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(54) FRICTION RING FOR FRICTION SHAFTS, PARTICULARLY FOR REWINDING SPOOLS

(57) A friction ring (1) for friction shafts (3), particularly for rewinding spools (29), comprising an internal ring (2) that can be arranged on a friction shaft (3) and is associated coaxially with an external ring (15) from which there protrude elements (17, 17a) for the removable locking of the core (31) of a spool (29) that can be coupled to the friction shaft. The internal ring (2) and the external ring (15) are rotatable mutually and coaxially in contrast with elastic means (30). The locking elements (17, 17a) are adapted to retract radially toward the inside of the external ring (15) as the load on the elastic means (30) decreases.

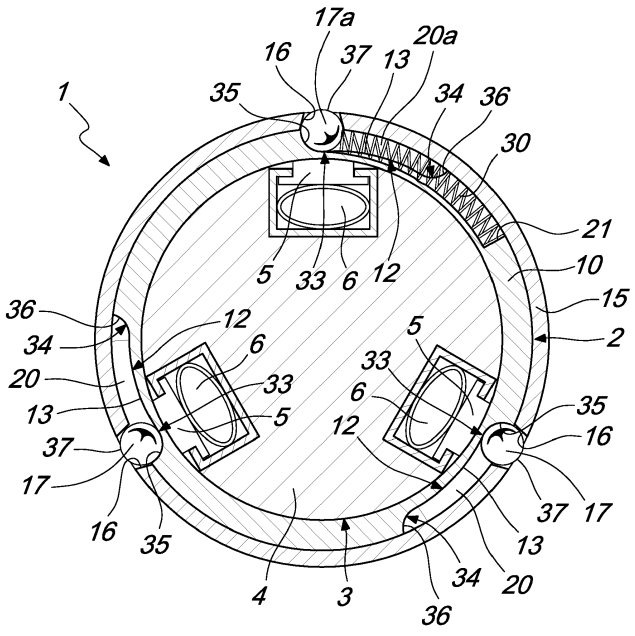

Fig. 1

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Description

[0001] The present invention relates to a friction ring for friction shafts, particularly for rewinding spools.

[0002] As is known, friction rings are already known which are placed on friction shafts used to rewind multiple spools, with the possibility to avoid generating differences in traction during the winding of the various spools.

[0003] Usually, friction rings of the known type are provided by means of an internal ring, which can be arranged on the friction shaft, typically provided with strips that are extended parallel to the axis and provide friction, by introducing compressed air in chambers provided below said strips.

[0004] In order to integrally couple each individual core of the spools with the respective ring or rings, there is an external ring from which locking elements protrude which are usually constituted by balls or rollers that are loaded radially outwardly and are made to retract upon the insertion or extraction of the core of the spool by means of a rotation of said core or by means of a rotation of the shaft.

[0005] For example, the balls or rollers are placed in guides that are defined on the outer surface of the internal ring and have a variable shape or depth, so that upon the rotation of the shaft, in a direction that is opposite to the spool rewinding direction, the balls or rollers are made to retract radially in order to allow the extraction of the spool from the shaft.

[0006] This known solution is not devoid of drawbacks, which include the fact that it is necessary to provide a second motor for each shaft in addition to the one required for rewinding, so as to be able to turn the shaft in the opposite direction with respect to the rewinding direction and thus disengage the balls or rollers from the cores of the spools fitted on the shaft.

[0007] Another drawback is that in known solutions the balls or rollers protrude in their radially outermost position in inactive conditions of the friction ring and this can cause damage to the internal surface of the cores of the spools during the insertion and extraction steps and in particular can form helical grooves.

[0008] The aim of the invention is to solve one or more of the drawbacks described above.

[0009] In particular, an object of the invention is to allow the fitting of cores of spools on a friction shaft without imposing, manually or with a motor, a mutual rotation between said cores and the shaft.

[0010] Another object of the invention is to allow the extraction of the spools from a friction shaft without forcing, manually or with a motor, a mutual rotation between said spools and the shaft.

[0011] A further object of the invention is to reduce or eliminate the damage of the internal surface of the cores of the spools during insertion or extraction.

[0012] Another object of the present invention is to provide a friction ring for friction shafts, particularly for rewinding spools, that can be obtained easily with simple mechanical operations starting from commonly commercially available elements and materials and is further competitive from a merely economic standpoint.

[0013] This aim, as well as these and other objects that will become better apparent hereinafter, are achieved by a friction ring according to claim 1.

[0014] Further characteristics and advantages of the invention will become better apparent from the description of a preferred but not exclusive embodiment of a friction ring for friction shafts, particularly for rewinding spools, illustrated by way of nonlimiting example with the aid of the accompanying drawings, wherein:

Figure 1 is a sectional front view of a friction ring according to the invention fitted on a shaft;
Figure 2 is an exploded perspective view of the friction ring of Figure 1;
Figure 3 is a perspective view of the friction ring of Figure 1;
Figure 4 is a sectional side view of a friction ring on which three friction rings according to the invention are fitted;
Figures 5 and 6 are sectional front views of a spool, respectively during winding and after winding, fitted on a friction ring, according to the invention, which in turn is fitted on a friction shaft.

[0015] With reference to the figures, the friction ring for friction shafts, particularly for winding spools, according to the invention, is designated generally by the reference numeral 1 and comprises an internal ring 2 that can be arranged on a friction shaft, generally designated by the reference numeral 3 and typically provided by means of a shaft body 4, which is provided peripherally with a plurality of strips 5 that are extended parallel to the axis and can expand radially by way of the action of expansion chambers 6 that can be connected to a compressed air supply circuit, not shown.

[0016] The strips 5 are made to expand with a pressure value that is variable as a function of the torque that one wishes to impart to the individual cores being rewound, so that the spools can adapt automatically to different traction conditions during winding.

[0017] The internal ring 2 is provided with a central body 10 which is provided, at one end, with a flange 11, which can be coupled to an external ring 15 provided with uniformly distributed openings 16 for the exit of locking elements constituted by balls 17 or, as an alternative, by rollers.

[0018] The openings 16, as an alternative, can be replaced with notches provided on the edges of the external ring. In any case, the size of the openings is smaller than the diameter of the balls 17 or in any case such as to prevent complete crossing of the respective locking element.

[0019] The balls 17 are activated for their movement in a radial direction by the rotation between the internal ring 2 and the external ring 15.

[0020] The external ring 15 is held in position by means of a spiral locking ring 18 that is inserted in a groove 19 defined correspondingly on the central body 10.

[0021] On the central body 10 of the friction ring 1a there are ramps 12 provided by means of a plurality of slots 20 that have a ramp-shaped bottom 13 so that the mutual rotation between the external ring 15 and the internal ring 2 produces an action on the balls 17 in a radial direction.

[0022] The external ring 15 and the internal ring 2 are mutually and coaxially rotatable in contrast with elastic means, constituted advantageously by at least one compression spring 30 which acts between the external ring 15 and the internal ring 2, in particular between a tab 21 of a slot 20a and a ball 17a. As an alternative, according to an alternative embodiment that is not shown, the compression spring 30 can be accommodated in an adapted slot provided in the central body 10. Such compression spring 30 can act advantageously between a bottom wall of said slot and an abutment element that is integral with the external ring 15. Said abutment element can be advantageously an abutment grub, which can be screwed onto the external ring 15, which can be inserted at least partially in said slot, at the opposite end with respect to the end against which the compression spring 30 acts. Advantageously, the abutment grub can be screwed to the external ring after the assembly of the balls 17 and of said compression spring 30.

[0023] A particularity of the invention is that the balls 17 are adapted to retract radially toward the inside of the external ring 15 as the load on the elastic means, in particular on the compression spring 30, decreases. More specifically, in the rest condition of the compression spring 30, or in a condition in which the spring 30 is subject to a minimal load (i.e., in a stroke limit position 35 of the ball 17a), all the balls 17, 17a are substantially retracted into the respective openings 16, thus allowing free sliding of the core 31 of the spool 29 to be rewound or already rewound, along the friction shaft 3 on which the friction rings 1 according to the invention are fitted, without in any way having to rotate the shaft 3 or impart manually a rotation to the core 31.

[0024] For this purpose, the openings 16 that can be crossed only partially by the balls 17, 17a, when said elastic means are in the inactive condition or minimum load condition, are superimposed on a portion 33 of a respective ramp 20, 20a that is radially more internal than the peak point 34 of said ramp 20, 20a. Said portion 33 can include an end wall 35 of the slot 20, while the other stroke limit wall 36 of the ball 17 is adjacent to the peak point 34 of the slot 20. The balls 17 are thus completely or almost completely retracted into the friction ring 1 in the situation, when the machine is stationary, in which the cores 31 of the spools 29 must be fitted on the friction shaft 3 that mounts the friction rings 1 according to the invention or in which the rewound spools 31 must be removed from said shaft 3.

[0025] Advantageously, in the inactive or minimum load condition a dome-like portion 37 of each ball 17 can be left protruding toward the outside of the respective opening 16 in order to define a sliding bearing for the core 31 of the spool 29.

[0026] Therefore, in inactive or minimum load conditions of the compression spring 30, by setting appropriately during manufacture the depth of the slots 20, 20a in the portion 33, the locking elements constituted by the balls 17, 17a can protrude radially from the external ring 15 to an extent that is sufficient to allow the engagement of the ring 31, which is optionally empty, and its sliding, optionally with the presence of the spool 29, along the friction ring 1 without jamming.

[0027] Operation of the invention is evident from what has been described above. A plurality of friction rings 1 are fitted on the shaft 3 and the strips 5 are made to expand radially in order to lock the friction rings 1 on the shaft 3. In this situation lacking external torque stresses, the elastic means, and more particularly the compression spring 30, are in the inactive condition and the balls 17, 17a are retracted completely or almost completely into the openings 16. One or more cores 31 are then fitted on the shaft 3,by simply pushing them in a direction that is parallel to the axis of rotation of the shaft 3, without the balls 17 hindering their sliding.

[0028] Once the necessary number of cores 31 has been fitted, the shaft 3 is made to rotate about its own axis by way of a motor, not shown, in the direction that allows the rewinding of a tape 38 around a respective core 31. The mutual locking between the shaft 3 and the internal ring 2 causes, upon the start of the rotation of the shaft 3, a mutual rotation between the internal ring 2 and the external ring 15 of each friction ring 1 covered by a core 31. This mutual rotation loads the compression spring 30 and entrains the balls 17, 17a pushed by the openings 16 in the radially rising direction of the ramps 12. The balls 17, 17a protrude accordingly from the respective openings 16 until they lock against the internal surface of the cores 31, thus locking them on the shaft 3.

[0029] At the end of the rewinding of the spools, the shaft 3 is stopped and the compression spring 30 of each friction ring 1 covered by a core 31 returns to the inactive or minimum load condition, thus causing the balls 17 to retract into the respective openings 16, disengaging them from the cores 31. In this condition, the rewound spools can be extracted from the shaft 3 simply by pushing them in a direction that is parallel to the rotation axis of the shaft 3, without having to rotate it in the opposite direction with respect to the rewinding direction as occurs in the background art, where for this purpose it is necessary to provide a second motor for the shaft.

[0030] It has thus been found that the friction ring for friction shafts according to the invention achieves the intended aim and objects.

[0031] The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims.

[0032] All the details may further be replaced with other

technically equivalent elements.

[0033] In practice, the materials used, so long as they are compatible with the specific use, as well as the contingent shapes and dimensions, may be any according to requirements and to the state of the art.

[0034] The disclosures in Italian Patent Application no. MI2014A001488, from which this application claims priority, are incorporated herein by reference.

[0035] Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. A friction ring for friction shafts, particularly for rewinding spools, comprising an internal ring that can be arranged on a friction shaft and is associated coaxially with an external ring from which there protrude elements for the removable locking of the core of a spool that can be coupled to said friction shaft, said internal and external rings being rotatable mutually and coaxially in contrast with elastic means, **characterized in that** said locking elements are adapted to retract radially toward the inside of said external ring as the load on said elastic means decreases.

2. The friction ring according to claim 1, **characterized in that** said elastic means comprise at least one compression spring, which acts between said internal ring and said external ring so that in inactive or minimum load conditions of said compression spring the locking elements protrude radially from said external ring to an extent that is sufficient to allow the engagement and/or the sliding of said core of said spool.

3. The friction ring according to one or more of the preceding claims, wherein said internal ring comprises sliding or rolling ramps for respective locking elements and said external ring comprises openings or notches that can be crossed partially by said locking elements and are superimposed on said ramps, wherein said openings or notches, when said elastic means are in the inactive or minimum load condition, are superimposed on a portion of a respective ramp that is radially more internal with respect to its peak point.

4. The friction ring according to claim 3, wherein said ramps are provided at respective arc-like slots of said internal ring.

5. The friction ring according to claim 4, wherein said elastic means are accommodated in at least one of said slots so as to act between one of said locking elements and a bottom wall of the respective slot.

6. The friction ring according to one or more of the preceding claims, wherein said locking elements are balls or rollers.

7. The friction ring according to one or more of the preceding claims, wherein said elastic means are accommodated in at least one slot that is provided in said central body so as to act between a bottom wall of said slot and an abutment element that is integral with said external ring.

8. The friction ring according to one or more of the preceding claims, wherein said abutment element is an abutment grub that can be screwed to said external ring.

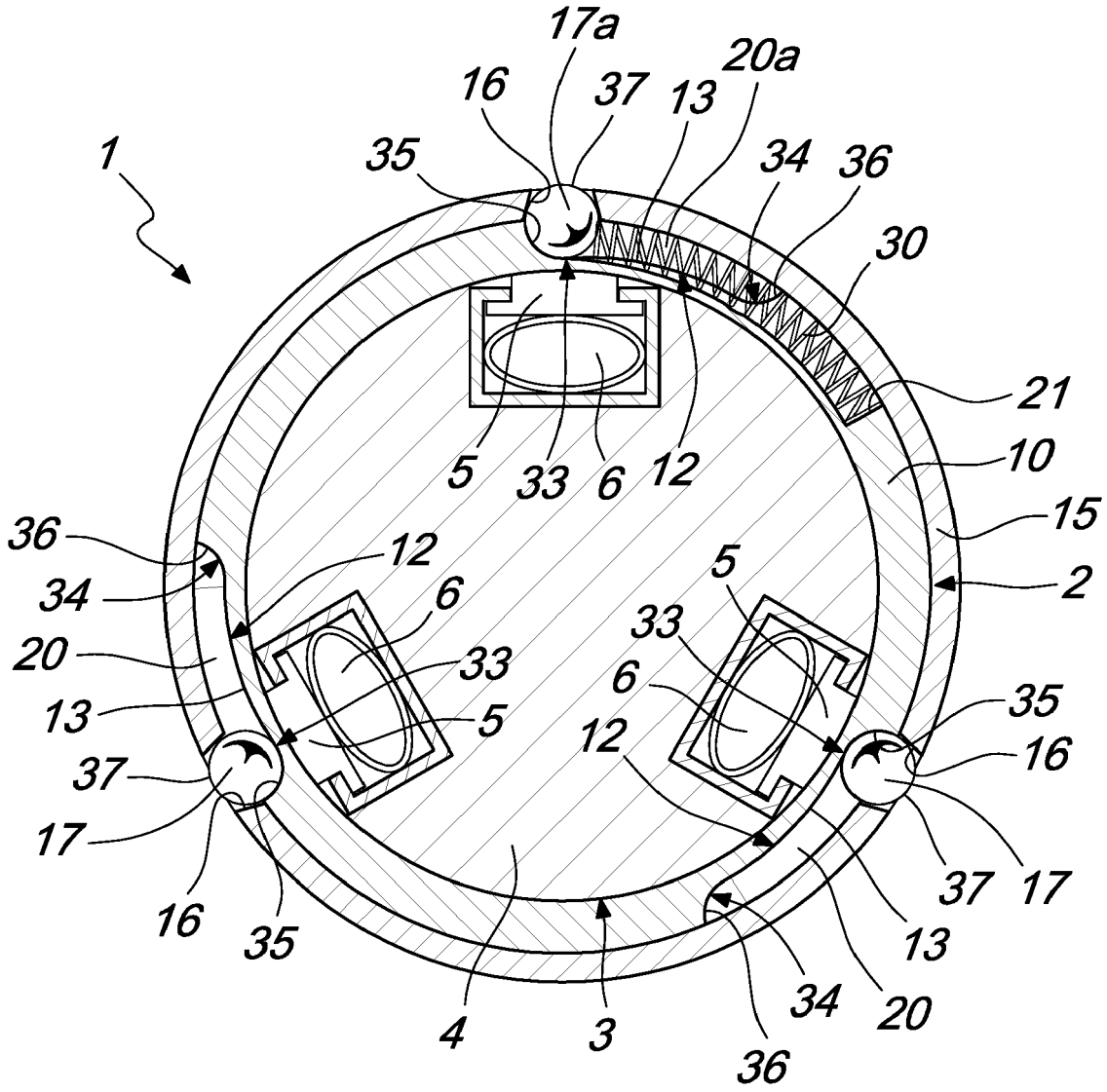
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Fig. 1

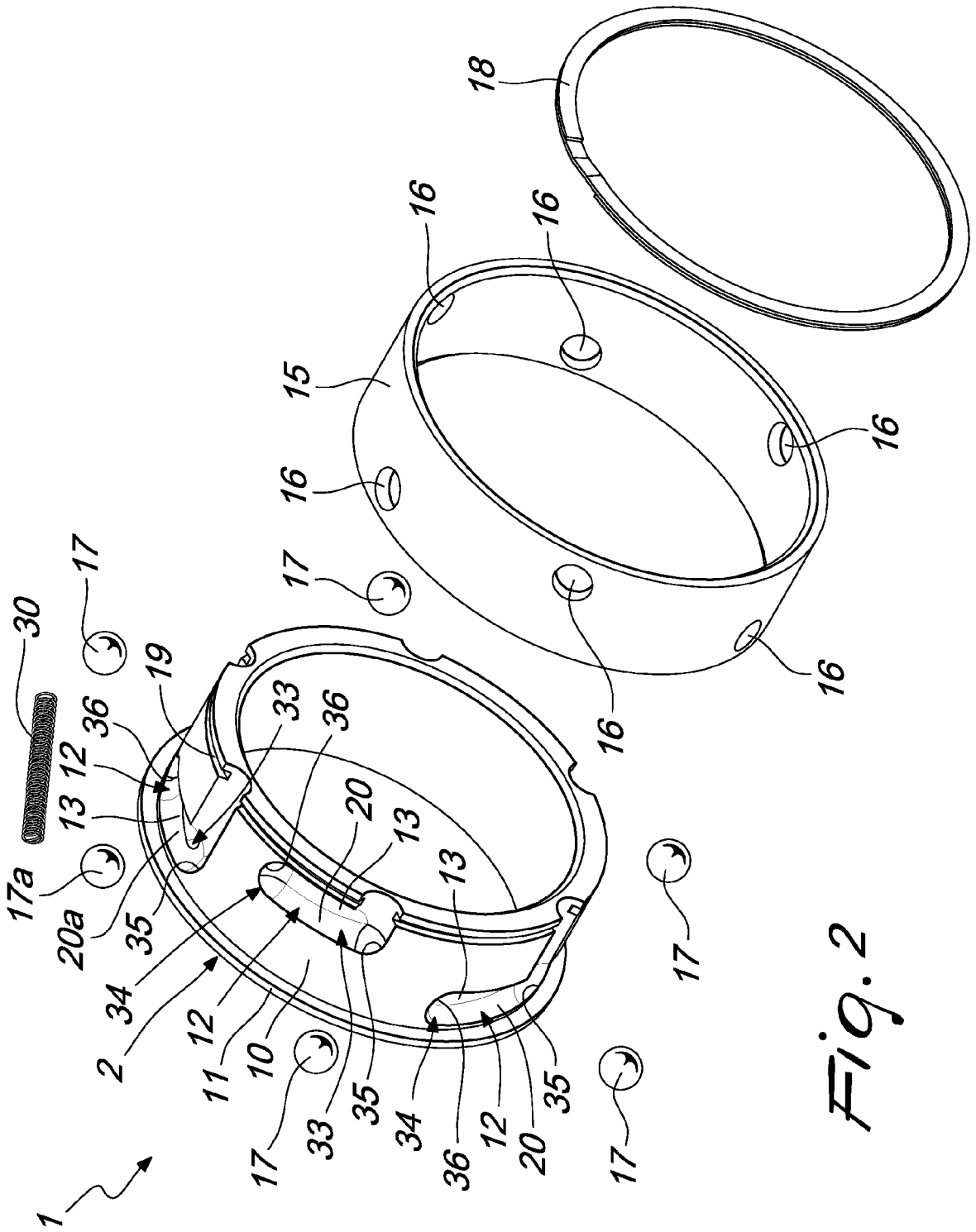
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Fig. 2

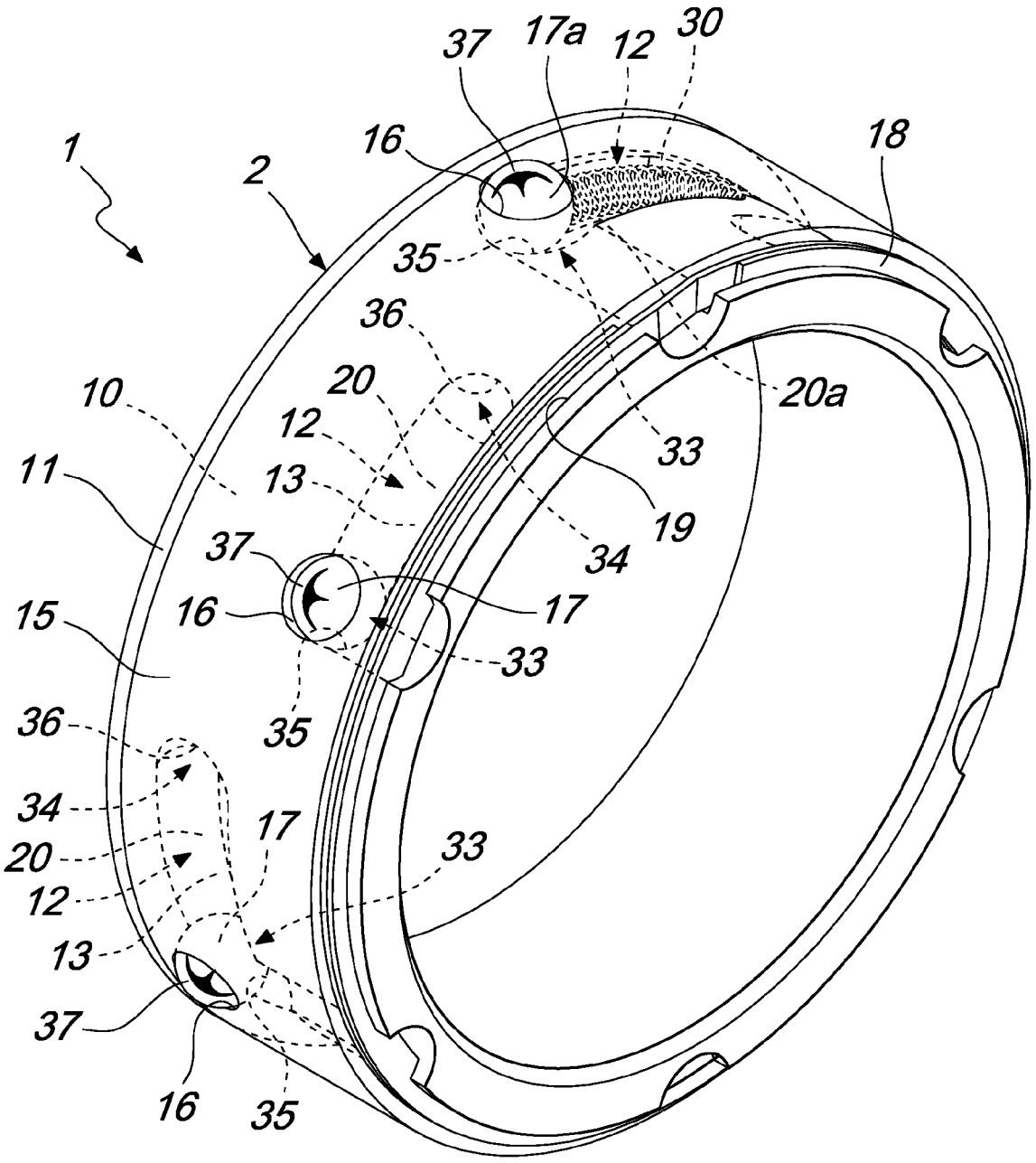
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Fig. 3

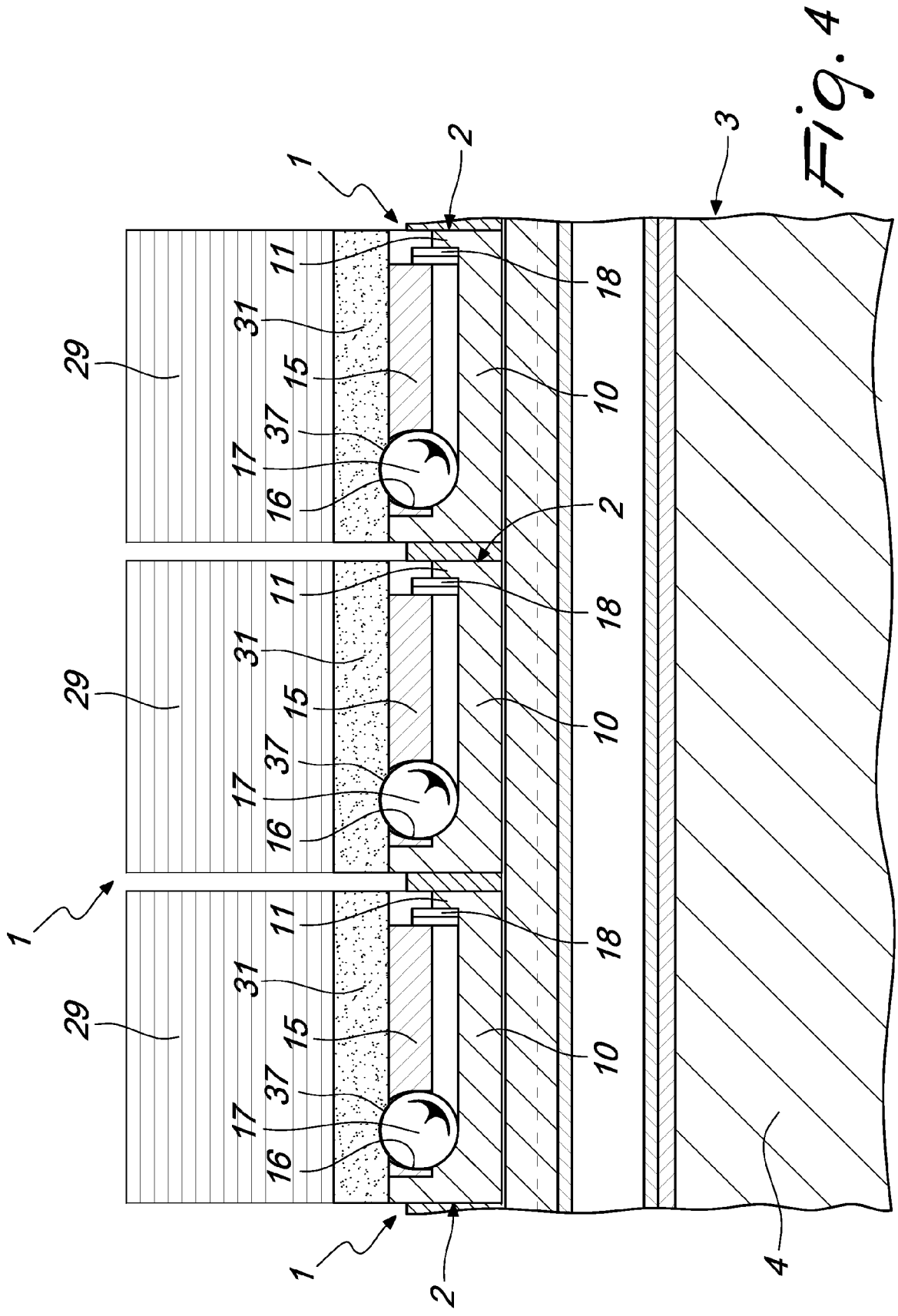

Fig. 4

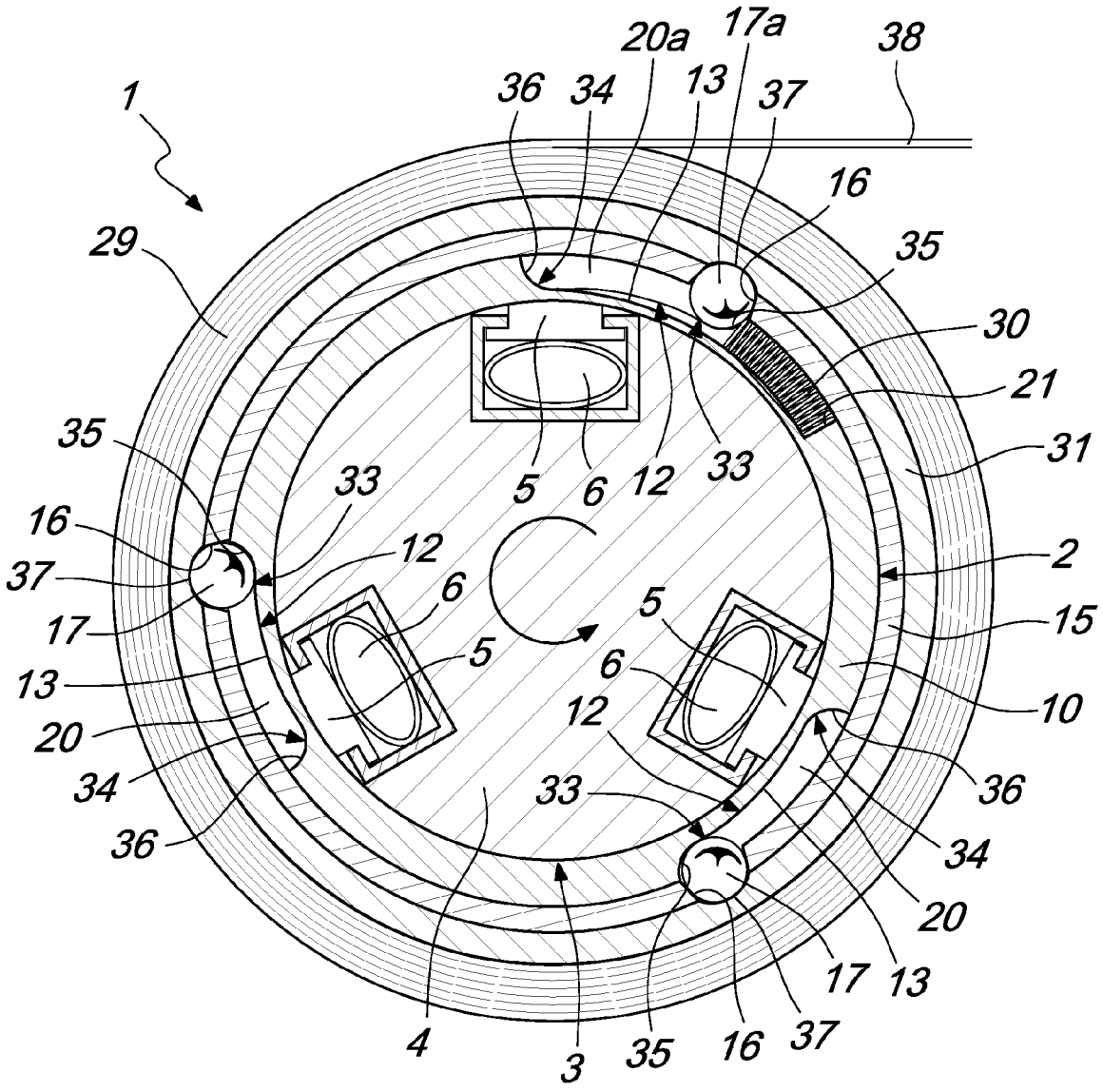
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Fig. 5

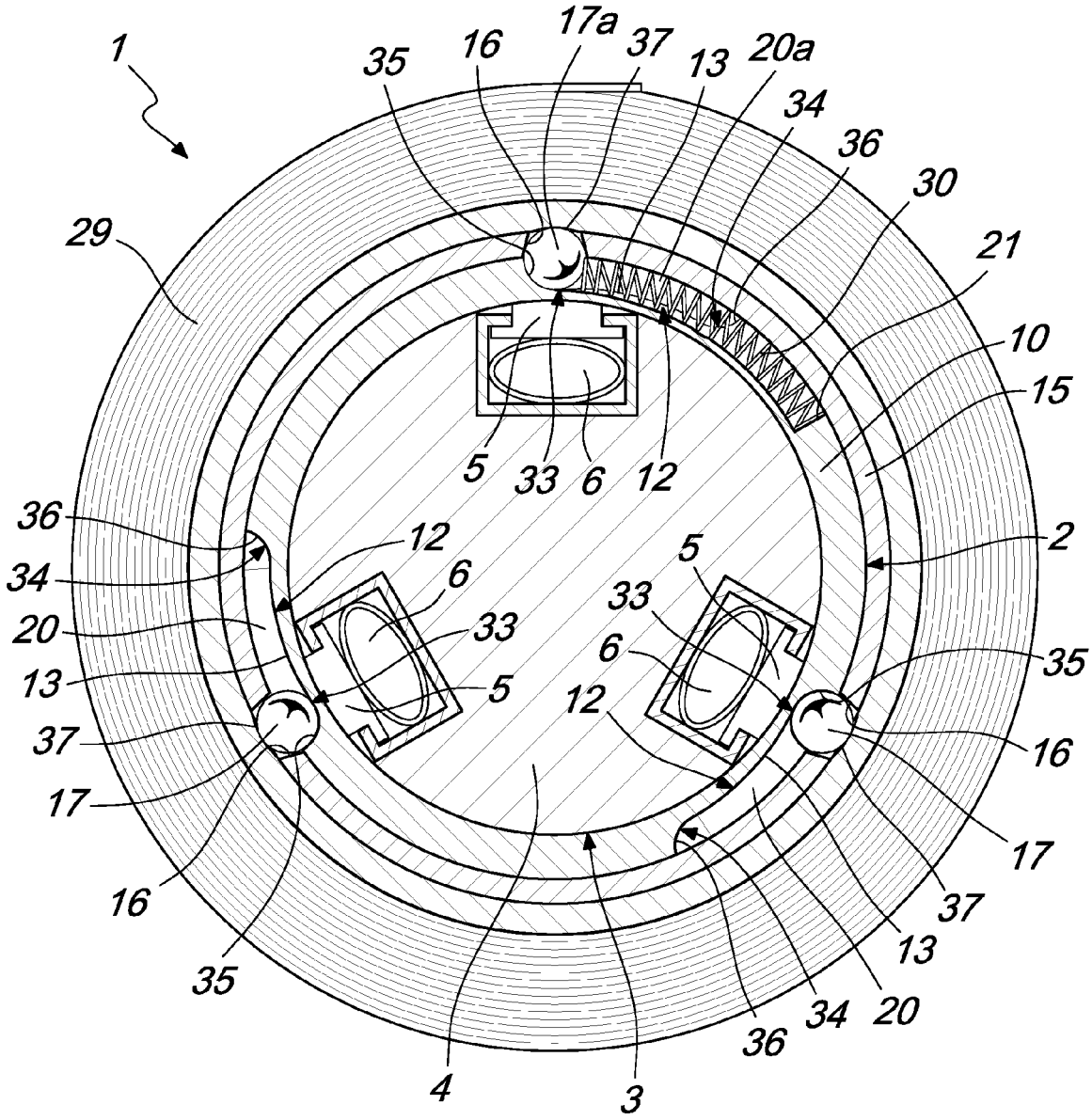
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Fig. 6

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EUROPEAN SEARCH REPORT

Application Number
EP 15 18 0337

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	1 December 2015	Lemmen, René

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