during compression of the expansion ring;

Fig. 4 is a fragmentary sectional view show-

ing a modification of the expansion and compression rings;

Fig. 5 is a fragmentary sectional view showing a further modification of the expansion and compression rings;

Fig. 6 is a longitudinal sectional view of a modified core chuck assembly taken on the line 6—6 of Fig. 7; and,

Fig. 7 is an end view of the modified core chuck assembly shown in Fig. 6.

In accordance with the present invention expansible core chucks of improved construction and operation are obtained by the novel arrangement of parts herein described and involving a novel coordination of the shape and size factors of the expansion element and the expanding elements. Thus, the shape and size factors are coordinated in such manner that the bulge and expansion of the expansion member or the bulge and expansion tendencies of the expansion member are substantially increased by subjecting the expansion member to (1) a graduated commission or (2) a ring expanding wedge action or (3) a combination of graduated compression and ring expanding wedge action. Furthermore, the expansion member which has generally been a relatively long and thick ring-like member or a plurality of contiguous shorter ring-like members is formed as a relatively short and thin ring member individually subjected to compressive forces, as stated before, between cooperating compression members. The novel constructions employed result in greater expansion effects with considerably less effort and manipulative procedure, it usually being possible to perform all adjustments by hand thus eliminating the need for special tools.

The embodiment of the invention shown in Figs. 1–3 illustrates the preferred form of the invention in which the expansion element is subjected to both a graduated compression and a ring expanding wedge action to produce a maximum expanding effect circumferentially thereof. The expansion member 10 is thus formed as a thin relatively narrow ring of elastic material such as rubber, rubber reinforced with fabric cord and like elastic materials, and is preferably rectangular in cross-sectional shape with flat straight lateral faces 11 and 12 for cooperation with the compression members 13 and 14. The compression members 13 and 14 may take the form of rings made of metal or like material and are provided with flat bevelled lateral faces 15 and 16 for cooperation with the lateral faces 11 and 12 of the expansion ring 10. The compression members 13 and 14 are positioned on opposite sides of the ring 10 and are relatively movable axially to compress the ring 10 therebetween.

During compression of the ring 10 by the members 13 and 14 the bevelled faces 15 and 16 engage the straight faces 11 and 12 to produce a graduated compression of the expansion ring 10 which is greatest adjacent the inner periphery thereof and gradually decreases outwardly depending on the angle of the bevelled faces 15 and 16. This results in an expansion effect which tends to expand or bulge the ring outwardly circumferentially, the greatest expanding or bulging effect taking place centrally thereof as shown in Fig. 3. Simultaneously therewith the bevelled faces 15 and 16 exert a ring expanding wedge action which likewise tends to expand the ring 10 outwardly circumferentially thereof. The combined effect of the graduated compression, the ring expanding wedge action, and the use of an individual relatively narrow and thin expansion ring make for easy and rapid expansion and hence easy manipulation of the core chuck.

In the embodiment of the invention illustrated in Fig. 4 the cooperating expansion and expanding elements are designed to give a ring expanding wedge action only. Thus, the expansion member 17 comprises an elastic ring of rubber or the like having inwardly bevelled faces 18 and 19 for cooperation with the correspondingly bevelled parallel faces 20 and 21 of the compression rings 22 and 23. By virtue of the parallel relationship of the faces 18 and 20 and the faces 19 and 21 compression of the ring 17 will be substantially uniform from the inner to the outer periphery thereof. However, the bevelled faces 20 and 21 retain their ring expanding wedge action and tend to expand the ring 17 outwardly circumferentially as before.

A still further modification of the cooperating expansion and compression rings is shown in Fig. 5. This embodiment of the invention is designed to give a graduated compression only and comprises an elastic expansion ring 25 having outwardly bevelled lateral faces 26 and 27 for cooperation with the straight lateral faces 28 and 29 of the compression rings 30 and 31. The lateral faces 26 and 27 are bevelled outwardly in converging relation from the inner to the outer periphery of the expansion ring 20 so that the straight faces 28 and 29 of the compression rings will compress the inner peripheral portions of the expansion ring 25 to a greater extent than the outer peripheral portions. This will result in an expansion effect tending to expand the ring 25 outwardly circumferentially thereof. However, no ring expanding wedge action will be obtained because of the straight sides of the compression rings.

The degree of bevel of the cooperating lateral faces of the expansion and/or compression rings is quite important in determining the extent of graduated compression and ring expanding wedge action which will be obtained. Within certain limits these effects increase as the bevel increases. However, in each case the degree of bevel will be determined by the desired expansion effect and will generally not exceed and will usually be somewhat less than about a 45 degree angle bevel.

The novel expansion and compression ring constructions above described are capable of use in many types of expansible core chucks but are particularly adapted for use with the improved core chuck assemblies herein described. Where more than one expansion ring is employed best results are obtained when the individual rings are separated by at least one intervening expanding ring. Thus the core chuck illustrated in Figs. 1–3 employs two expansion rings separated by two intervening compression rings and a spacing sleeve.

Referring again to Figs. 1–3 the expansion ring 10 and compression ring 14 are mounted on a sleeve member 32 and are slideable therealong into pressure contact with the compression ring 13. The compression ring 13 is integrally attached to the sleeve member 32 as by welding or the like and is accurately positioned thereon by an annular collar 33 extending into the end of the sleeve.

The sleeve 32 carries additional expansion and compression rings 34, 35 and 36 which have cooperating lateral faces thereon similar to the rings 10, 13 and 14 and are spaced therefrom by the

sleeve 37. The compression rings 13, 14, 35 and 36 and sleeve 37 are preferably slightly smaller in diameter than the expansion rings 10 and 34 so that a core of proper size may be slipped thereover in relatively snug engagement with the outer surfaces of the expansion rings.

The expanding or bulging tendencies of the expansion rings 10 and 34 are produced by means of a nut member 38 screw-threadedly engaged with a sleeve member 39 integrally secured to the sleeve member 32 in any suitable manner. A lock nut 40 may be provided, if desired, and locked in place by any suitable means such as a set screw or the like. The peripheral portions of the nuts 38 and 40 are preferably knurled as shown at 41 and 42 to facilitate manual gripping and turning thereof and may, in addition, be provided with spaced openings 43 and 44 for the reception of a spanner tool or the like.

The device of Figs. 1–3 is particularly adapted to be rotatably mounted on a fixed shaft or the like supported at one end only. For this purpose suitable bearing sleeves 13*a* and 39*a*, such as oilite and the like, are mounted in the compression ring 13 and sleeve member 39 respectively and are designed to fit standard shafts now in use.

When the core chuck of Figs. 1–3 is rotatably mounted on a shaft supported at one end, as pointed out above, and with the nuts 38 and 40 at the free end of the shaft, a core or spool may be very quickly and easily mounted thereon merely by slipping it over the nuts 38 and 40, and into contact with a peripheral flange 13*b* on the compression ring 13. It should be noted in this regard that the outside diameters of the nuts 38 and 40 are substantially the same as the outside diameters of the compression rings and slightly smaller than the expansion rings to facilitate mounting the core thereover. When the core is properly positioned on the chuck, it is then secured thereon by manually rotating the nut 38 in a direction to move it to the left in Fig. 1, thus squeezing the expansion rings between the compression rings to produce the bulging or expanding effect above described.

The modified form of core chuck shown in Fig. 6 is particularly designed for insertion in the ends of a core. In this embodiment the expansion rings 45 and 46 are mounted on a stub sleeve 47 between compression rings 48 and 49 and are spaced apart by a relatively narrow compression ring 50. The compression ring 49 is keyed to the sleeve 47 by any suitable means such as the pins 51 and has an outwardly bevelled lateral face 52 for cooperation with the lateral straight face 53*a* of the expansion ring 45. The compression rings 48 and 50 are slidably mounted on the sleeve 47 and have outwardly bevelled lateral faces 53, 54 and 55 for cooperation with the respective adjacent lateral straight faces 56, 57 and 58 of the expansion rings 45 and 46. It will be realized, of course, that any of the previously described expansion and compression ring constructions may be utilized in this modified form of the invention. Expansion of the rings 45 and 46 is obtained by a lock nut 59 screw-threadedly engaged with the sleeve 47 and having a knurled surface 60 and, if desired, spanner tool engaging openings 61. Thus by rotating the nut 59 in a direction to force the compression ring 48 to the right in Fig. 6 the expansion rings 45 and 46 will be squeezed between the compression rings 49, 50 and 48 and expanded outwardly circumferentially thereof as previously described.

The sleeve 47 is provided at the nut end with a flange 62 having a knurled surface 63. The flange 62 may be used for manipulating the chuck and for holding it, if necessary, when the nut 59 is rotated to expand the rings 45 and 46. The flange 62 is further designed to secure the chuck to a shaft and for this purpose has a cut out portion 64 extending into the sleeve 47 and a countersunk opening 65 spanning the cut out portion 64 and having a screw-threaded portion 66 for receiving a threaded stud 67 having a head 68. It will be apparent that when the stud 67 is screwed into the threaded portion 66 the head 68 of the stud will draw the separated parts of the flange together to thereby grip the shaft.

The core chuck of Fig. 6 is preferably used with another core chuck of like construction, the two being positioned in opposite ends of a core. Thus it is readily adaptable to cores of any size and width. When used with especially heavy rolls such as jumbo rolls weighing from one thousand to twenty-five hundred pounds means are preferably provided to insure against creeping of the rings with consequent tendency to tighten up on one side and loosen on the other. Such means may desirably comprise a key-way 70 cut in the body of the chuck and adapted to slidably receive keys 71, 72 and 73 integrally formed with the end rings 48 and 49 and compression ring 50 respectively. Instead of being integral the keys 71, 72 and 73 may, of course, comprise single or multiple inserts adapted for cooperation with the key-way 70 and similarly shaped key-ways in the rings 48, 49 and 50. By virtue of this construction the compression rings 48, 49 and 50 are free to slide lengthwise of the sleeve 47 but are held against rotation thereon so that there is no tendency for the adjusting nut to turn and thereby cause a change of position when once tightened or set in place.

It will thus be seen that the present invention provides improved core chuck assemblies which are easily and quickly assembled in a core usually by a simple manual manipulative procedure.

Although I have illustrated and described a preferred embodiment of the invention I do not intend to be limited to the precise details thereof as the scope of the invention is best defined in the appended claims.

I claim:

1. An expansible core chuck comprising an elastic expansion ring having flat opposite lateral faces, compression rings positioned on opposite sides of said expansion ring and having flat lateral faces adapted to engage the opposite lateral faces of said expansion ring, means mounting said compression rings for relative axial movement to cause the pair of lateral faces thereof to engage the pair of lateral faces of the expansion ring therebetween, the pair of lateral faces of said expansion ring being bevelled outwardly away from each other from the outer periphery to the inner periphery and the pair of lateral faces of said compression rings being straight, whereby the compressive action of the compression rings causes the expansion ring to tend to expand circumferentially.

2. An expansible core chuck comprising an elastic expansion ring having flat opposite lateral faces, compression rings positioned on opposite sides of said expansion ring and having flat lateral faces adapted to engage the opposite lateral faces of the expansion ring, means mounting said compression rings for relative axial movement to cause the pair of lateral faces thereof to engage the pair of lateral faces of the ex-

pansion ring to compress the expansion ring therebetween, the pair of lateral faces of said compression rings being bevelled outwardly in divergent relationship to each other and to the flat lateral faces of said expansion ring, whereby the compressive action of the compression rings causes the expansion ring to tend to expand circumferentially.

3. An expansible core chuck comprising an elastic expansion ring having flat opposite lateral faces, compression rings positioned on opposite sides of said expansion ring and having flat lateral faces adapted to engage the opposite lateral faces of the expansion ring, means mounting said compression rings for relative axial movement to cause the pair of lateral faces thereof to engage the pair of lateral faces of the expansion ring to compress the expansion ring therebetween, the pair of lateral faces of said expansion ring being straight and the pair of lateral faces of said compression rings being bevelled outwardly in diverging relationship, whereby the compressive action of the compression rings causes the expansion ring to tend to expand circumferentially.

4. An expansible core chuck comprising an elastic expansion ring having flat opposite lateral faces, compression rings positioned on opposite sides of said expansion ring and having flat lateral faces adapted to engage the opposite lateral faces of the expansion ring, means mounting said compression rings for relative axial movement to cause the pair of lateral faces thereof to engage the pair of lateral faces of the expansion ring to compress the expansion ring therebetween, the pair of lateral faces of said expansion ring being bevelled outwardly in converging relation from the inner periphery to the outer periphery and the pair of lateral faces of said compression rings being straight, whereby the compressive action of the compression rings causes the expansion ring to tend to expand circumferentially.

5. An expansible core chuck comprising a sleeve member, spaced elastic expansion rings mounted on said sleeve member and having flat lateral faces, compression rings mounted on said sleeve member on opposite sides of said expansion rings and having flat lateral faces adapted to engage the lateral faces of the expansion rings and disposed at outwardly opening acute angles thereto, means mounting said compression rings for relative axial movement on said sleeve member, and adjustable means mounted on said sleeve member and adjustable thereon to urge said compression members toward each other to cause said expansion rings to tend to expand circumferentially.

6. An expansible core chuck comprising a sleeve member, spaced elastic expansion rings mounted on said sleeve member and having flat lateral faces, compression rings mounted on said sleeve member on opposite sides of said expansion rings and having flat lateral faces bevelled outwardly in divergent relation to each other and to the adjacent faces of said expansion rings, one of said compression rings being fixed to the sleeve member and the others being movable axially thereof, and adjustable means mounted on said sleeve member and adjustable thereon to urge said movable compression rings toward said fixed compression ring to cause said expansion rings to tend to expand circumferentially.

7. An expansible core chuck comprising a sleeve member, spaced elastic expansion rings mounted on said sleeve member and having flat lateral faces disposed substantially at right angles to the longitudinal axis of said sleeve member, pairs of compression rings mounted on said sleeve member on opposite sides of said expansion rings and having flat lateral faces bevelled outwardly in diverging relationship to the lateral faces of said expansion rings and adapted for engagement therewith, means mounting said pairs of compression rings for relative axial movement on said sleeve member, and adjustable means mounted on said sleeve member and adjustable thereon to urge said compression members toward each other to cause said expansion rings to tend to expand circumferentially.

8. An expansible core chuck assembly comprising a stub sleeve member adapted to engage one end of a core, an annular flange adjacent one end of said sleeve member, a fixed compression ring adjacent the opposite end of said sleeve member, spaced expansion rings mounted on said sleeve member between said annular flange and said fixed compression ring, a movable compression ring mounted on said sleeve member between said expansion rings, a second movable compression ring mounted on said sleeve member between said annular flange and one of said expansion rings, the adjacent lateral faces of said compression rings and said expansion rings being disposed at an outwardly opening acute angle relatively to each other, and adjustable means mounted on said sleeve member inwardly of said annular flange for effecting relative axial movement of said movable compression rings to cause said expansion rings to tend to expand circumferentially.

9. An expansible core chuck as set forth in claim 8 in which the annular flange is a split flange member, and means are provided for causing said split flange member to grip a shaft to secure the core chuck thereon.

10. An expansible core chuck comprising an elastic expansion ring, compression rings positioned on opposite sides of said expansion ring and having flat lateral faces adapted to engage the opposite lateral faces of the expansion ring, means for mounting the compression rings for movement relative to each other to cause the lateral faces thereof to engage the lateral faces of the expansion ring and compress the expansion ring therebetween, the lateral faces of said compression rings being disposed at small outwardly opening acute angles to the lateral faces of said expansion ring so that relative movement of the compression rings toward each other subjects the expansion ring to a simultaneous graduated compression action and a ring expanding wedge action.

11. An expansible core chuck assembly adapted to be mounted on a shaft as a unit comprising a sleeve member, bearing members secured to opposite ends of the sleeve member and provided with spaced bearings therein adapted to receive a shaft, one of said bearing members having an annular flange provided with a flat lateral face, the other of said bearing members having an adjustable member thereon, spaced elastic expansion rings mounted on said sleeve member between said annular flange and said adjusable member and having flat lateral faces, a lateral face of one of said expansion rings being engageable with the lateral face of the annular flange, compression rings mounted on said sleeve member and having flat lateral faces adapted to

engage the lateral faces of the expansion rings, a spacer sleeve mounted on said sleeve member between the inner ones of said compression rings, said expansion rings, compression rings and spacer sleeve being relatively movable axially on said sleeve member, said adjustable member being movable on said other end bearing member for effecting relative axial movement of the compression rings to cause said expansion rings to tend to expand circumferentially.

12. An expansible core chuck assembly for mounting on a shaft comprising a sleeve member, bearing members secured to opposite ends of said sleeve member and provided with bearing surfaces adapted to receive a shaft, an annular flange on one of said bearing members, a pair of spaced expansion rings mounted on said sleeve member, compression rings mounted on said sleeve member, a spacer sleeve mounted on said sleeve member between the inner ones of said compression rings, said expansion rings, compression rings and spacer sleeve being axially movable on said sleeve member, and adjustable means mounted on said other bearing member and adjustable thereon to urge said compression rings, expansion rings and spacer sleeve toward said annular flange to cause said expansion rings to tend to expand circumferentially.

WILLIAM H. CANNARD.

References Cited in the file of this patent

UNITED STATES PATENTS

Number	Name	Date
1,518,026	Van Sluys	Dec. 2, 1924
1,597,568	Bandy	Aug. 24, 1926
1,810,403	Rupp	June 16, 1931
2,025,865	Holmes	Dec. 31, 1935
2,027,749	Mossberg et al.	Jan. 14, 1936
2,058,224	George	Oct. 20, 1936
2,066,659	Templeton et al.	Jan. 5, 1937
2,365,980	Thomas	Dec. 26, 1944
2,481,000	Brunner	Sept. 6, 1949

FOREIGN PATENTS

Number	Country	Date
23,294	Great Britain	of 1911
269,699	Great Britain	Apr. 28, 1927
759,707	France	Nov. 23, 1933