June 30, 1942. H. E. SOMES 2,288,037

CLUTCH

Filed May 20, 1940

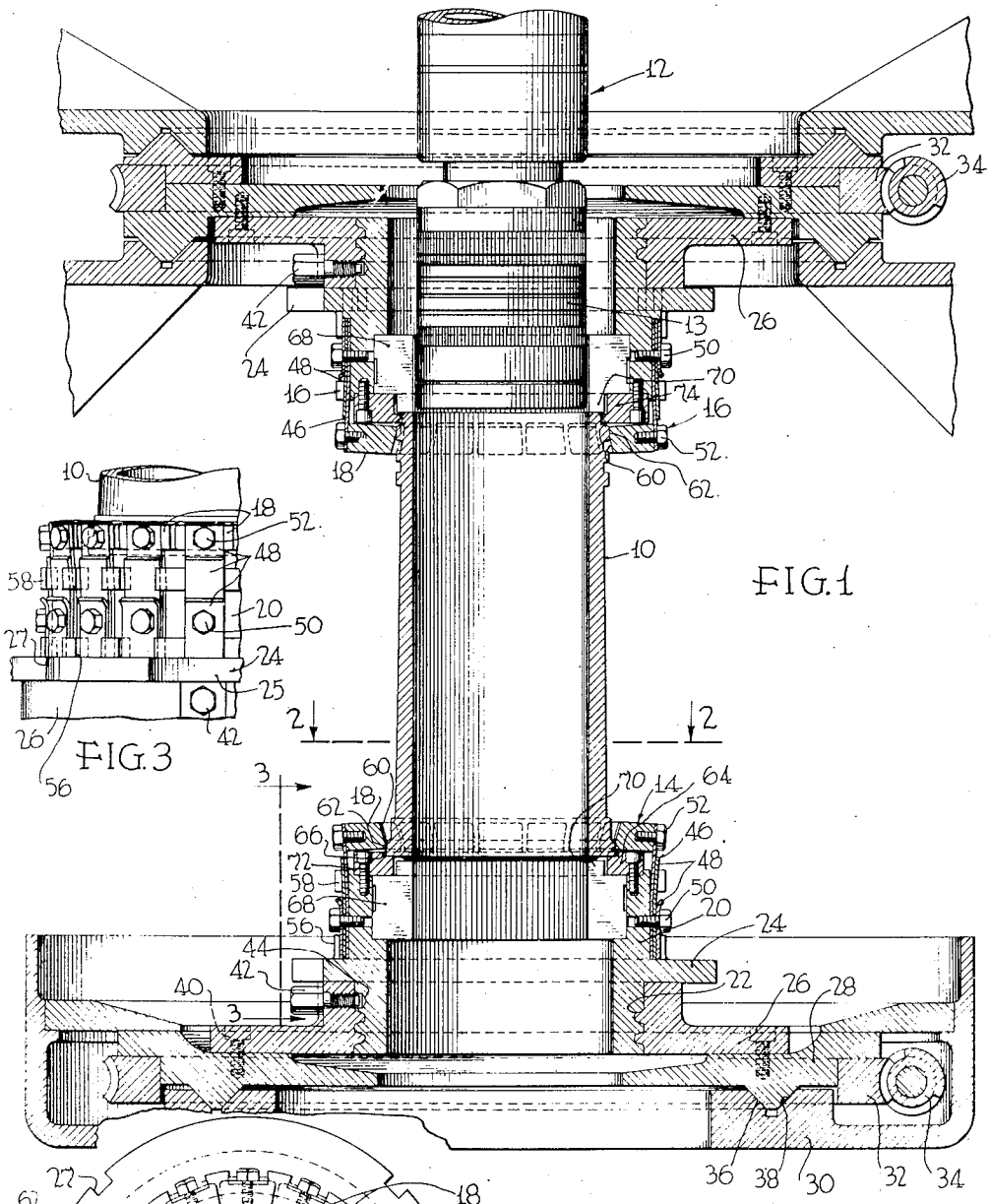


FIG. 1

FIG. 3

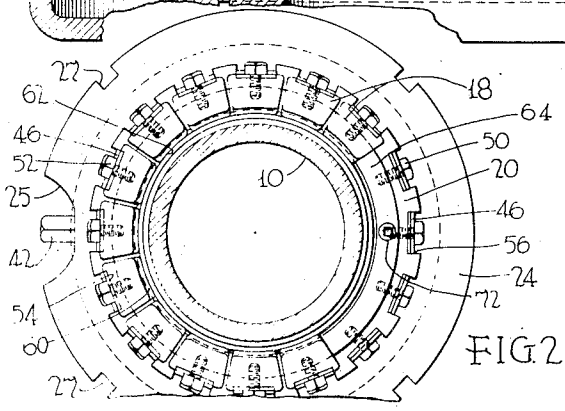


FIG. 2

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CLUTCH

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Application May 20, 1940, Serial No. 336,130

12 Claims. (Cl. 219—13)

This invention relates to chucking devices and more particularly to a chuck of the pot type adapted to grip a work member undergoing treatment resulting in expansion or contraction such as thermal expansion due to electromagnetic induction heat treatment.

In the heat treatment of thin walled cylindrical structures as by electromagnetic induction heating and quenching the substantially instantaneous heat generated in the structure causes considerable expansion and contraction of the structure and as a result it is necessary to support the structure in such a way that sufficient yield is provided to permit such expansion and contraction without setting up stresses in the structure which would cause the same to lose its shape. The present invention is directed to a novel resilient clutch adapted for use in connection with such apparatus and in which a resilient grip about the entire circumference of a cylinder or other object is afforded together with such a resilient grip as to force the chucked article to remain centered throughout working thereon.

It is accordingly an object of the present invention to provide a resilient yielding chuck adapted to uniformly grip an object about its complete circumference.

Another object of the invention is to provide a resilient chuck which throughout its yield will maintain a chucked article subject to variation in size, for example due to thermal expansion, properly centered throughout such variation.

A further object of the invention is to provide a chuck of the type described of extreme simplicity, easily operable to chuck articles and which at the same time will be capable of effecting a substantial grip upon an article to which it is adapted with even pressure at all points.

The above and other novel features of the invention will appear more fully hereinafter from the following detailed description when taken in conjunction with the accompanying drawing. It is expressly understood, however, that the drawing is employed for purposes of illustration only and is not designed as a definition of the limitation of the invention, reference being had for this purpose to the appended claims.

In the drawing wherein like reference characters indicate like parts,

Figure 1 is a longitudinal section through a pair of spaced chucks of similar construction illustrating their adaptability to support a thin walled cylinder.

Figure 2 is a section taken on the line 2—2 of Figure 1 illustrating a top plan view of one of the chucks with parts removed.

Figure 3 is a fragmentary side elevational view taken substantially from the plane 3—3 of Figure 1.

In Figure 1 there is illustrated a thin walled cylinder positioned between a pair of chucks embodying the principle of the present invention, the cylinder 10 being held coaxial with respect to the electromagnetic induction heat treat head 12, the latter being similar in many respects to that shown in the copending application Serial No. 277,996, filed June 8, 1939. Each of the chucks 14 and 16 are similar in that they are composed of a plurality of segment-shaped fingers 18 adapted to be spring pressed into engagement with the cylinder 10. The lower chuck 14 comprises an annular main support member or sleeve 20 having a threaded shank portion 22 and flange 24 for threaded solid engagement with a support flange 26 carried by a rotatable turn table 28 supported in a stationary frame member 30. The rotatable table may be driven through a worm wheel 32 and worm 34, and a suitable motor, not shown. The turn table is maintained centered through the annular groove 36 in the frame member 30 and the annular projection 38 on the rotatable table. The flange member 26 is detachably supported upon the table 28 through bolts 40 so that flanges of varying size may be quickly substituted in order to receive chucks of varying size to hold a variety of cylinder sizes. A set screw 42 in the flange 26 is adapted to extend into a recess 44 in the threaded shank portion 22 so as to lock the same against unscrewing during operation, the flange 24 being cut away at 25 for access. The flange is notched as at 27 in order to receive a suitable spanner or wrench.

Each of the segment shaped fingers 18 are supported on individual leaf springs 46, each of which is composed of a plurality of leaves 48 of graduated length, the leaf spring being secured to the sleeve through a bolt 50 and to each finger by a bolt 52. If desired the leaf spring may have a pre-set, so that by drawing the bolt 52 a residual tension is present. As is illustrated in Figure 2, the finger segments are specially notched as at 54 to receive the end of the spring and the sleeve is also notched at the base next to the flange as at 56. Additional projections 58 are provided upon the sleeve between the springs, and the notches 54 and 56 and the projection 58 all operate to maintain the springs in proper aligned position with the finger. Each of the

fingers is provided with an inclined or conical end face 60 and an adjacent gripping face 62, the conical faces being adapted to guide the cylinder structure into the chuck and assist in spreading the fingers apart preparatory to engagement of the cylinder by the engaging faces 62. The annular sleeve 20 is provided on its end with a guide ring 64 having a shoulder 66 arranged therein for receiving the end of the cylinder and limiting the position of the cylinder axially with respect to the chuck. The guide ring 64 also acts as a retaining ring for a series of radial thin sector-shaped laminations 68 formed of magnetic material, which laminations are provided with an extension 70 to bring the same into close proximity with the end of the cylinder 10. The guide or retaining ring 64 is clamped tightly into engagement with the laminations 68 through the screws 72.

The upper chuck is similar to the lower chuck except for a change in shape in the guide ring, the upper guide ring being indicated by the reference character 74. This guide ring, while acting as a retaining ring for the laminations as in the lower chuck, merely acts as a centering guide for the cylinder, permitting the cylinder to bear against the projection portion 70 of the laminations.

In practice, the upper chuck may be threadedly supported upon a flange such as 26 and in turn carried upon a turn table. In such a case the support for the turn table should be relatively movable with respect to the lower turn table so that the chucks may be moved toward and away from one another in order to load a cylinder in the chucks. The employment of an upper and lower turn table both driven as illustrated is advantageous in avoiding slippage between the cylinder and the resilient chucks, particularly where large heavy cylinder structures are being worked upon.

It will be appreciated that the chuck described is adapted to resiliently grip the cylinder 10 so that thermal expansion and contraction due to the generation of differential heating currents therein by the inductor 13 on the heat treat head 12 may take place without unduly straining the chuck or setting up distortion stresses within the cylinder. The even uniform grip of the chuck fingers around the entire periphery of the cylinder is important in preventing distortion stresses, and the fingers are preferably segments cut from a disc turned to chuck size so that accuracy is assured. The employment of leaf springs formed from a plurality of leaves of graduated length assures that throughout the expansion and contraction, the cylinder or object being held by the chuck will be maintained in its central original position or, as in the case of the cylinder shown, in a position coaxial with the heat treat head throughout the entire treatment. The use of leaf springs in which the stress set up by the deflection of the spring increases at a rate greater in proportion than the deflection is important in assuring the maintenance of concentricity of the object chucked during the expansion and contraction to which the article is subjected.

In practice, the operation of the chucks will be obvious, it merely being necessary to insert the cylinder in the tapered opening formed by the chucking fingers and force the same axially into the chuck to spread the fingers apart so that the chucking face 62 of each of the fingers will be in engagement with the exterior surface of the end of the cylinder. In practice, if the upper chuck is, for example, elevated by a power cylinder, the effort required to insert the cylinder into the two chucks may be supplied through such elevating and lowering cylinders. However, the taper of the individual fingers can be arranged so gradual that the cylinder may be easily and quickly loaded into the chuck by hand and the segmental fingers spread to receive the cylinder.

Although the invention has been illustrated and described in connection with a single modification, it is to be understood that the same is not limited thereto but may be embodied in various modified forms. As many changes in the construction and arrangement may be made without departing from the spirit of the invention as will be apparent to those skilled in the art, reference will be had to the appended claims for a definition of the limits of the invention.

What is claimed is:

1. In a chuck, an annular support member, a plurality of resilient members substantially uniformly circumferentially spaced and secured to said member and paraxially extending, said member having torsion resisting recesses and shoulders for maintaining said resilient members paraxial, and a gripping finger on each of said resilient members.

2. In a chuck, an annular support member, a plurality of resilient members substantially uniformly circumferentially spaced and secured to said member and paraxially extending, said member having torsion resisting recesses and shoulders for maintaining said resilient members paraxial, and a gripping finger on each of said resilient members, said gripping finger having an inclined work receiving face.

3. In a chuck, an annular support member, a plurality of resilient members substantially uniformly circumferentially spaced and secured to said member and paraxially extending, said member having torsion resisting recesses and shoulders for maintaining said resilient members paraxial, and a gripping finger on each of said resilient members, said gripping fingers forming a gripping radially resilient annulus.

4. In a chuck, an annular support member, a plurality of resilient members substantially uniformly circumferentially spaced and secured to said member and paraxially extending, said member having torsion resisting recesses and shoulders for maintaining said resilient members paraxial, and a radially extending gripping finger on each of said resilient members, said gripping finger each having an inclined face so as to form, together with the other gripping members, a conical work receiving aperture.

5. In a chuck, for supporting a cylinder for internal treatment which comprises an annular support sleeve, having an internal shoulder, an annular body of laminated material seated against said shoulder, means including a guide ring secured to one end of said sleeve for securing said annular body in place, a plurality of paraxially arranged leaf springs secured to the outside of said sleeve and a segmental chucking finger secured to each spring, said chucking fingers being arranged to form a ring of fingers concentric with said body and sleeve.

6. In a chuck for supporting a cylinder for internal treatment which comprises an annular support sleeve having an internal annular shoulder, an external central annular flange, an annular body of laminated material arranged with-

in said sleeve abutting said shoulder and extending beyond one end of said sleeve, means including a guide ring arranged on the one end of said sleeve for securing said body in place, an attaching thread upon said sleeve on the other end thereof, a plurality of leaf springs arranged substantially uniformly around the exterior of the one end of the sleeve and extending in a substantially axial direction beyond the end of the sleeve, and gripping fingers secured to each spring beyond the one end of the sleeve, said gripping fingers being arranged to form a resilient gripping annulus concentric with said sleeve, magnetic body and guide ring.

7. In a chuck for supporting a cylindrical object for internal treatment which comprises an annular support means, said means including an internal lining in the form of a laminated magnetic material annulus, extending substantially to one end of said means, a plurality of sector shaped gripping fingers resiliently supported beyond said one end of said means and forming a resilient gripping annulus concentric with said laminated annulus.

8. In a chuck, a support member, a plurality of resilient members, a plurality of fingers secured to said members, said fingers being adapted to receive and resiliently and uniformly grip a work piece, and maintain said piece in position thru thermal expansion and contraction thereof, said resilient members exerting a gripping force in response to deflection of increasing proportion with increases in deflection.

9. In a chuck, an annulus support member, a plurality of gripping fingers arranged in an annulus to grip and hold a cylindrical object concentric with said member, resilient means supporting each of said fingers from said annulus, said resilient means exerting a gripping force in response to deflection of increasing proportion with increases in deflection, whereby said resiliently supported gripping fingers assure concentricity of an object supported thereby thruout thermal expansion and contraction of the article.

10. In a chuck, an annular member, a plurality of substantially paraxially extending substantially uniformly spaced leaf springs secured to the exterior of said annular member and guide means on said sleeve for resisting torsional stresses tending to throw said leaf springs out of their respective planes passing thru the axis and gripping means secured to each of said leaf springs.

11. In a chuck, an annular member, a plurality of substantially paraxially extending substantially uniformly spaced leaf springs secured to the exterior of said annular member, and guide means on said sleeve for resisting torsional stresses tending to throw said leaf springs out of their respective planes passing thru the axis, and gripping means secured to each of said leaf springs for resilient engagement with a workpiece, each of said springs being composed of a plurality of leaves of graduated length.

12. In a chuck, an annular member, a plurality of substantially paraxially extending substantially uniformly spaced leaf springs secured to the exterior of said annular member, and guide means on said sleeve for resisting torsional stresses tending to throw said leaf springs out of their respective planes passing thru the axis, and gripping means secured to each of said leaf springs for resilient engagement with a workpiece, each of said springs being pre-stressed thru radial engagement thereof with said member.

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