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[54] EXTERNALLY ADJUSTABLE CLUTCH
可外部調節的離合器

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(54) EXTERNALLY ADJUSTABLE CLUTCH

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EMBRAYAGE RÉGLABLE DE L'EXTÉRIEUR

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Description

TECHNICAL FIELD

[0001] The present invention relates generally to the field of clutches and, more particularly, to an improved externally adjustable clutch for preventing the transmission of excessive torque in, for example, hoist systems.

BACKGROUND ART

[0002] Clutches are well known in the art and are generally used to transmit force between two rotating shafts. One of the shafts is typically attached to a motor, sometimes referred to as the driving member, and the other shaft provides output power for work to be done, often referred to as the driven member. The clutch connects the two shafts across a slip joint so that they can be either engaged so that they spin at the same speed, or decoupled and disengaged so they spin at different speeds.

[0003] German Patent Publication DE102004054890 B3 is directed to a clutch that is adjusted by tightening a compression nut positioned outside of a spring on the threaded end of a rod that is connected at the other end to a pressure disk which is pressured to increase friction against a movable friction plate.

[0004] German Patent Publication DE19927847 C1 is directed to a slip clutch that is adjusted by tightening a compression nut positioned outside of a spring on one end of a threaded pull rod that is connected at the other end to a pressure disk which is pressured to increase friction between clutch discs.

[0005] U.S. Patent No. 5,853,165 is directed to a clutch in which the preload of disks is provided by a nut acting on a helical spring and screwed onto a corresponding thread on a stub shaft that projects beyond the clutch disk and a second spring.

[0006] German Patent Publication DE4408578 A1 is directed to a slip clutch which can be adjusted without opening the casing. A shaft carries an external thread onto which a nut is screwed. A compression spring acts between the nut and a bearing such that the spring bias force on friction rings can be adjusted.

[0007] United Kingdom Patent Application GB2321504 A is directed to a slip clutch in which the amount of friction force is varied by rotation of an adjustment member on a threaded shaft portion.

[0008] U.S. Patent No. 5,533,712 is directed to a slip clutch having an elastic member and an adjustment member.

[0009] DE19757500 is directed to a clutch with an adjustment mechanism comprising a compression spring in a cap having a threaded ring that is in threaded engagement with a threaded portion of a shaft.

[0010] U.S. Patent No. 1,807,210 is directed to a friction coupling and generally discloses a key gear having a hub, follower ring, spring and cylindrical shell.

[0011] U.S. Patent No. 2,953,911 is directed to a drive coupling and discloses a driven plate with radial grooves, hub, driving plate, pressure plate and clutch springs.

[0012] U.S. Patent No. 7,591,357 is directed to a crank shaft torque modulator and discloses a driven hub, clutch spring, carrier disk, thrust washer, crank shaft pulley and mounting hub.

BRIEF SUMMARY OF THE INVENTION

[0013] With parenthetical reference to the corresponding parts, portions or surfaces of the disclosed embodiments, merely for purposes of illustration and not by way of limitation, the present invention provides an adjustable clutch assembly (15) comprising a base portion (18); a clutch housing cap (19); a first rotary member (20) having a first torque transfer surface (23); the first rotary member configured to rotate about a clutch axis (22) and to rotationally couple to a first shaft; a second rotary member (21) having a second torque transfer surface (24) opposing said first torque transfer surface of said first rotary member at a slip joint (25); the second rotary member configured to rotate about the clutch axis and to rotationally couple to a second shaft; a spring element (26) disposed axially between the clutch housing cap and the first rotary member and configured to bias the opposed first and second torque transfer surfaces axially towards each other; a gear drive (28) comprising a wheel (29) configured to rotate about the clutch axis and a shaft (30) in engagement with the wheel and configured to rotate about an adjustment axis (31) to thereby selectively rotate the wheel about the clutch axis; the wheel in engagement with the clutch housing cap; the shaft having a first portion (32) to which an adjustment torque may be applied; a locking element (34) constraining rotational movement of the clutch housing cap relative to the base portion; and the gear drive, the base portion, the locking element and the clutch housing cap configured such that selective rotation of the wheel about the clutch axis causes axial movement of the clutch housing cap along the clutch axis relative to the base portion or the second rotary member; whereby the bias of the spring may be adjusted by rotation of the shaft.

[0014] The first rotary member may be a driving member and the second rotary member may be a driven member. The first torque transfer surface may comprise a friction liner layer (35). The spring element may comprise a cylindrical compression spring oriented about the clutch axis.

[0015] The clutch housing cap may comprise a spring seat (36) axially retaining a first end of the spring and the assembly may further comprise a spring cup (38) receiving a second end of the spring. The assembly may further comprise a bearing (39) disposed axially between the spring cup and the first rotary member and disposed radially between the first rotary member and the clutch housing cap. The assembly may further comprise a cylindrical bushing (40) disposed radially between the bearing and the clutch housing cap.

[0016] The wheel may comprise an outer cylindrical surface having outwardly extending circumferentially spaced teeth (41) and the shaft may comprise an outer cylindrical surface having a threaded portion (42), and the engagement of the wheel with the shaft may comprise the threaded portion of the shaft rotationally engaging the teeth of the wheel. The first portion of the shaft may comprise a recess (33) configured to receive a torqueing tool. The clutch housing cap may comprise an outer cylindrical surface having a threaded portion (43) and the wheel may comprise an inner cylindrical surface having a threaded portion (44), and the engagement of the wheel with the clutch housing cap may comprise the threaded portion of the inner cylindrical surface of the wheel rotationally engaging the threaded portion of the outer cylindrical surface of the clutch housing cap.

[0017] The locking element may comprise an annular locking plate (34) fixed to the base portion and engaging an outer surface of the clutch housing cap. The annular locking plate may comprise multiple protrusions (45a-c) extending radially inwards towards the clutch axis and the outer surface of the clutch housing cap may comprise multiple axially extending grooves (46a-c), wherein the protrusions may slide axially relative to the clutch axis in the grooves and are constrained from rotational movement about the clutch axis by the grooves, whereby the clutch housing cap is axially movable relative to the base portion and rotationally constrained relative to the base portion. The annular locking plate may be fixed to the base portion via a plurality of shaft elements (48a-c). The wheel may be rotationally supported by a plurality of bearings (49a-c) and the bearings may be supported between the annular locking plate and the base portion on the respective shaft elements. The shaft elements may comprise turn studs and the assembly may further comprise multiple spring elements (50a-c) disposed between the annular locking plate and the respective bearings on the respective turn studs and configured to bias the locking plate away from the base portion.

[0018] The assembly may further comprise a hoist housing (16) fixed to the base portion and a second bearing (51) disposed radially between the second rotary member and the hoist housing. The second rotary member may comprise an outer journal (52) for receiving the second bearing.

[0019] The first rotary member (20) and the spring element (26) may be disposed between the base portion (18) and the clutch housing cap (19); the clutch housing cap may have an inner surface (55) and the first rotary member may have a surface (53) opposing the inner surface of the clutch housing cap; the spring element may act between the inner surface of the clutch housing cap and the surface of the first rotary member opposing the inner surface of the clutch housing cap; and the clutch housing cap and the first rotary member may be configured such that axial movement of the clutch housing cap relative to the first rotary member adjusts the bias of the spring element. The gear drive may be disposed outside of the clutch housing cap.

BRIEF DESCRIPTION OF THE DRAWINGS

[0020]

FIG. 1 is a top plan view of an embodiment of the improved clutch.

FIG. 2 is a front partial view of the clutch shown in FIG. 1

FIG. 3 is a vertical cross-sectional view of the clutch shown in FIG. 1, taken generally on line A-A of FIG. 1.

FIG. 4 is a vertical cross-sectional view of the clutch shown in FIG. 1, taken generally on line B-B of FIG. 1.

FIG. 5 is a vertical cross-sectional view of the clutch shown in FIG. 1, taken generally on line C-C of FIG. 1.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0021] At the outset, it should be clearly understood that like reference numerals are intended to identify the same structural elements, portions or surfaces consistently throughout the several drawing figures, as such elements, portions or surfaces may be further described or explained by the entire written specification, of which this detailed description is an integral part. Unless otherwise indicated, the drawings are intended to be read (*e.g.,* cross-hatching, arrangement of parts, proportion, degree, etc.) together with the specification, and are to be considered a portion of the entire written description of this invention. As used in the following description, the terms "horizontal", "vertical", "left", "right", "up" and "down", as well as adjectival and adverbial derivatives thereof (*e.g.*, "horizontally", "rightwardly", "upwardly", etc.), simply refer to the orientation of the illustrated structure as the particular drawing figure faces the reader. Similarly, the terms "inwardly" and "outwardly" generally refer to the orientation of a surface relative to its axis of elongation, or axis of rotation, as appropriate.

[0022] Referring now to the drawings and, more particularly, to FIGS. 1-3 thereof, an improved clutch assembly is provided, an embodiment of which is generally indicated at 15. Assembly 15 generally includes base plate 18, fixed to hoist housing 16, clutch housing cap 19, worm drive 28 acting between base plate 18 and clutch housing cap 19, driving hub 20, driven hub 21, and spring 26 acting between clutch housing cap 19 and driving hub 20. Clutch assembly 15 is configured and arranged such that internal spring 26 and the spring force of clutch 15 can be regulated or adjusted externally via worm drive 28, thereby eliminating the need to remove any covers or components.

[0023] As shown in FIGS. 2-5, clutch housing cap 19 is a generally bell-shaped structure orientated about axis x-x, also referred to as clutch axis 22, and having cylindrical opening 68 at its top. With reference FIG. 4, housing cap 19 is generally bounded by inwardly-facing ver-

tical cylindrical surface 54, downwardly-facing horizontal annular surface 55, inwardly-facing vertical cylindrical surface 56, downwardly-facing horizontal annular surface 57, inwardly-facing vertical cylindrical surface 58, downwardly-facing horizontal annular surface 59, inwardly and downwardly-facing rounded frusto-conical surface 60, inwardly-facing vertical cylindrical surface 61, downwardly-facing horizontal annular surface 62, outwardly-facing vertical cylindrical surface 63, outwardly and upwardly-facing frusto-conical surface 64, outwardly and upwardly-facing second frusto-conical surface 65, and upwardly-facing horizontal annular surface 66, joined at its inner marginal end to the upper marginal end of surface 54.

[0024] Surface 54 defines opening 68 in the top of cap housing 19. Surfaces 55 and 56 define annular spring seat 36. The bottom portion 43 of outwardly-facing vertical cylindrical surface 63 is threaded. Housing cap 19 contains concentric spring cup 38, bearing 39, bushing 40, spring 26 and driving hub 20.

[0025] As shown, spring cup 38 is a generally ring-shaped annular structure orientated about clutch axis 22 and has an inwardly and upwardly facing annular seat 69 for receiving one end of spring 26 and an outer cylindrical surface. Bearing 39 is a generally ring-shaped annular structure orientated about clutch axis 22 and has an outer cylindrical surface and an inner cylindrical surface. Bushing 40 is a generally elongated ring-shaped annular structure orientated about clutch axis 22 and has an outer cylindrical surface and an inner cylindrical surface.

[0026] In this embodiment, spring 26 is a cylindrical compression spring oriented about clutch axis 22. As shown, spring 26 is radially retained about clutch axis 22 by seat 36 in housing cap 19 at its top end and seat 69 in spring cup 38 at its bottom end. Spring 26 is compressed axially directly between seat 36 in housing cap 19 and seat 69 in spring cup 38.

[0027] The outer cylindrical surface of bushing 40 is affixed to inner surface 58 of housing cap 19. As shown, both bearing 39 and spring cup 38 are radially retained about clutch axis 22 by bushing 40 and are in axial sliding engagement with bushing 40 such that they can move axially along clutch axis 22 as a function of the compression force of spring 26. Thus, bushing 40 extends between the outer cylindrical surfaces of spring cup 38 and bearing 39 and the inner cylindrical surface 58 of housing cap 19. Bearing 39 is sandwiched axially between spring cup 38 and annular seat 53 of driving hub 20.

[0028] As shown, driving hub 20 is generally a ring-shaped annular structure orientated about clutch axis 22. The inner cylindrical surface of driving hub 20 is splined and forms a bore configured to receive the corresponding splined end of a motor shaft for rotational engagement therewith. Thus, when a motor shaft extends through opening 68 in housing cap 19 and engages the splined bore of driving hub 20, rotation of the motor shaft about clutch axis 22 causes corresponding rotation of driving hub 20 about clutch axis 22.

[0029] As shown, driven hub 21 is generally a cylindrical annular structure oriented about clutch axis 22. Driven hub 21 also has an inner cylindrical surface that is splined and forms a bore configured to receive the corresponding splined end of a drive shaft for rotational engagement. Thus, when the drive shaft engages the splined bore of driven hub 21, rotation of driven hub 21 about clutch axis 22 causes corresponding rotation of that drive shaft about clutch axis 22.

[0030] As shown, in this embodiment driving hub 20 includes a conventional annular non-metallic composite friction liner 35 bonded to driving hub 20 as shown. Friction liner 35 provides a desired contact area between the opposed torque transfer surfaces 23 and 24 of driving hub 20 and driven hub 21, respectively. While in this embodiment liner 35 is bonded to driving hub 20, alternatively it may be free floating or bonded to driven hub 21. Friction liner 35 may also be contoured to control the size, shape and location of the contact area and resulting torque at slip joint 25 between torque transfer surface 23 of driving hub 20 and torque transfer surface 24 of driven hub 21. For example, friction liner 35 may be tapered.

[0031] As shown, driving hub 20 includes annular ledge, journal or seat 53 in which bearing 39 is positioned. The inwardly-facing vertical cylindrical surface of bearing 39 is configured to bear against the outer cylindrical surface of seat 53 of driving hub 20 and the outer cylindrical surface of bearing 39 is configured to bear against the inner cylindrical surface of bushing 40. Thus, bearing 39 allows for rotation of driving hub 20 about clutch axis 22 relative to housing cap 19 and base plate 18.

[0032] As shown, bearing 51 is generally a ring-shaped annular structure orientated about clutch axis 22. As shown, bearing 51 is radially retained about clutch axis 22 by an inner cylindrical surface of hoist housing 16, which is fixed relative to base plate 18. Driven hub 21 includes annular ledge, journal or seat 52 in which bearing 51 is positioned. The inwardly-facing vertical cylindrical surface of bearing 51 is configured to bear against the outer cylindrical surface of seat 52 of driven hub 21 and the outer cylindrical surface of bearing 51 is configured to bear against an inner cylindrical surface of hoist housing 16. Thus, bearing 51 allows for rotation of driven hub 21 about clutch axis 22 relative to hoist housing 16 and base plate 18 while holding driven hub 21 in proper radial and axial alignment.

[0033] As shown, spring 26 bears on one side against surface 55 of housing cap 19 and on the other side against the opposing surface of seat 69 of spring cup 38. In operation, spring 26 presses axially against spring cup 38, causing spring cup 38 to in turn press axially against bearing 39, which in turn causes bearing 39 to press axially against driving hub 20. This in turn causes driving hub 20 and friction liner 35 to press axially against driven hub 21. This encourages driven hub 21 to rotate together with driving hub 20 due to contact friction at slip joint 25. However, when the driving torque exceeds the friction

torque, driven hub 21 will slip relative to driving hub 20, resulting in the drive shaft no longer rotating at the same speed as the motor shaft.

[0034] In general, worm drive 28 comprises a conventional type worm 30 in threaded engagement with a conventional type worm gear 29. As shown in FIG. 1, worm shaft 30 is a generally cylindrical structure orientated about axis 31 and configured to rotate about axis 31. Shaft 30 is fixed axially such that it does not move along axis 31. Shaft 30 includes adjustment portion 32 and threaded portion 42. Adjustment portion 32 is located externally of housing cap 19 and at one end includes recess 33, which is configured to receive a tool for selectively applying an adjustment torque about axis 31 to shaft 30. In this embodiment, recess 33 is hexagonal and is configured to receive a hex wrench, but it is contemplated that other mechanisms or configurations may be used by which a torque is selectively applied to rotate shaft 30 about axis 31. Shaft 30 includes a second medial portion 42 having a shallow spiral thread that engages worm gear 29 in a non-intersecting, perpendicular axis configuration.

[0035] Worm gear 29 is a ring-shaped annular structure oriented about clutch axis 22 and operatively configured to rotate about clutch axis 22. As shown, worm gear 29 is configured to rotate about clutch axis 22 on outer bearings 49a-c and includes an outer center cylindrical surface having multiple circumferential spaced outwardly protruding teeth 41 orientated substantially parallel to clutch axis 22. Bearings 49a-c have upper and lower cylindrical portions that rotationally bear on the outer cylindrical edges of worm gear 29 with the center of the outer cylindrical surface of worm gear 29 having wheel teeth 41.

[0036] Worm gear 29 also includes inner threaded portion 44 on its inner cylindrical surface, with portion 44 in engagement with threaded portion 43 of outer cylindrical surface 63 of housing cap 19. The relative threads of inner cylindrical portion 44 of worm gear 29 and opposed outer cylindrical portion 43 of housing cap 19 spiral about clutch axis 22 and such that relative rotation of worm gear 29 about clutch axis 22 causes axial movement of housing cap 19 along clutch axis 22.

[0037] Locking ring or plate 34 is generally a ring-shaped annular structure orientated around clutch axis 22 and positioned externally or radially outside of housing cap 19 relative to clutch axis 22. Locking plate 34 is fixed to base plate 18 by three circumferentially spaced turn studs 48a-c that rotationally support bearings 49a-c, respectively. Bearings 49a-c keep worm gear 29 concentric with driving hub 20, driven hub 21 and housing cap 19 on clutch axis 22. Wave springs 50a-c are positioned on turn studs 48a-c between the bottom of plate 34 and bearings 49a-c, respectively, and bias locking plate 34 away from base plate 18. E-clips 70a-c secure locking plate 34 to the ends of turn studs 48a-c, respectively.

[0038] As shown, base plate 18 is generally a ring-shaped annular structure orientated around clutch axis 22. Base plate 18 is bolted to hoist housing 16 with bolts 71a-d. Thus, base plate 18 and hoist housing 16 are fixed relative to each other. Driven hub 21 and base plate 18 are also axially fixed relative to each other.

[0039] As shown in FIGS. 1 and 2, locking plate 34 has three circumferentially spaced radially inwardly-extending protrusions 45a-c on its inner cylindrical surface. Outer surface 63 of housing cap 19 includes three axially-extending grooves 46a-c that correspond to and receive protrusions 45a-c, respectively, of locking plate 34. Protrusions 45a-c are configured with grooves 46a-c such that protrusions 45a-c may slide axially in grooves 46a-c with axial movement of housing cap 19 relative to clutch axis 22. However, protrusions 45a-c fit within grooves 46a-c, respectively, so as to constrain rotational movement of housing cap 19 about clutch axis 22. Thus, clutch housing cap 19 is axially moveable along clutch axis 22 relative to base plate 18 and hoist housing 16 and is rotationally constrained relative to base plate 18 and hoist housing 16. Due to locking plate 34, housing cap 19 is restrained from rotational movement relative to base plate 18.

[0040] As shown, in operation, rotation of shaft 30 about axis 31, which can be performed externally with a hex wrench inserted into hex recess 33 in the end of shaft 30, causes rotation of worm gear 29. Because of the threaded connection between threaded portion 44 of the inner cylindrical surface of worm gear 29 and the overlapping threaded portion 43 of outer cylindrical surface 63 of housing cap 19, rotation of worm gear 29 about clutch axis 22 causes axial movement of housing cap 19 relative to base plate 18. Such movement in the clockwise direction about clutch axis 22 increases the pressure of spring 26 against driving hub 20, and such movement in the counter-clockwise direction decreases the spring pressure and bias of spring 26 against driving hub 20. This allows for the spring bias of spring 26 to be adjusted externally as desired. Thus, rotation of worm shaft 30 externally to cap housing 19 in the clockwise direction increases the spring pressure within cap housing 19, and rotation of worm shaft 30 externally in the counter-clockwise direction decreases the spring pressure within cap housing 19. Thus, for example, if over time either spring 26 loses its elasticity or if any of the liners or hub interfaces of clutch 15 are worn away, worm shaft 30 may be adjusted externally to maintain the desired bias of spring 26 internally to cap housing 19. This adjustment may be done without having to removed housing 19 and/or housing 16. In addition, worm gear 29 does not loosen easily and therefore there is no need for a separate mechanism to lock the spring adjustment of clutch 15.

[0041] While a single driving hub 20 and driven hub 21 are shown and described, multiple pressure plates and friction hubs may be used to adjust torque transfer as desired. Furthermore, spring 26 may be separated from clutch housing cap 19 and driving hub 20 by more or fewer elements than spring cup 38 and bearing 39 shown and described. In such cases, spring 26 may still be dis-

posed axially between clutch housing cap 19 and driving hub 20 as it may still exert a spring force on driving hub 20 and driven hub 21, and that spring force may be adjustable by the axial movement of housing cap 19 relative to driven hub 21.

[0042] The present invention contemplates that many changes and modifications may be made. Therefore, while the presently-preferred form of the externally adjustable clutch assembly has been shown and described, and several modifications and alternatives discussed, persons skilled in this art will readily appreciate that various additional changes and modifications may be made without departing from the scope of the invention, as defined and differentiated by the following claims.

Claims

1. An adjustable clutch assembly (15) comprising:

a base portion (18);
a clutch housing cap (19);
a first rotary member (20) having a first torque transfer surface (23);
said first rotary member (20) configured to rotate about a clutch axis (22) and to rotationally couple to a first shaft;
a second rotary member (21) having a second torque transfer surface (24) opposing said first torque transfer surface (23) of said first rotary member (20) at a slip joint;
said second rotary member (21) configured to rotate about said clutch axis (22) and to rotationally couple to a second shaft;
a spring element (26) disposed axially between said clutch housing cap (19) and said first rotary member (20) and configured to bias said opposed first (23) and second (24) torque transfer surfaces axially towards each other;
a gear drive (28) comprising a wheel (29) configured to rotate about said clutch axis (22) and a shaft (30) in engagement with said wheel (29) and configured to rotate about an adjustment axis (31) to thereby selectively rotate said wheel (29) about said clutch axis (22);
said wheel (29) in engagement with said clutch housing cap (19);
said shaft having a first portion (32) to which an adjustment torque may be applied;
a locking element (34) constraining rotational movement of said clutch housing cap (19) relative to said base portion (18); and
said gear drive (28), said base portion (18), said locking element (34) and said clutch housing cap (19) configured such that selective rotation of said wheel (29) about said clutch axis (22) causes axial movement of said clutch housing cap (19) along said clutch axis (22) relative to said base portion (18) or said second rotary member (21);
whereby said bias of said spring (26) may be adjusted by rotation of said shaft.

2. The assembly (15) set forth in claim 1, wherein said first rotary member (20) is a driving member and said second rotary member is a driven member.

3. The assembly (15) set forth in claim 1, wherein said first torque transfer surface (23) comprises a friction liner layer.

4. The assembly (15) set forth in claim 1, wherein said spring element (26) comprises a cylindrical compression spring oriented about said clutch axis (22).

5. The assembly (15) set forth in claim 4, wherein said clutch housing cap (19) comprises a spring seat axially retaining a first end of said spring and further comprising a spring cup receiving a second end of said spring.

6. The assembly (15) set forth in claim 5, and further comprising a bearing disposed axially between said spring cup and said first rotary member (20) and disposed radially between said first rotary member (20) and said clutch housing cap (19), preferably further comprising a cylindrical bushing disposed radially between said bearing and said clutch housing cap (19).

7. The assembly (15) set forth in claim 1, wherein said wheel (29) comprises an outer cylindrical surface having outwardly extending circumferentially spaced teeth and said shaft comprises an outer cylindrical surface having a threaded portion, and wherein said engagement of said wheel (29) with said shaft comprises said threaded portion of said shaft rotationally engaging said teeth of said wheel (29).

8. The assembly (15) set forth in claim 1, wherein said first portion of said shaft comprises a recess configured to receive a torqueing tool.

9. The assembly (15) set forth in claim 1, wherein said clutch housing cap (19) comprises an outer cylindrical surface having a threaded portion and said wheel (29) comprises an inner cylindrical surface having a threaded portion, and wherein said engagement of said wheel (29) with said clutch housing cap (19) comprises said threaded portion of said inner cylindrical surface of said wheel (29) rotationally engaging said threaded portion of said outer cylindrical surface of said clutch housing cap (19).

10. The assembly (15) set forth in claim 1, wherein said

locking element (34) comprises an annular locking plate fixed to said base portion and engaging an outer surface of said clutch housing cap (19).

11. The assembly (15) set forth in claim 10, wherein said annular locking plate comprises multiple protrusions extending radially inwards towards said clutch axis (22) and said outer surface of said clutch housing cap (19) comprises multiple axially extending grooves, wherein said protrusions may slide axially relative to said clutch axis (22) in said grooves and are constrained from rotational movement about said clutch axis (22) by said grooves, whereby said clutch housing cap (19) is axially movable relative to said base portion (18) and rotationally constrained relative to said base portion (18).

12. The assembly (15) set forth in claim 10, wherein said annular locking plate is fixed to said base portion (18) via a plurality of shaft elements.

13. The assembly (15) set forth in claim 12, wherein said wheel (29) is rotationally supported by a plurality of bearings and said bearings are supported between said annular locking plate and said base portion (18) on said respective shaft elements, preferably wherein said shaft elements comprise turn studs and further comprising multiple spring elements disposed between said annular locking plate and said respective bearings on said respective turn studs and configured to bias said locking plate away from said base portion (18).

14. The assembly (15) set forth in claim 1, and further comprising a hoist housing fixed to said base portion (18) and a second bearing disposed radially between said second rotary member (21) and said hoist housing, preferably wherein said second rotary member (21) comprises an outer journal for receiving said second bearing.

15. The assembly (15) set forth in claim 1, wherein:

said first rotary member (20) and said spring element are disposed between said base portion (18) and said clutch housing cap (19);
said clutch housing cap (19) has an inner surface and said first rotary member (20) has a surface opposing said inner surface of said clutch housing cap (19);
said spring element acts between said inner surface of said clutch housing cap (19) and said surface of said first rotary member (20) opposing said inner surface of said clutch housing cap (19); and
wherein said clutch housing cap (19) and said first rotary member (20) are configured such that axial movement of said clutch housing cap (19) relative to said first rotary member (20) adjusts said bias of said spring element, preferably wherein said gear drive is disposed outside of said clutch housing cap (19).

Patentansprüche

1. Verstellbare Kupplungsbaugruppe (15), die Folgendes umfasst:

einen Basisteil (18);
eine Kupplungsgehäusekappe (19);
ein erstes Drehelement (20) mit einer ersten Drehmomentübertragungsfläche (23);
wobei das genannte erste Drehelement (20) zum Drehen um eine Kupplungsachse (22) und zum rotatorischen Kuppeln mit einer ersten Welle konfiguriert ist;
ein zweites Drehelement (21) mit einer zweiten Drehmomentübertragungsfläche (24) gegenüber der ersten Drehmomentübertragungsfläche (23) des genannten ersten Drehelements (20) an einer Gleitverbindung;
wobei das genannte zweite Drehelement (21) zum Drehen um die genannte Kupplungsachse (22) und zum rotatorischen Kuppeln mit einer zweiten Welle konfiguriert ist;
ein Federelement (26), das axial zwischen der genannten Kupplungsgehäusekappe (19) und dem genannten ersten Drehelement (20) angeordnet und zum Vorspannen der genannten gegenüberliegenden ersten (23) und zweiten (24) Drehmomentübertragungsfläche axial zueinander hin konfiguriert ist;
einen Zahnradantrieb (28), der ein zum Drehen um die genannte Kupplungsachse (22) konfiguriertes Rad (29) und eine Welle (30) im Eingriff mit dem genannten Rad (29) und zum Drehen um eine Verstellachse (31) konfiguriert umfasst, um dadurch das genannte Rad (29) selektiv um die genannte Kupplungsachse (22) zu drehen;
wobei das genannte Rad (29) mit der genannten Kupplungsgehäusekappe (19) im Eingriff ist;
wobei die genannte Welle einen ersten Teil (32) aufweist, auf den ein Verstelldrehmoment aufgebracht werden kann;
ein Sperrelement (34), das eine Drehbewegung der genannten Kupplungsgehäusekappe (19) relativ zu dem genannten Basissteil (18) einschränkt; und
wobei der genannte Zahnradantrieb (28), der genannte Basisteil (18), das genannte Sperrelement (34) und die genannte Kupplungsgehäusekappe (19) so konfiguriert sind, dass eine selektive Drehung des genannten Rads (29) um die genannte Kupplungsachse (22) eine axiale Bewegung der genannten Kupplungsgehäuse-

kappe (19) entlang der genannten Kupplungsachse (22) relativ zu dem genannten Basisteil (18) oder dem genannten zweiten Drehelement (21) bewirkt;
so dass die genannte Vorspannung der genannten Feder (26) durch eine Rotation der genannten Welle verstellt werden kann.

2. Baugruppe (15) nach Anspruch 1, wobei das genannte erste Drehelement (20) ein Antriebselement ist und das genannte zweite Drehelement ein angetriebenes Element ist.

3. Baugruppe (15) nach Anspruch 1, wobei die genannte erste Drehmomentübertragungsfläche (23) eine Reibbelagschicht ist.

4. Baugruppe (15) nach Anspruch 1, wobei das genannte Federelement (26) eine um die genannte Kupplungsachse (22) herum orientierte zylindrische Druckfeder ist.

5. Baugruppe (15) nach Anspruch 4, wobei die genannte Kupplungsgehäusekappe (19) einen Federteller umfasst, der ein erstes Ende der genannten Feder axial hält, und ferner einen Federtopf umfasst, der ein zweites Ende der genannten Feder aufnimmt.

6. Baugruppe (15) nach Anspruch 5, die ferner ein Lager umfasst, das axial zwischen dem genannten Federtopf und dem genannten ersten Drehelement (20) angeordnet und radial zwischen dem genannten ersten Drehelement (20) und der genannten Kupplungsgehäusekappe (19) angeordnet ist, die ferner vorzugsweise eine zylindrische Buchse umasst, die radial zwischen dem genannten Lager und der genannten Kupplungsgehäusekappe (19) angeordnet ist.

7. Baugruppe (15) nach Anspruch 1, wobei das genannte Rad (29) eine äußere zylindrische Fläche mit auswärts verlaufenden umfangsmäßig beabstandeten Zähnen umfasst und die genannte Welle eine äußere zylindrische Fläche mit einem Gewindeabschnitt umfasst, und wobei der genannte Eingriff des genannten Rads (29) mit der genannten Welle beinhaltet, dass der genannte Gewindeabschnitt der genannten Welle rotatorisch in die genannten Zähne des genannten Rads (29) eingreift.

8. Baugruppe (15) nach Anspruch 1, wobei der genannte erste Abschnitt der genannten Welle eine Aussparung aufweist, die zum Aufnehmen eines Drehmomentwerkzeugs konfiguriert ist.

9. Baugruppe (15) nach Anspruch 1, wobei die genannte Kupplungsgehäusekappe (19) eine äußere zylindrische Fläche mit einem Gewindeabschnitt umfasst und das genannte Rad (29) eine innere zylindrische Fläche mit einem Gewindeabschnitt umfasst, und wobei der genannte Eingriff des genannten Rades (29) mit der genannten Kupplungsgehäusekappe (19) den genannten Gewindeabschnitt der genannten inneren zylindrischen Fläche des genannten Rads (29) im Dreheingriff mit dem genannten Gewindeabschnitt der genannten äußeren zylindrischen Fläche der genannten Kupplungsgehäusekappe (19) umfasst.

10. Baugruppe (15) nach Anspruch 1, wobei das genannte Sperrelement (34) eine ringförmige Sperrplatte umfasst, die an dem genannten Basisabschnitt befestigt ist und in eine Außenfläche der genannten Kupplungsgehäusekappe (19) eingreift.

11. Baugruppe (15) nach Anspruch 10, wobei die genannte ringförmige Sperrplatte mehrere Vorsprünge umfasst, die sich radial einwärts in Richtung der genannten Kupplungsachse (22) erstrecken, und die genannte Außenfläche der genannten Kupplungsgehäusekappe (19) mehrere axial verlaufende Nuten umfasst, wobei die genannten Vorsprünge axial relativ zu der genannten Kupplungsachse (22) in den genannten Nuten gleiten können und ihre Drehbewegung um die genannte Kupplungsachse (22) durch die genannten Nuten eingeschränkt wird, so dass die genannte Kupplungsgehäusekappe (19) axial relativ zu dem genannten Basisabschnitt (18) beweglich ist und rotatorisch relativ zu dem genannten Basisabschnitt (18) eingeschränkt wird.

12. Baugruppe (15) nach Anspruch 10, wobei die genannte ringförmige Sperrplatte an dem genannten Basisteil (18) über mehrere Wellenelemente befestigt ist.

13. Baugruppe (15) nach Anspruch 12, wobei das genannte Rad (29) durch mehrere Lager drehgelagert wird und die genannten Lager zwischen der genannten ringförmigen Sperrplatte und dem genannten Basisabschnitt (18) auf den genannten jeweiligen Wellenelementen gelagert sind, wobei vorzugsweise die genannten Wellenelemente Drehbolzen umfassen und ferner mehrere Federelemente umfassen, die zwischen der genannten ringförmigen Sperrplatte und den genannten jeweiligen Lagern auf den genannten jeweiligen Drehbolzen angeordnet und zum Vorspannen der genannten Sperrplatte weg von dem genannten Basisabschnitt (18) konfiguriert sind.

14. Baugruppe (15) nach Anspruch 1, die ferner ein an dem genannten Basisabschnitt (18) befestigtes Hebezeuggehäuse und ein radial zwischen dem genannten zweiten Drehelement (21) und dem genannten Hebezeuggehäuse angeordnetes zweites

Lager umfasst, wobei das genannte zweite Drehelement (21) vorzugsweise einen äußeren Lagerzapfen zum Aufnehmen des genannten zweiten Lagers umfasst.

15. Baugruppe (15) nach Anspruch 1, wobei:

das genannte erste Drehelement (20) und das genannte Federelement zwischen dem genannten Basisabschnitt (18) und der genannten Kupplungsgehäusekappe (19) angeordnet sind;
die genannte Kupplungsgehäusekappe (19) eine Innenfläche hat und das genannte erste Drehelement (20) eine Fläche gegenüber der genannten Innenfläche der genannten Kupplungsgehäusekappe (19) hat;
das genannte Federelement zwischen der genannten Innenfläche der genannten Kupplungsgehäusekappe (19) und der genannten Fläche des genannten ersten Drehelements (20) gegenüber der genannten Innenfläche der genannten Kupplungsgehäusekappe (19) wirkt; und
wobei die genannte Kupplungsgehäusekappe (19) und das genannte erste Drehelement (20) so konfiguriert sind, dass eine axiale Bewegung der genannten Kupplungsgehäusekappe (19) relativ zu dem genannten ersten Drehelement (20) die genannte Vorspannung des genannten Federelements verstellt, wobei der genannte Zahnradantrieb vorzugsweise außerhalb der genannten Kupplungsgehäusekappe (19) angeordnet ist.

Revendications

1. Ensemble embrayage réglable (15) comprenant :

une partie de base (18) ;
un couvercle de carter d'embrayage (19) ;
un premier organe rotatif (20) ayant une première surface de transfert de couple (23) ;
ledit premier organe rotatif (20) étant configuré pour tourner autour d'un axe d'embrayage (22) et se coupler en rotation à un premier arbre ;
un deuxième organe rotatif (21) ayant une deuxième surface de transfert de couple (24) à l'opposé de ladite première surface de transfert de couple (23) dudit premier organe rotatif (20) au niveau d'un joint coulissant ;
ledit deuxième organe rotatif (21) étant configuré pour tourner autour dudit axe d'embrayage (22) et se coupler en rotation à un deuxième arbre ;
un élément ressort (26) disposé axialement entre ledit couvercle de carter d'embrayage (19) et ledit premier organe rotatif (20) et configuré pour solliciter lesdites première (23) et deuxième (24) surfaces de transfert de couple opposées axialement l'une vers l'autre ;
un entraînement par engrenages (28) comprenant une roue (29) configuré pour tourner autour dudit axe d'embrayage (22) et un arbre (30) engrené avec ladite roue (29) et configuré pour tourner autour d'un axe de réglage (31) afin de faire tourner de manière sélective ladite roue (29) autour dudit axe d'embrayage (22) ;
ladite roue (29) étant engrenée avec ledit couvercle de carter d'embrayage (19) ;
ledit arbre ayant une première partie (32) sur laquelle un couple de réglage peut être appliqué ;
un élément de verrouillage (34) limitant le déplacement rotatif dudit couvercle de carter d'embrayage (19) par rapport à ladite partie de base (18) ; et
ledit entraînement par engrenages (28), ladite partie de base (18), ledit élément de verrouillage (34) et ledit couvercle de carter d'embrayage (19) étant configurés de telle sorte qu'une rotation sélective de ladite roue (29) autour dudit axe d'embrayage (22) amène un déplacement axial dudit couvercle de carter d'embrayage (19) le long dudit axe d'embrayage (22) par rapport à ladite partie de base (18) ou ledit deuxième organe rotatif (21) ;
grâce à quoi ladite sollicitation dudit ressort (26) peut être réglée par rotation dudit arbre.

2. Ensemble (15) selon la revendication 1, dans lequel ledit premier organe rotatif (20) est un organe d'entraînement et ledit deuxième organe rotatif est un organe entraîné.

3. Ensemble (15) selon la revendication 1, dans lequel ladite première surface de transfert de couple (23) comprend une couche de garniture de friction.

4. Ensemble (15) selon la revendication 1, dans lequel ledit élément ressort (26) comprend un ressort de compression cylindrique orienté autour dudit axe d'embrayage (22).

5. Ensemble (15) selon la revendication 4, dans lequel ledit couvercle de carter d'embrayage (19) comprend un siège de ressort retenant axialement une première extrémité dudit ressort et comprenant en outre une cuvette de ressort recevant une deuxième extrémité dudit ressort.

6. Ensemble (15) selon la revendication 5, et comprenant en outre un palier disposé axialement entre ladite cuvette de ressort et ledit premier organe rotatif (20) et disposé radialement entre ledit premier organe rotatif (20) et ledit couvercle de carter d'embraya-

ge (19), de préférence comprenant en outre une bague cylindrique disposée radialement entre ledit palier et ledit couvercle de carter d'embrayage (19).

7. Ensemble (15) selon la revendication 1, dans lequel ladite roue (29) comprend une surface cylindrique extérieure ayant des dents circonférentiellement espacées s'étendant vers l'extérieur et ledit arbre comprend une surface cylindrique extérieure ayant une partie filetée, et dans lequel ledit engrènement de ladite roue (29) avec ledit arbre comprend ladite partie filetée dudit arbre s'engrenant en rotation avec lesdites dents de ladite roue (29).

8. Ensemble (15) selon la revendication 1, dans lequel ladite première partie dudit arbre comprend un renfoncement configuré pour recevoir un outil d'application de couple.

9. Ensemble (15) selon la revendication 1, dans lequel ledit couvercle de carter d'embrayage (19) comprend une surface cylindrique extérieure ayant une partie filetée et ladite roue (29) comprend une surface cylindrique intérieure ayant une partie filetée, et dans lequel ledit engrènement de ladite roue (29) avec ledit couvercle de carter d'embrayage (19) comprend ladite partie filetée de ladite surface cylindrique intérieure de ladite roue (29) s'engrenant en rotation avec ladite partie filetée de ladite surface cylindrique extérieure dudit couvercle de carter d'embrayage (19).

10. Ensemble (15) selon la revendication 1, dans lequel ledit élément de verrouillage (34) comprend une plaque de verrouillage annulaire fixée à ladite partie de base et se mettant en prise avec une surface extérieure dudit couvercle de carter d'embrayage (19).

11. Ensemble (15) selon la revendication 10, dans lequel ladite plaque de verrouillage annulaire comprend des saillies multiples s'étendant radialement vers l'intérieur vers ledit axe d'embrayage (22) et ladite surface extérieure dudit couvercle de carter d'embrayage (19) comprend des rainures multiples s'étendant axialement, dans lequel lesdites saillies peuvent coulisser axialement par rapport audit axe d'embrayage (22) dans lesdites rainures et sont limitées en déplacement rotatif about ledit axe d'embrayage (22) par lesdites rainures, grâce à quoi ledit couvercle de carter d'embrayage (19) peut être déplacé axialement par rapport à ladite partie de base (18) et limité en déplacement rotatif par rapport à ladite partie de base (18).

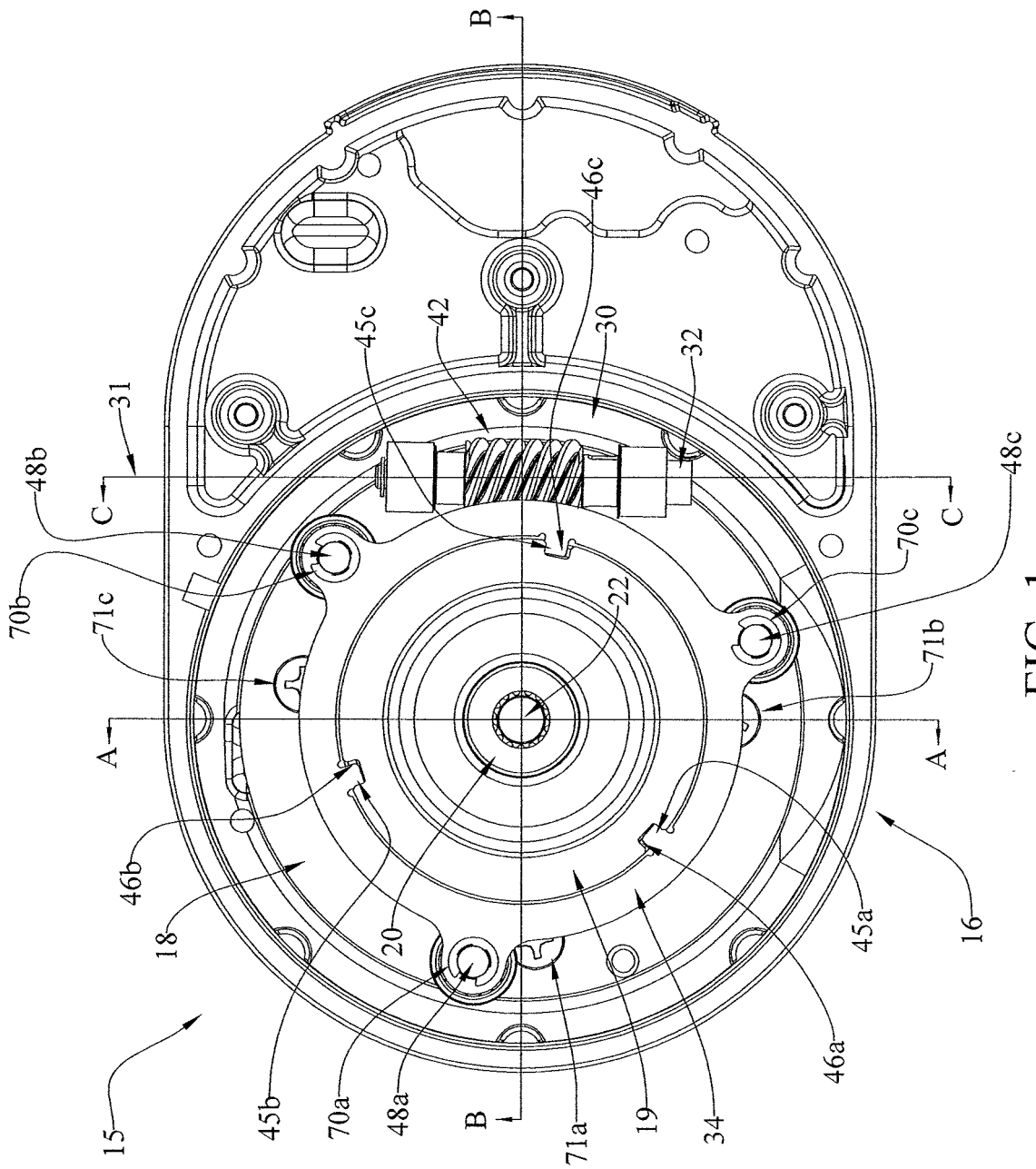
12. Ensemble (15) selon la revendication 10, dans lequel ladite plaque de verrouillage annulaire est fixée à ladite partie de base (18) via une pluralité d'éléments arbres.

13. Ensemble (15) selon la revendication 12, dans lequel ladite roue (29) est soutenue en rotation par une pluralité de paliers et lesdits paliers sont soutenus entre ladite plaque de verrouillage annulaire et ladite partie de base (18) sur lesdits éléments arbres respectifs, de préférence dans lequel lesdits éléments arbres comprennent des goujons de rotation et comprenant en outre des éléments ressorts multiples disposés entre ladite plaque de verrouillage annulaire et lesdits paliers respectifs sur lesdits goujons de rotation respectifs et configurés pour solliciter que ladite plaque de verrouillage s'écarte de ladite partie de base (18).

14. Ensemble (15) selon la revendication 1, et comprenant en outre un logement de treuil fixé à ladite partie de base (18) et un deuxième palier disposé radialement entre ledit deuxième organe rotatif (21) et ledit logement de treuil, de préférence dans lequel ledit deuxième organe rotatif (21) comprend un tourillon extérieur pour recevoir ledit deuxième palier.

15. Ensemble (15) selon la revendication 1, dans lequel :

ledit premier organe rotatif (20) et ledit élément ressort sont disposés entre ladite partie de base (18) et ledit couvercle de carter d'embrayage (19) ;
ledit couvercle de carter d'embrayage (19) a une surface intérieure et ledit premier organe rotatif (20) a une surface à l'opposé de ladite surface intérieure dudit couvercle de carter d'embrayage (19) ;
ledit élément ressort agit entre ladite surface intérieure dudit couvercle de carter d'embrayage (19) et ladite surface dudit premier organe rotatif (20) à l'opposé de ladite surface intérieure dudit couvercle de carter d'embrayage (19) ; et
dans lequel ledit couvercle de carter d'embrayage (19) et ledit premier organe rotatif (20) sont configurés de telle sorte qu'un déplacement axial dudit couvercle de carter d'embrayage (19) par rapport audit premier organe rotatif (20) règle ladite sollicitation dudit élément ressort, de préférence dans lequel ledit entraînement par engrenages est disposé à l'extérieur dudit couvercle de carter d'embrayage (19).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30
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22
71b
A
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45a
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15
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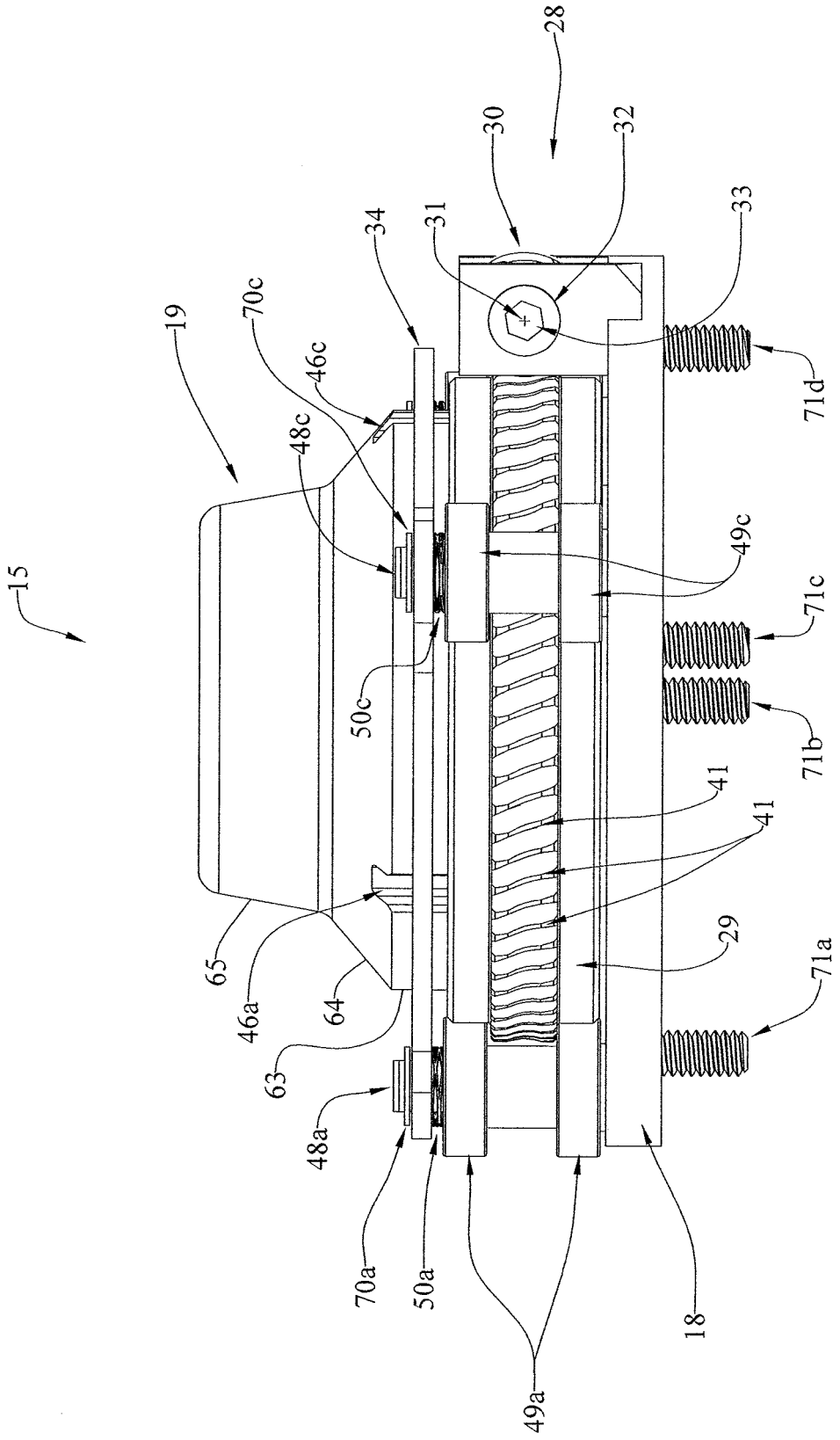
70a
48a
B
71a
19
34
46a

FIG. 1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48a
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49a
18

FIG. 2

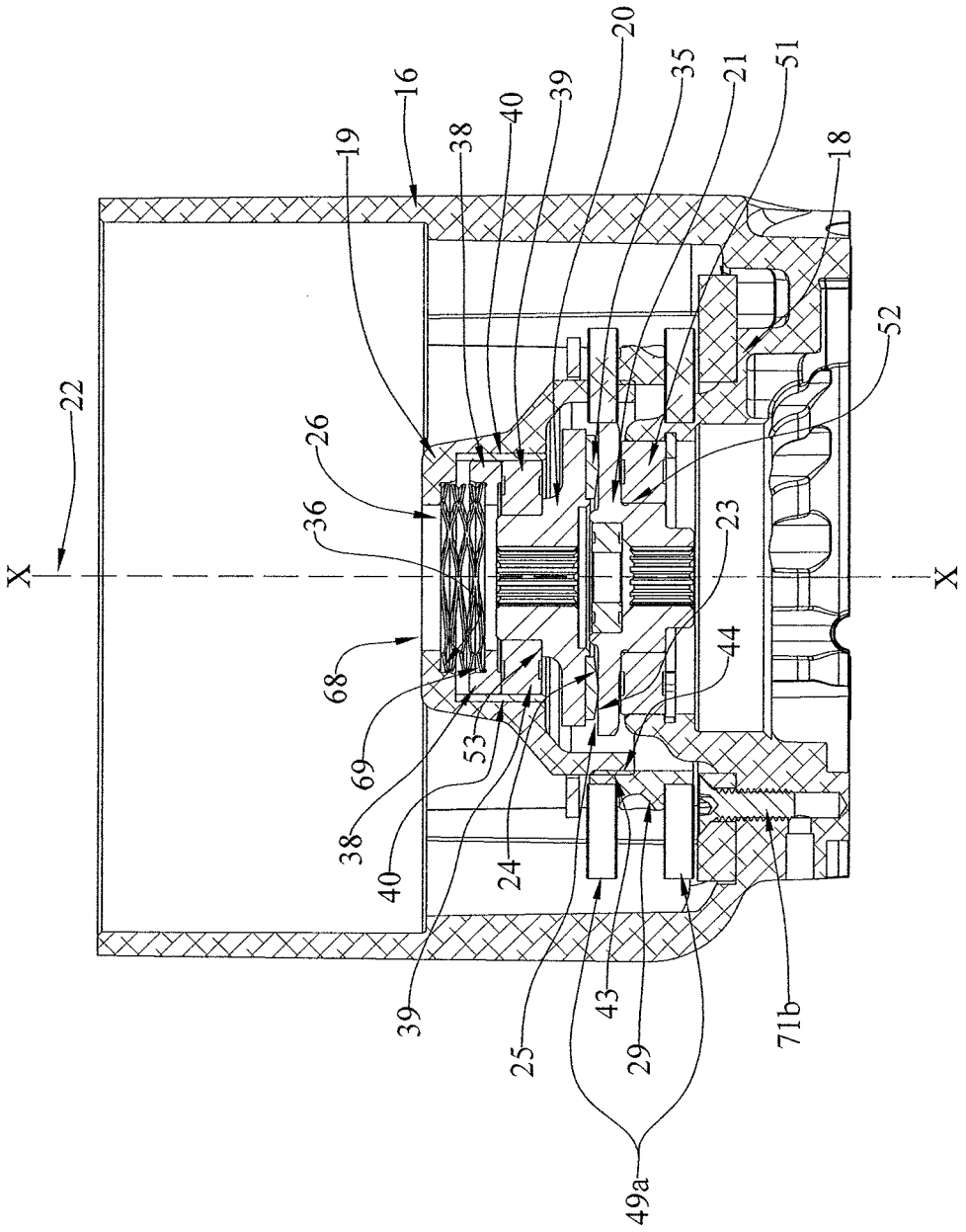
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FIG. 3

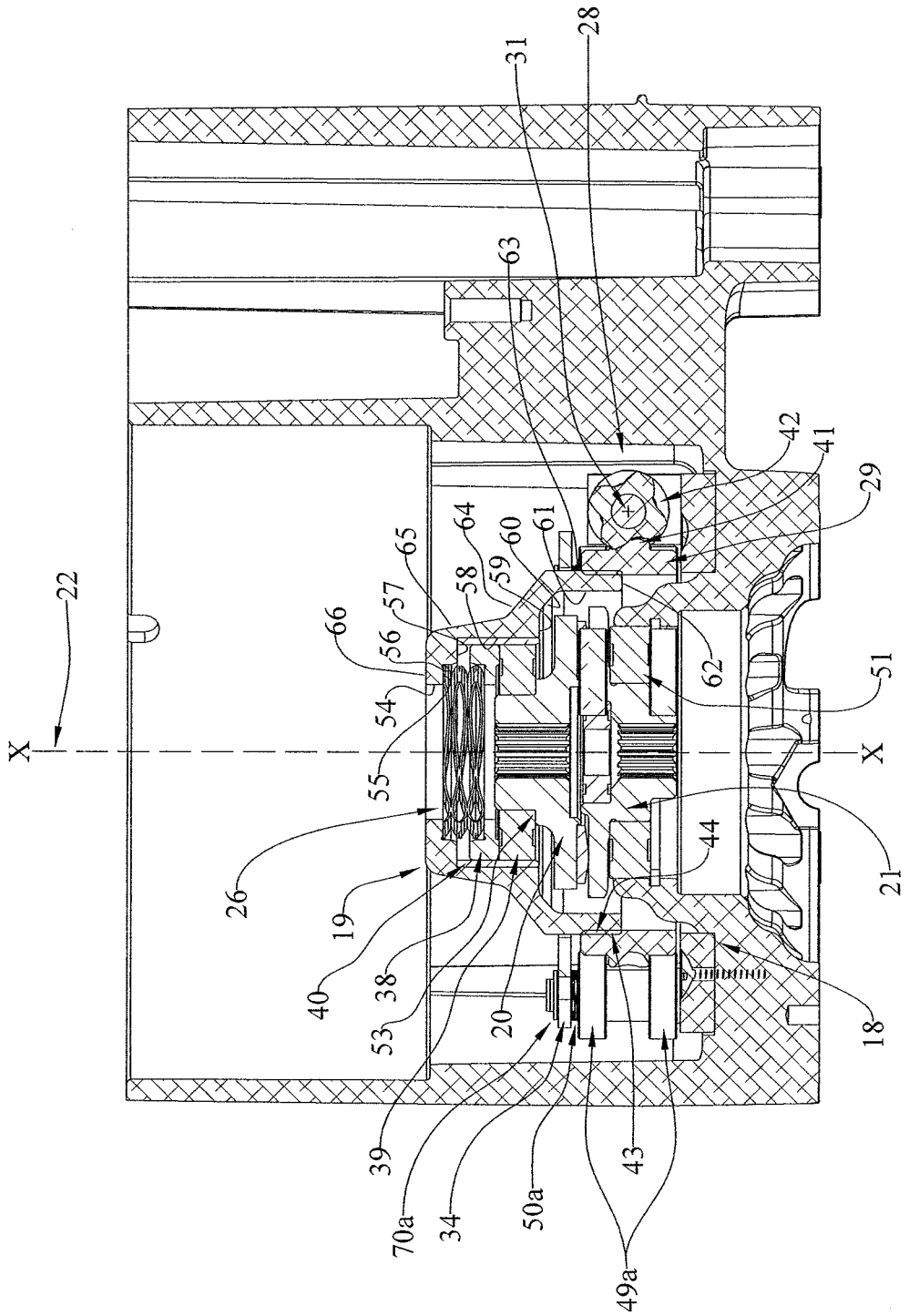
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FIG. 4

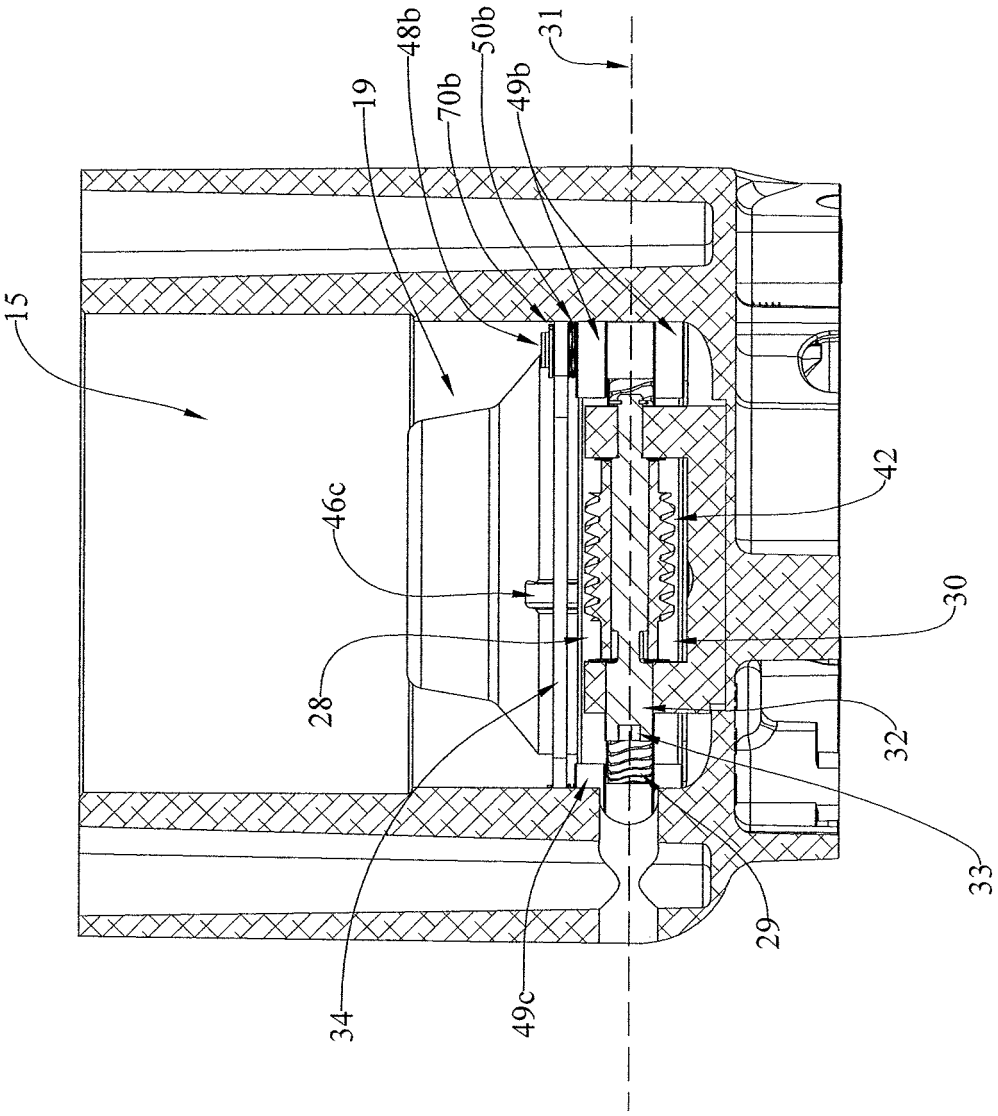

FIG. 5

REFERENCES CITED IN THE DESCRIPTION

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