

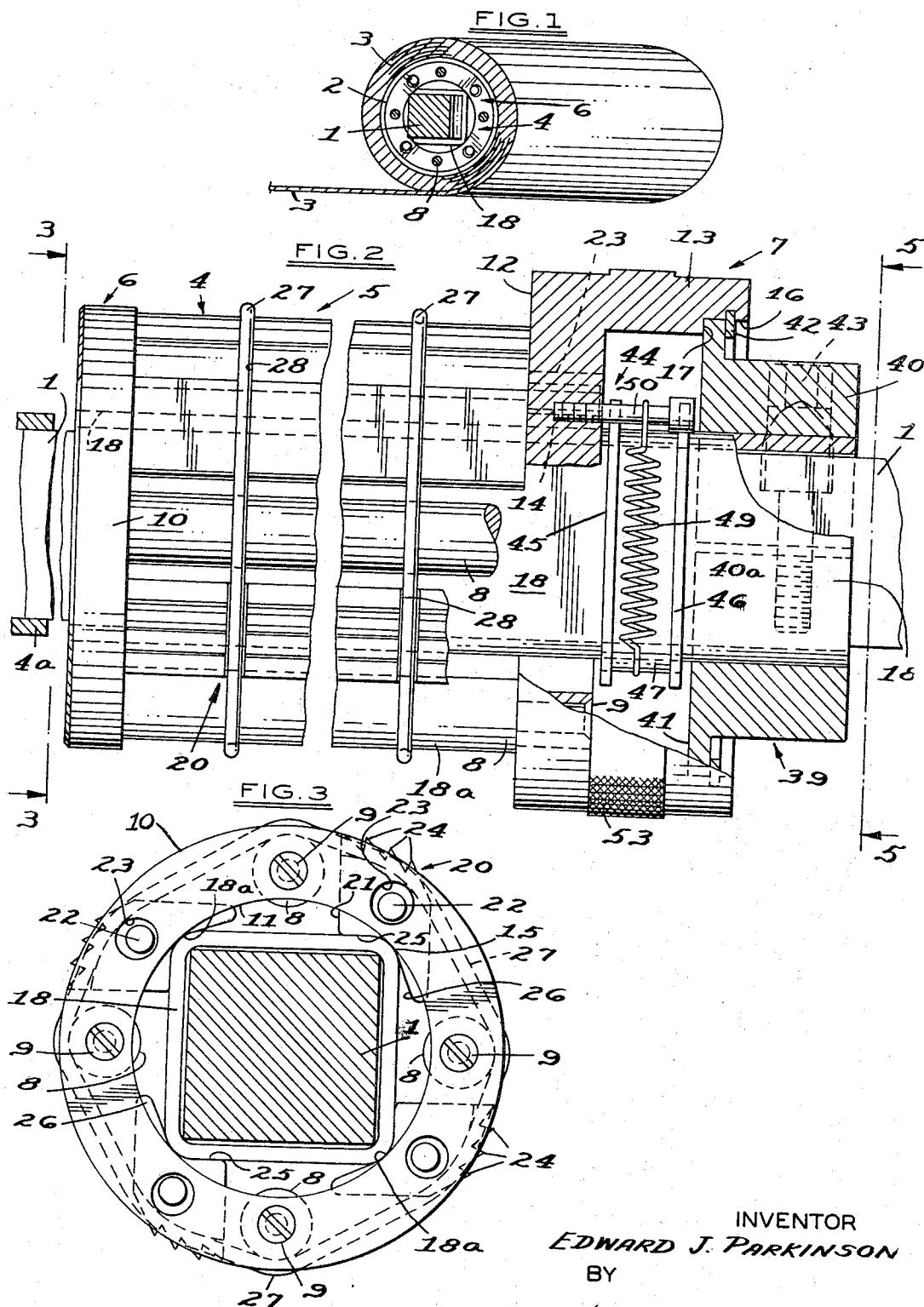
Aug. 22, 1967

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CORE LOCKING APPARATUS

3,337,151

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2 Sheets-Sheet 1



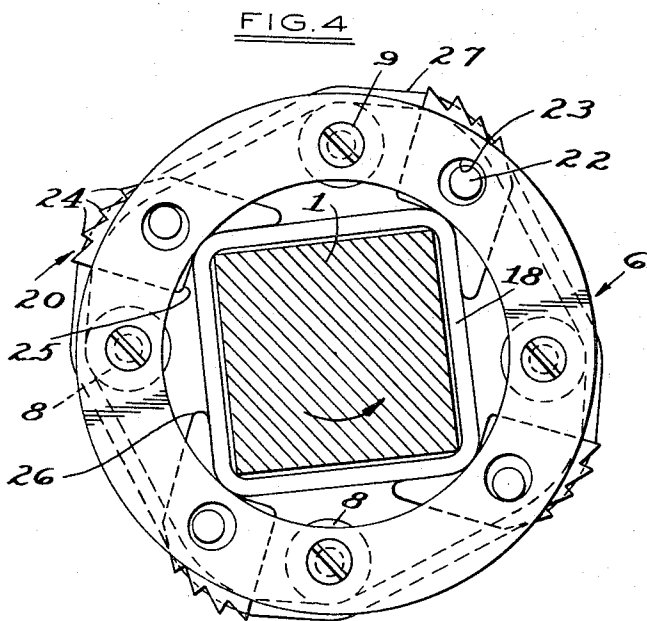
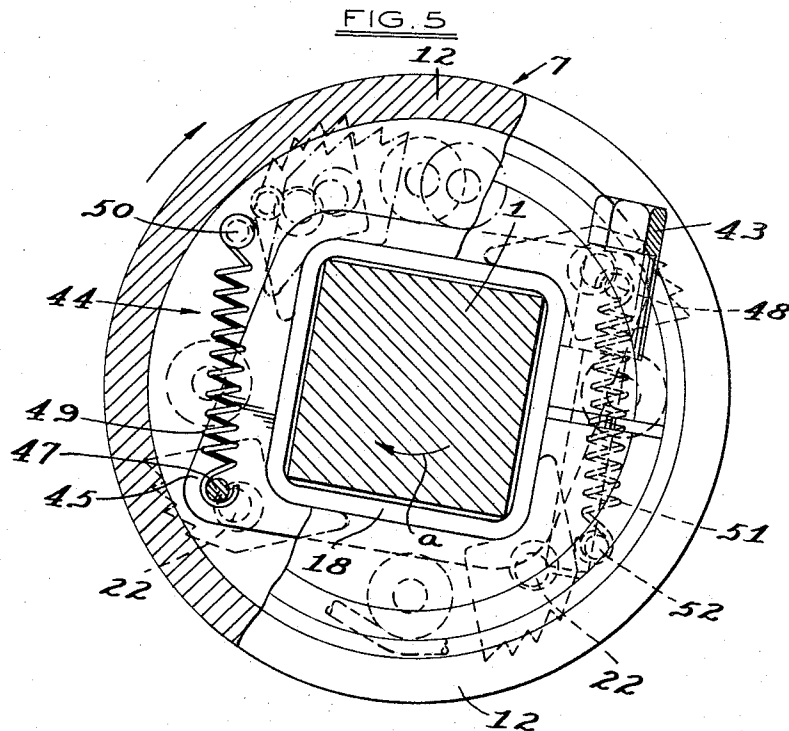
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1

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CORE LOCKING APPARATUS

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ABSTRACT OF THE DISCLOSURE

Core locking and driving apparatus having a cylindrical body is provided with toothed gripper members mounted for radial movements inwardly and outwardly of the body in response to relative rotation between the body and a support rotatably accommodated within the body. Springs react between the support and the body and constantly bias the latter and the support to rotate relatively to each other in a direction to move the gripper members outwardly of the body.

This invention relates broadly to drive transmission apparatus and more particularly to mechanism for releasably locking the hollow core on which a web of film or sheet material is to be wound to a rotatable shaft in a manner to preclude relative rotation between the shaft and the core in one direction of rotation and positively drive the core.

Webs of plastic film material conventionally are wound on a hollow, cylindrical core element which may be supported on a rotatable shaft to as to enable the web to be wound or unwound about the axis of rotation of the shaft. In the winding of such a web, it is necessary that the web be wound with a constant torque even though its diameter is progressively increasing and that there be no relative rotation, or slippage, between the core and the shaft. Various proposals have been suggested heretofore for preventing such relative rotation, but they have not been altogether successful for a number of reasons. For example, some of the previously known core locking devices are so designed that they function properly with but a single size core. It is not uncommon for cores to vary slightly in internal diameter or for such cores to be used repeatedly, with the result that their size changes over a period of time. If a core locking device is capable of performing satisfactorily with but a single size core, it will not function satisfactorily with other cores and with cores whose dimensions change after a period of use. Consequently, the life of a core adapted for use with such core locking devices is materially shortened.

Another objection to some core locking devices in use heretofore is that they have locking pins or the like which penetrate the core surface so as to render the core incapable of movement relative to the driven shaft. Core locking devices of this kind tend to accelerate the dimensional instability of the cores and, in addition, frequently result in deterioration and weakening of the cores. Further, such core locking devices are often incapable of proper adjustment during winding of a web to release the drive.

An object of this invention is to provide positively locking yet quickly releasable core locking apparatus which overcomes the disadvantages of previously known devices used for similar purposes.

Another object of the invention is to provide core locking apparatus having clamping members which are self-energizing in the sense that the greater the pull tending to cause slipping, the more positively the core is gripped.

A further object of the invention is to provide core locking apparatus wherein the self-centering core clamping members constantly are biased to their clamping posi-

2

tions and wherein the clamping members, while positively gripping, are capable of such a range of movement as to enable the apparatus to be used successfully with cores of slightly different size.

Another object of the invention is to provide core locking apparatus of the character described wherein the clamping members are capable of exerting substantial clamping forces on a core without damaging the surface of the core.

Another object of the invention is to provide core locking apparatus wherein the clamping members quickly and easily may be disengaged from the surface of the core.

A further object of the invention is to provide core clamping apparatus of the character referred to and wherein engagement and disengagement of the core clamping members from the core surface is effected by a compound radial and orbital cam controlled movement of the clamping members so as to effect substantially instantaneous engagement and release of the core and without gouging or reaming the core surface.

Other objects and advantages of the invention will be pointed out specifically or will become apparent from the following description when it is considered in conjunction with the appended claims and the accompanying drawings, wherein:

FIGURE 1 is a perspective view on a reduced scale illustrating a web of sheet material in the process of being wound or unwound on a core and wherein the core is clamped to the shaft of a winding machine by core locking apparatus constructed in accordance with the invention;

FIGURE 2 is a fragmentary, partly elevational and partly sectional view of core locking apparatus constructed according to the invention;

FIGURE 3 is a view taken on the line 3—3 of FIGURE 2 and illustrating the clamping members in their retracted or unclamped position;

FIGURE 4 is a view similar to FIGURE 3, but illustrating the clamping members in their projected or clamping position; and

FIGURE 5 is a sectional view taken on the line 5—5 of FIGURE 2, with parts broken away for clarity.

Apparatus constructed in accordance with the invention is illustrated as being associated with a power driven, rectangular shaft 1 that is positioned within a tubular, cylindrical core 2 formed of suitable plastic, paper, fibrous or other material and on which is wound a coil of sheet or film material 3. Core locking apparatus 4 formed according to the invention is mounted on the shaft 1 between the latter and the core 2. The apparatus 4 effectively serves as one end restraining member for the core 2 and a conventional end flange 4a mounted at a spaced axial distance therefrom by set screw means or the like for endwise adjustment on the shaft 1 serves as the other.

The core locking apparatus 4, which need be disposed at one end of the core only, comprises a body 5 having a pair of spaced apart end members 6 and 7 which are maintained in spaced relation by a plurality of rigid, elongated rods 8 that are uniformly spaced about the circumference of the members 6 and 7 and are fixed thereto by suitable screws 9.

The member 6 is a flat annulus or ring 10 having a cylindrical bore 11. The member 7, however, is cup-shaped and has an annular portion 12 terminating in a peripheral flange 13. The annular portion 12 has a bore 14 corresponding in shape and size to the shape and size of the bore 11. The flange 13 has an enlarged inside diameter and a counterbore 16 at its free end which forms a shoulder 17. The size of the bores 11 and 14 is such as snugly but rotatably to receive a tubular support or mounting sleeve 18 having a cross-sectional shape corresponding to the cross-sectional shape of the shaft 1 and

being of such size as to enable the shaft 1 slideably to be accommodated within the sleeve 18. Preferably, the sleeve 18 is square in cross-section and has rounded corners 18a.

A plurality of identical gripper or clamp members 20 is supported by the body 5. Each clamp member comprises an elongated body portion 21 which spans the distance between the end members 6 and 7 and is mounted in the end members by means of axially extending pins 22 which are received in oversize openings 23 formed in the members 6 and 12, respectively. The arrangement is such that each gripper member is mounted for pivotal movement about the axis of the pins 22 and for orbital movement within the confines of the openings 23.

At their radially outer ends the gripper members 20 are provided with a plurality of axially extending, serrated edges or teeth 24. The inner ends of the gripper members 20 are contoured to form a cam follower surface 25 that is adapted normally to bear against a flat face of the support sleeve 18. Each follower surface 25 merges with an elongated dog 26 along a smooth curve that extends around one corner 18a of the sleeve. The surface of the dog adjacent the sleeve 18 is inclined so as normally to be spaced from the adjacent face of the sleeve 18 an amount sufficient to permit limited radially outward rocking movement of the member 20. The members 20 are urged lightly to the retracted positions shown in FIGURE 3 by elastic rings 27 which are stretched around the body 5. The toothed surfaces of the members 20 are grooved as at 28 to accommodate the rings 27, the depth of the grooves being such as to permit the teeth 24 to project beyond the rings 27.

Means 39 is provided for clamping the body 4 on the support sleeve 18 and comprises a split ring 40 having a peripheral flange 41 at one end that is rotatably received in the counterbore 16 and abuts the shoulder 17. The member 40 is rotatably maintained in the member 7 by means of a snap ring 42 that is accommodated in a groove formed in the counterbore 16. A screw 43 joins the confronting edges 40a of the split ring 40 and may be rotated so as to clamp the latter firmly to the member 18. In these positions of the parts, the body 5 is rotatable relatively to the mounting sleeve 18 and to the locking means 39.

Means designated generally by the reference character 44 is provided for constantly biasing the clamp members 20 in a direction tending to project them generally radially outwardly of the body 5 so as to engage the inner surface of a core such as the core 2. The biasing means comprises a pair of parallel, rhomboid-shaped plates 45 and 46 (see FIGURES 2 and 5), each of which has an opening therein corresponding in size and shape to the size and shape of mounting sleeve 18 and being of such size as snugly and nonrotatably to accommodate the latter. The plates are maintained in spaced apart position by a pair of studs 47 and 48. To the stud 47, and between the plates 45 and 46, is anchored under tension one end of a spring 49, the opposite end of which is anchored to a screw 50 that is threaded into the portion 12 of the end member 7. A similar spring 51 has one of its ends anchored to the stud 48 and its other end anchored, under tension, to a screw 52 which is threaded into the end member 7. The arrangement is such that the springs 49 and 51 constantly exert a force on the plates 45 and 46 tending to rock them clockwise, as is viewed in FIGURE 5, but since the plates are not capable of rotating relatively to the mounting sleeve 18, the net effect of the springs 49 and 51 is to urge the body 5 to rock counterclockwise, as viewed in FIGURE 5. The strength or capacity of the springs 49 and 51 is such as to enable them to overcome the force exerted on the clamp members 20 by the elastic rings 27.

To condition the apparatus for use, the support member 18 is inserted in the body 5 and the clamp ring 40 locked to the support member. To remove a core on which film has been wound, the end flange 4a is removed and the core 2 is then slipped off this end of the shaft.

To accomplish this and replace a new core, it is necessary to twist the flange 13, which has a knurled surface 53, to overcome springs 49 and 51 so that grippers 21 are retracted by the elastic rings 27.

During the winding operation when difficulty occurs it is possible to quickly release the drive by twisting member 13 to overcome the springs 49 and 51. When the member 13 is released, the biasing springs 49 and 51 will act on the end member 7 so as to tend to rock the body 5 counterclockwise, as is viewed in FIGURE 5. This will cause relative movement between the body 5 and the support member 18 so that the four rounded cam corners 15 of the support 18 will bear against the actuating surfaces 25 of the respective clamping members 20 and rock the latter so that they are thrust radially outwardly of the body to effect engagement between the teeth 24 and the inner surface of the core 2. If the shaft 1 then is caused to rotate in the direction of the arrow a (FIGURE 5), teeth 24 will rotate the core in the same direction to wind film on the core. Should any resistance to rotation of the core be encountered, such as by undue drag imposed on the web of sheet material being wound, the grippers 21 only grip more positively. The outward movement of the clamp members into engagement with the core wall can best be described as a rolling movement about the corners of the mounting member 18, with the result that each clamp member 20 is bodily displaced outwardly relatively to the body 5. The enlarged openings 23 permit the device to accommodate to cores having slightly different internal diameters. Rotation of the clamp members beyond a maximum projected position is limited by engagement of the dogs 26 with the sleeve 18.

Upon relative rotation of the members 5 and 18 in such direction as to effect retraction of the clamp members, the oversize openings 23 in the end members enable bodily displacement of the members 20 with respect to the end members 6 and 7, thereby permitting radial collapse of the clamp members so as to avoid scraping of the inner surface of the wall of the core 2. Preferably, the core is removed and replaced following retraction of the clamp members.

The disclosed embodiment is representative of a presently preferred form of the invention, but is intended to be illustrative rather than definitive thereof. The invention is defined in the claims.

I claim:

1. Core driving apparatus comprising a body member of such size as to be accommodated within a hollow core; a support member rotatably accommodated within said body member; biasing means reacting between said members and urging the latter to rotate relatively to one another; clamp means; means mounting said clamp means on said body member for movement outwardly beyond the confines thereof; and actuating means reacting between said support member and said clamp means in response to relative rotation of said body member and said support member for moving said clamp means outwardly of said body member.

2. The apparatus set forth in claim 1 including resilient means acting on said clamp means and tending to move the latter inwardly of said body member.

3. The apparatus set forth in claim 2 wherein said actuating means and said support member are cooperable for limiting the inward movement of said clamp means.

4. The apparatus set forth in claim 1 including means on each of said clamp means engageable with said support member for limiting the outward movement of said clamp means.

5. The apparatus set forth in claim 1 wherein said mounting means mounts said clamp means for bodily displacement thereof relative to said body member.

6. The apparatus set forth in claim 1 wherein said mounting means mounts said clamp means for pivotal and orbital movements relative to said body member.

5

6

7. The apparatus set forth in claim 1 wherein said clamp means comprises a plurality of toothed members, the teeth on said members facing outwardly of said body member.

8. The apparatus set forth in claim 7 wherein said toothed members are elongated, extend longitudinally of said body member, and are substantially uniformly circumferentially spaced about said body member.

9. The apparatus set forth in claim 1 wherein said biasing means comprises a member nonrotatably mounted on said support member, and resilient means interconnecting said member and said body member.

10. Core locking apparatus comprising a body of such size as to be accommodated in a cylindrical, hollow core; a support centrally located within said body; a plurality of clamp members extending longitudinally of said body; means mounting said clamp members for radial movement relative to said body for engagement with and disengagement from said core; actuating means reacting between said support and said clamp members for moving the latter radially of said body in response to relative rotation of said support and said body; biasing means reacting between said body and said support and constantly but yieldably urging said support and said body to rotate relatively to one another in a direction to effect radially

outward movement of said clamp members; and resilient means acting on said clamp members and urging the latter to move radially inwardly, said biasing means being of such capacity as to be capable of overcoming said resilient means.

11. The apparatus set forth in claim 10 wherein said support comprises a square sleeve having rounded external corners and said actuating means comprises a cam follower surface on each of said clamp members engageable with said corners in response to relative rotation of said support and said body.

12. The apparatus set forth in claim 10 including limit means on each of said clamp members engageable with said support and operable to limit radially outward movement of said clamp members.

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