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[21] Appl. No. 837,971
[22] Filed Apr. 9, 1969
Continuation of application Ser. No.
691,108, Dec. 7, 1967, now abandoned.
[45] Patented Jan. 5, 1971

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[54] EXPANDING CHUCK
14 Claims, 6 Drawing Figs.

[52] U.S. Cl. 242/72.1
[51] Int. Cl. B65h 75/24
[50] Field of Search. 242/72.1,
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ABSTRACT: An automatically expanding chuck for supporting tubular rolls which has sections that can be expanded to grip the interior of a tubular roll, the chuck has outer sections which are expanded radially outward by cams. The cams are in turn actuated by the end surface of the roll in which the chuck is inserted.

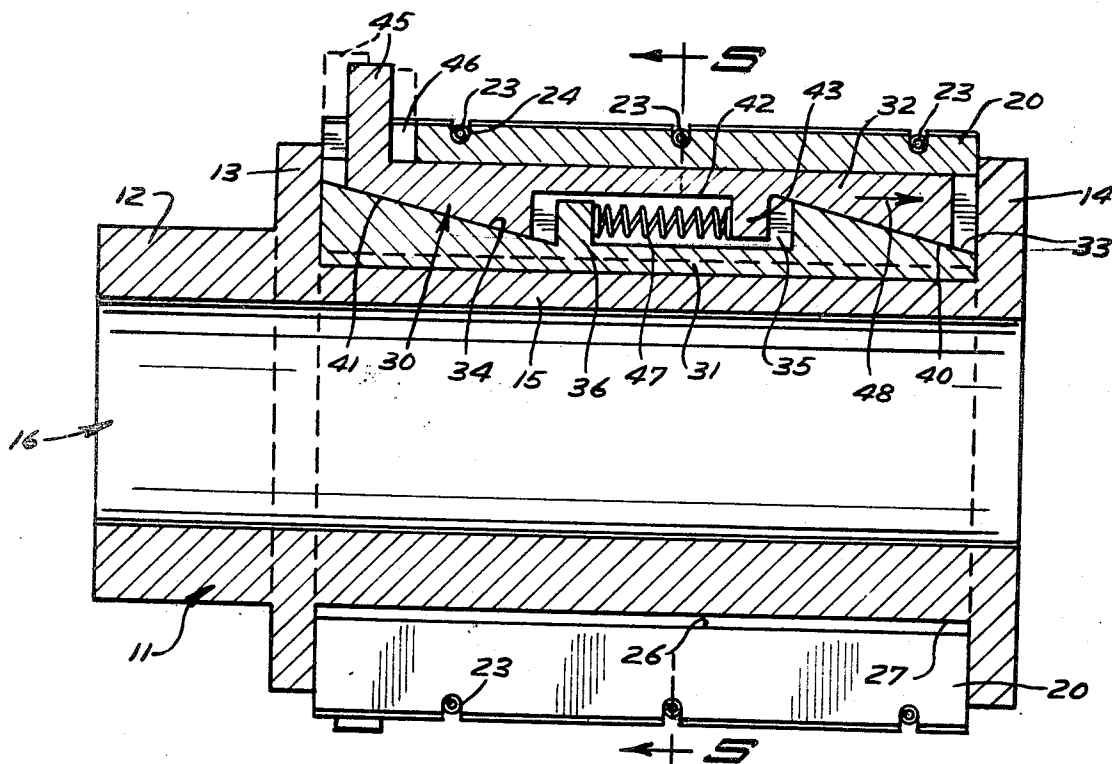


FIG. 1

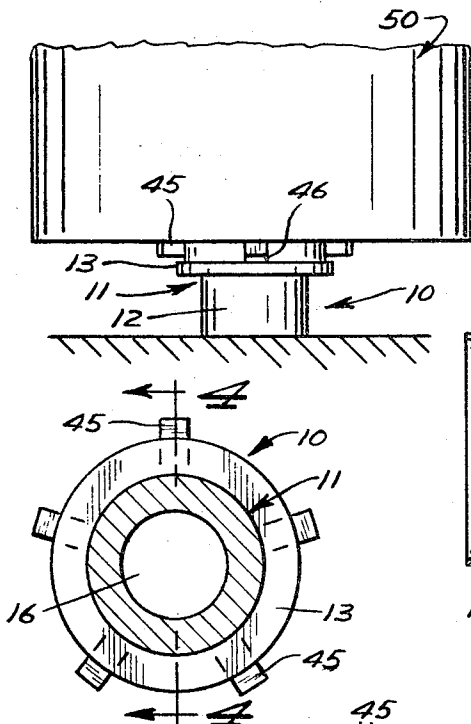


FIG. 2

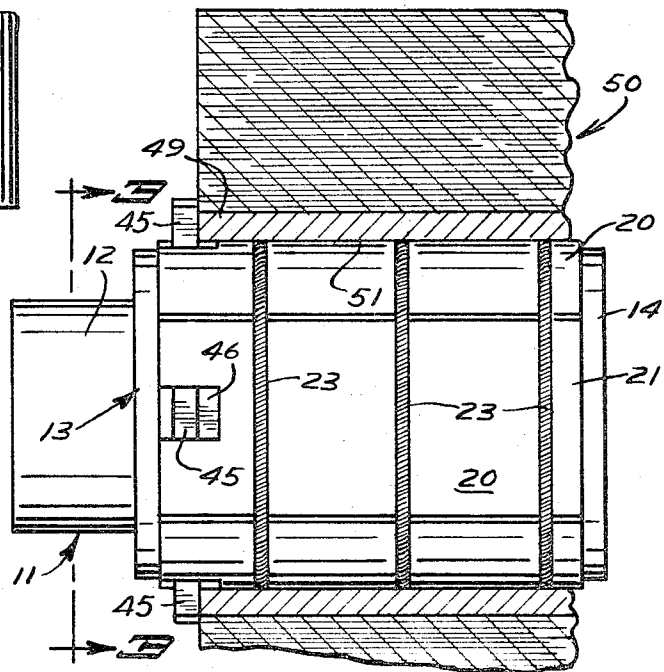


FIG. 3

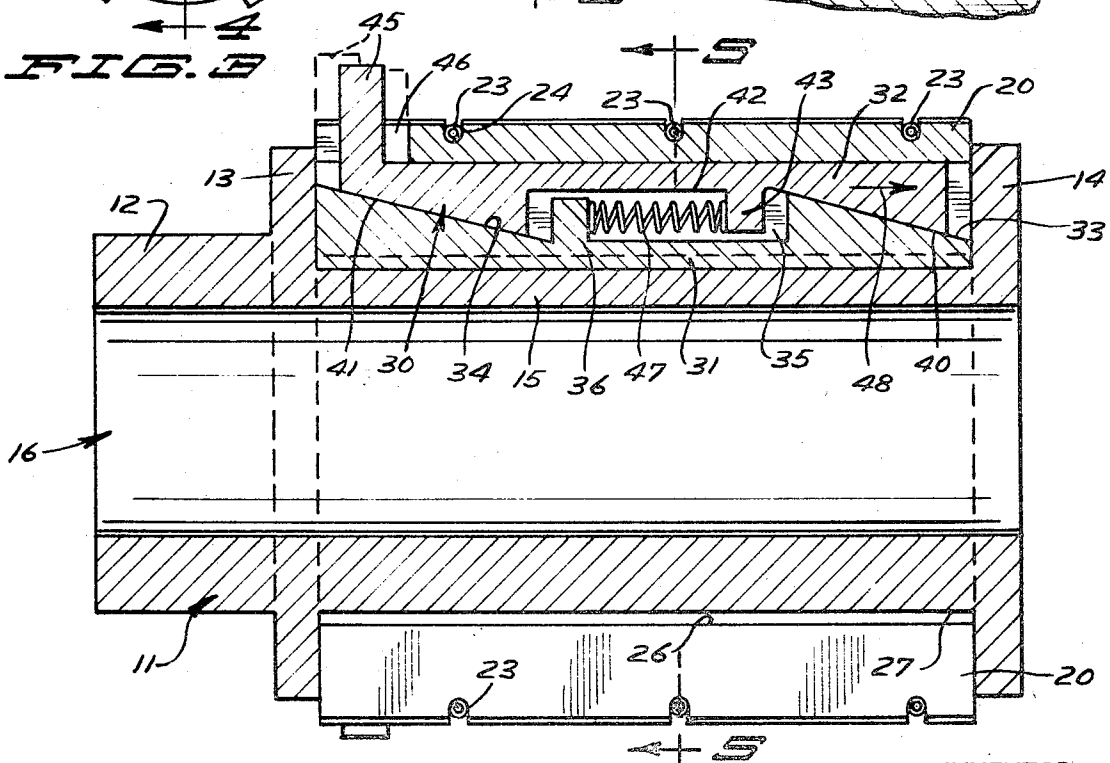


FIG. 4

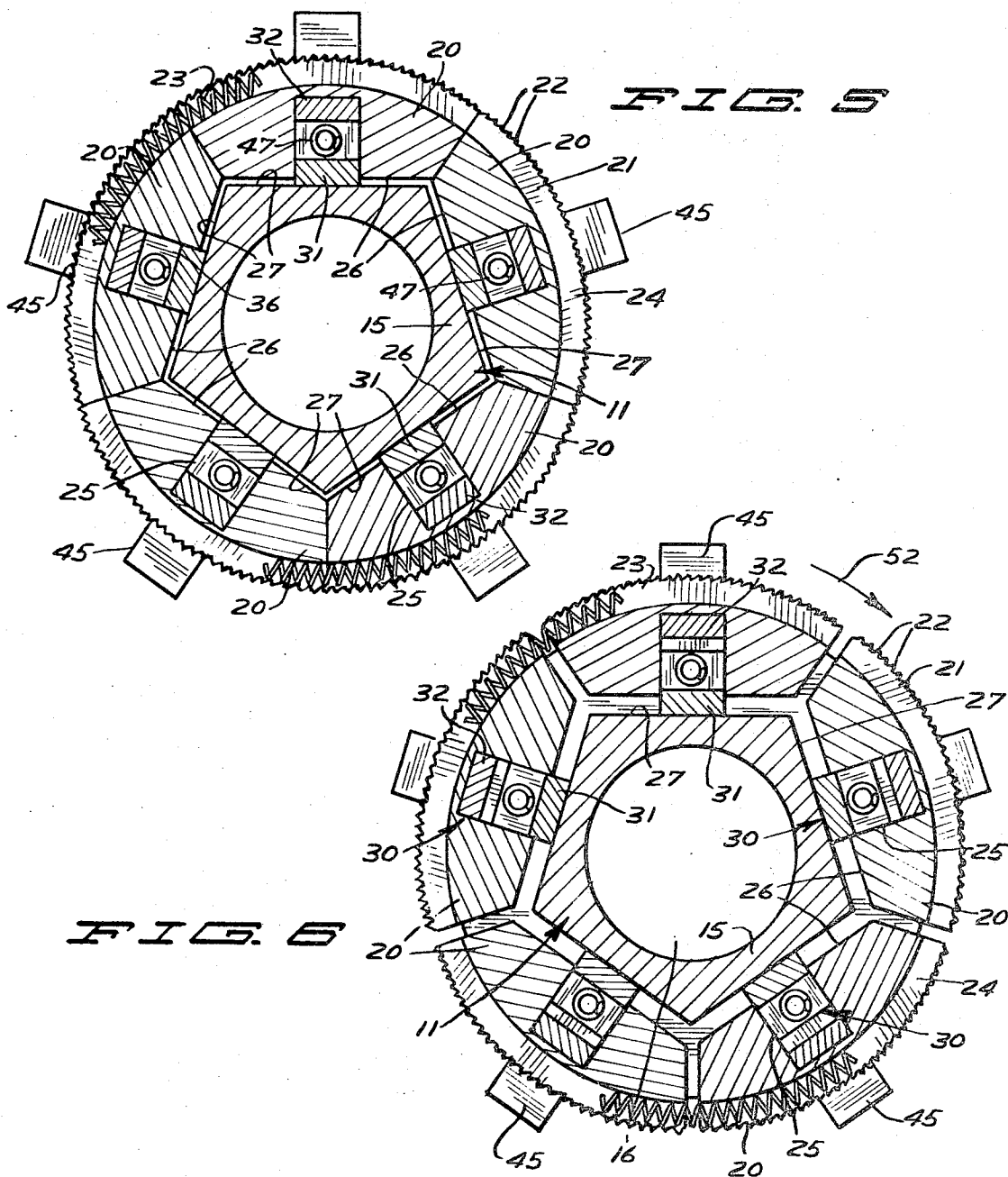
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EXPANDING CHUCK

CROSS REFERENCE TO OTHER APPLICATION

This application is a continuation of my copending application Ser. No. 691,108, filed Dec. 7, 1967, for Expanding Chuck now abandoned.

PRIOR ART

At the present time there are several different types of expanding chucks that have been advanced for holding cores and driving mechanism, but none have proved suitable where the loads are heavy and where the cores or rolls being held are heavy. Particularly in the paper industry, where huge rolls of paper stock must be wound or unwound from central cores, it is difficult to center chucks in these cores and hold them securely while the paper is being wound on or unwound.

SUMMARY OF THE INVENTION

The device of the present invention utilizes a chuck which will slip into a tubular core and has means thereon for initially centering and expanding the outer periphery of the chuck to grip the inside of the core. This is an initial setting to hold the chuck in proper position until the paper roll on the chuck has been placed in the desired machine for winding or unwinding the paper stock. The chuck is then driven to wind up paper, or braked during an unwinding operation (a drag load is applied to the roll when the paper is being unwound to prevent inertia from causing slack and whipping of the paper). The unit is designed so that the outer periphery of the chuck will continue to tighten against the inner surfaces of the tubular core to insure effective holding and driving engagement between these two surfaces.

The unit is relatively simple to manufacture, easy to use, and provides accurate centering of the chuck in the tubular cores.

It is therefore an object of the present invention to present an expanding chuck for holding a tubular core for winding and unwinding material from the core.

In the drawings,

FIG. 1 is a side elevational view of a chuck made according to the present invention and having a paper roll supported thereon prior to being placed into a paper machine;

FIG. 2 is a vertical sectional view of the device of FIG. 1 showing the roll in horizontal position, which would be the normal one for winding or unwinding material;

FIG. 3 is a sectional view taken as on line 3-3 in FIG. 2;

FIG. 4 is a sectional view taken as on line 4-4 in FIG. 3;

FIG. 5 is a sectional view taken as on line 5-5 in FIG. 4; and

FIG. 6 is a sectional view taken on substantially the same line as FIG. 5 and showing the chuck in expanded position.

Referring to the drawings and the numerals of reference thereon, a chuck assembly illustrated generally at 10 has a central mounting member 11 which has a holder section 12 at one end thereof, and spaced apart substantially parallel, disc-like end flanges 13 and 14.

The mounting member 11 has a center cam section 15 between the end flanges 13 and 14 which has a polygonal (as shown a pentagon) cross section, as shown in FIGS. 5 and 6. The pentagon-shaped cross section is of uniform size and extends between the flanges 13 and 14. The mounting member 11 can be bored out in the center as shown at 16, to reduce weight, if desired, or can be bored to specification for shaft mounting.

The mounting member 11 is used to mount jaw plates 20 for the chuck. The number of jaw plates will correspond to the number of sides or surfaces in the cross section of center cam member 15. As shown, there are five jaw plates 20. The jaw plates 20 have a serrated outer surface 21, with the serrations all having points 22 around the periphery of the jaw plates. The serrations can be as shown, or can be of other suitable design. For steel or fiberglass cores the jaw plates could have a friction material on their surface, for example rubber. This is

so that when the chuck is driven in either direction (one direction of rotation is shown by arrow 52 in FIG. 6), the points 22 will engage and grip any surface which is against them.

As shown in FIG. 5, the inner surfaces 26 of the jaw plates are of size to correspond with the outer surfaces 27 of the center section 15. The jaw plates are made so that they will mate at their edges and form a continuous peripheral surface which is substantially cylindrical. The side surfaces taper outwardly on radial planes from the inner surface to the outer peripheral surface.

The jaw plates 20 are resiliently held in place around the center member with a plurality of annular garter springs 23 which are fitted within provided grooves 24 that align on each of the jaw plates and when the jaw plates are in position form annular grooves around the unit.

Each of the jaw plates is also provided with a longitudinally or axially extending recess 25 which opens to the inner surface 26 of each of the jaw plates and extends outwardly therefrom.

Each of the recesses 25 houses a wedge assembly illustrated generally at 30 in FIG. 4. The wedge assemblies each include an inner wedge 31 and an outer wedge 32. The inner wedge, as shown, is of substantially the same length as the distance between the flanges 13 and 14 on the center section, and each of the inner wedges rests against the aligned outer surfaces 27 of the center section. There are five wedge assemblies, one for each of the jaw plates.

The inner wedge has a first wedging surface 33 and a second wedging surface 34 which face outwardly and taper outwardly from the center member and are longitudinally spaced apart on the inner wedge. The space between the wedging surfaces 33 and 34 define a recess 35. An upright lug 36 integral with the inner wedge is positioned in this recess. The lug 36 is adjacent the second wedging surface 34.

The outer wedge 32 of each assembly 30 also has a first wedging surface 40 and a second wedging surface 41. The first and second wedging surfaces of the outer wedge face toward and mate against the first and second wedging surface of the inner wedge. The two wedging surfaces on the outer wedge also define a receptacle 42 therebetween. A lug 43 is integral with the outer wedge and is positioned adjacent the first wedging surface 40 of the outer wedge. The lugs 36 and 43 are positioned in the receptacles defined in the opposite wedge. In other words, the lug 43 is positioned within the receptacle 35 defined in the inner wedge and the lug 36 of the inner wedge is positioned in the receptacle 42 of the outer wedge. The lugs face each other and are longitudinally spaced apart, as shown.

The outer wedge, as shown, is somewhat shorter than the inner wedge and has room to move longitudinally or axially between the flanges 13 and 14. The outer wedge of each assembly also has an actuating lug 45 that extends radially outwardly from the outer wedge and extends through provided slots 46 in its associated jaw plate. The lug 45 protrudes above the serrated surface 21 of its jaw plate. The lugs 45 are positioned to move within the provided slots 46 in its associated jaw plate.

A separate spring 47 is positioned between the lugs 43 and 36 of the inner and outer wedges of each assembly. The spring 47 exerts a force tending to move the outer wedge in direction as indicated by arrow 48 in FIG. 4 relative to the inner wedge, which is held between the end flanges.

When each of the outer wedges has moved all the way toward the flange 14 that it can, the wedge assemblies will be compressed and the jaw plates will be pulled radially inwardly by the garter springs 23. The jaw plates together will be substantially the same outside diameter as the diameter of the end flanges. In this contracted position, the unit can be slipped inside a tubular core 49 of a paper roll. This is shown in FIG. 1 and the pressure used to insert the chuck into the paper roll will act on the actuating lugs 45 and tend to move them into position as shown in dotted lines in FIG. 4. The relaxed position of the chuck is shown in FIG. 5 with the jaw plates forming a substantially continuous cylindrical outer surface.

At the time the actuating lugs are moved, in an ordinary paper roll they will move substantially to the position as shown in solid lines in FIG. 4. This will force the outer wedge in opposite direction from arrow 48 and the expanding action of the wedging surfaces of the inner and outer wedges will cause the outer wedge to tend to expand each of the jaw plates. This will move the unit to position as shown in FIG. 6, and at the same time this action will automatically center the chuck inside the tubular core 49 for the paper roll 50. The serrated surfaces will engage the inner surface 51 of the tubular core on which the paper is mounted and when the chuck and core will be placed into a machine used for winding paper onto the core or for unwinding paper from the core (as is shown). In the case of winding paper on the core, the end of the sheet of paper is then attached to the core and the chuck would be driven in direction as indicated by arrow 52 in FIG. 6. The teeth 22 of the serrations would bite into the inner surface 51 of the core 49 of the paper roll and as the drag on the paper which is being wound onto the core increases, these teeth will tend to fit into the inner surface of the core and slide the jaw plates in opposite direction from that indicated by arrow 52. This will move the jaw plates and wedges along the outer surfaces 27 of the center member of the chuck. As this is done, it can be seen that the wedges will also move outwardly because of the camming action of these outer surfaces 27 of the center member. This will cause the jaw plates to more tightly engage the core inner surface and will provide the necessary driving force so that the unit will function properly.

Likewise, if paper is being unwound from a large roll, a brake is usually applied to the machine holding the chucking member 12 of the chuck and the paper is taken off the roll. This brake will provide a retarding force restraining movement in the opposite direction from that indicated by arrow 52. The force removing the paper will tend to slide the jaw plates in direction opposite from that indicated by arrow 52 and will move the wedges up along the surfaces 27 thereby tending to expand the jaw plates and more tightly force the jaw plates against the inner surface of the core.

Once the paper has been wound on or has been removed, and the chuck member assembly is to be moved from the core, the actuating lugs 45 can be forced in direction as that indicated by arrow 48. The springs 47 will help this action and also, the garter springs 23 will tend to urge the jaw plates radially inwardly. When the jaw plates have been urged inwardly, then the chuck assembly can easily be removed from the tubular core.

The use of the actuating lugs on the inner and outer wedge assemblies gives an automatic centering of the chuck assembly in the core merely by pushing the chuck assembly into the core. When the core is horizontal the chuck is slipped in until the end of the core strikes the lugs 45. Then the center member 11 is hit axially inwardly causing the outer wedges to slide and expand the jaw plates, centering the core and holding it in place. Then, as more force is needed to either wind paper onto the core or to retard movement of the core during an unwinding operation, the serrations 22 will cause the jaw plates to be urged to slide around the center member of the chuck assembly. With a polygon cross section, this will cause the wedge assemblies to move outwardly from the axis of rotation in a cam type action and more tightly force the jaw plates against the inner surfaces of the core on the jaw plates.

The garter springs 23 hold the unit together when it is not in use and the springs 47 aid in returning the wedges to their relaxed position to simplify removing of the chuck assembly from the centers of the core.

The machines for winding and unwinding material from cores are well known and the drive end 12 of the center member can be modified as desired to fit onto any standard machine.

I claim:

1. An automatic chuck comprising a rotatable mounting member, a plurality of jaw plates extending in direction along the axis of rotation of the mounting member and positioned so

that together they substantially surround said mounting member and extend outwardly therefrom to together form an outer chucking surface means, and actuating means for each of said jaw plates, said actuating means comprising wedge means which expand the jaw plates outwardly upon axial movement thereof, said wedge means for each jaw plate comprising separate inner wedges engaging said mounting member and outer wedges engaging the respective jaw plates, separate lug means on each of the outer wedges extending outwardly beyond the periphery of the jaw plates adjacent one end of the chuck a sufficient distance to engage an end surface of a tubular member into which said chuck can be slipped, said inner and outer wedges having inclined surfaces and being oriented so that upon axial movement of said outer wedge in direction toward said one end the effective wedge action is radially outwardly from said mounting member.

2. The combination as specified in claim 1 wherein the cross-sectional shape of said mounting member is polygonal.

3. The combination as specified in claim 2 wherein the outer surface means of said jaw plates are serrated.

4. The combination as specified in claim 1 and a plurality of garter springs extending around the peripheries of said jaw plates and resiliently urging said jaw plates toward said mounting member.

5. The combination as specified in claim 1 wherein said mounting member has a pair of radially extending disclike end flanges, and said jaw plates and wedge means are between said end flanges.

6. The combination as specified in claim 1 wherein the lug means on said wedge means are of a size to engage the end surfaces of a core into which the chuck can be slipped, and upon longitudinal movement of said chuck toward said core, said wedge means will be moved and expanded so that the outer surfaces of said jaw plates engage the inner surface of said core.

7. The combination as specified in claim 1 and bias means acting on said outer wedges tending to move said outer wedges away from said one end.

8. An automatic chuck for holding tubular members comprising a mounting member having means at one end thereof for rotationally driving it, and a center section of a polygonal cross section, a plurality of jaw plates movably positioned on said center section and extending axially along said mounting member, one of said jaw plates corresponding to each of the surfaces of the center section and extending outwardly therefrom, said jaw plates together forming chucking means, and wedge means for each jaw plate annularly slidably mounted on said mounting member and axially slidably actuable from a retracted position to increase the outer diameter of the chucking means, said wedge means including actuator means extending beyond the jaw plates a sufficient distance to engage the end surface of a tubular member to be held by said chuck, when the wedge means are in retracted position.

9. A chuck for holding a tubular member comprising a mounting member adapted to be rotationally driven, said mounting member including a center section having a polygonal cross section, a plurality of jaw plates annularly slidably positioned on and overlying said center section in the polygonal cross section region, said jaw plates together forming chucking means for the tubular member, means for retaining said jaw plates on said center section while permitting annular sliding movement between the jaw plates and the center section, and wedge means for each jaw plate slidably mounted on said mounting member and actuable from a retracted position to move the jaw plates outwardly and increase the effective size of the chucking means to move said jaw plates against the inner surface of a tubular member, said means for retaining said jaw plates on said center section permitting said center section to annularly move relative to the jaw plates during driving of the center section to tend to expand the jaw plates against the inner surface of said tubular member.

10. The combination as specified in claim 9 wherein said means for retaining said jaw plates comprise annular bias means mounted around said jaw plates.

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11. The combination as specified in claim 9 and means defining axially extending grooves in each of said jaw plates, said wedge means for each jaw plate being slidably mounted in the groove of its associated jaw plate.

12. The combination as specified in claim 9 wherein said polygonal cross section forms a pentagon.

13. A chuck for engaging the inner surface of a tubular member comprising a mounting member, a plurality of expandable jaw sections mounted on said mounting member, and wedge means for each jaw section, each wedge means

comprising a set of inner and outer wedges, said inner and outer wedges having inclined surfaces and being oriented for movement from a retracted to an expanded position to expand said jaw sections outwardly, and separate bias means acting between the inner and outer wedges of each set tending to return said inner and outer wedges to their retracted position.

14. The chuck of claim 13 and actuator means for moving the wedges of each set to expanded position against the action of said bias means.

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