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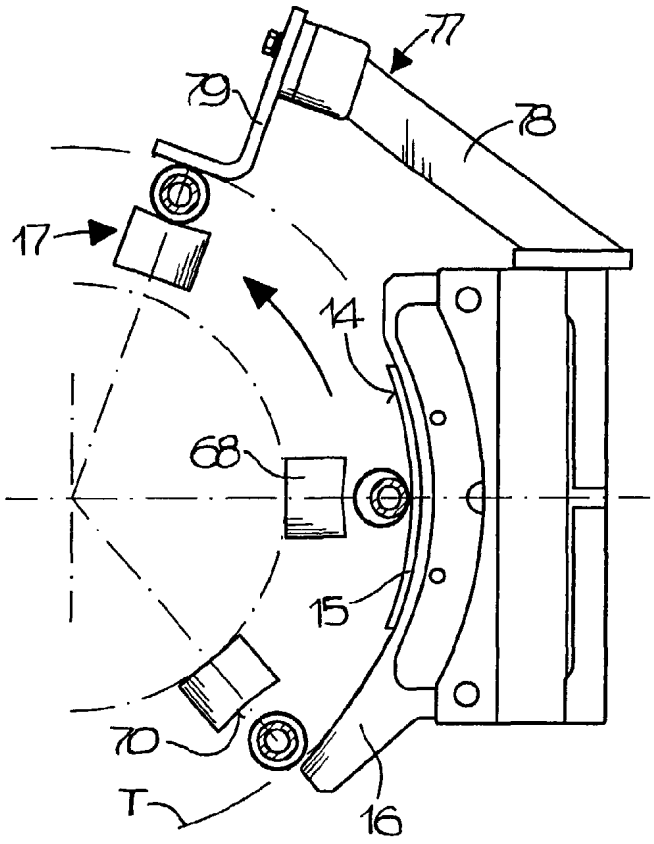
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(54) Title: APPARATUS FOR MAKING A FRACTURE CUT BETWEEN THE CUP AND THE SAFETY RING IN PLASTIC CAPS



(57) Abstract: An apparatus for making a fracture cut between the cup and the safety ring in plastic caps, which comprises rotary means (11) provided with at least one mandrel (12) that can be arranged inside the cup (3) and is suitable to produce the rolling, about its own axis of symmetry (S), of the side wall (13) of the cup (3) along the cutting edge (14) of a blade (15) for making the cut, the blade (15) being associated with an inlet path portion (16) adapted to axially offset the cup (3) with respect to the rotation axis (R) of the mandrel (12) by clamping the side wall (13) against the mandrel (12); the apparatus also comprises means (17) for recentering the cup (3) with respect to the rotation axis (R).

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APPARATUS FOR MAKING A FRACTURE CUT BETWEEN THE CUP AND THE SAFETY RING IN PLASTIC CAPS

Technical Field

The present invention relates to an apparatus for making a fracture cut between the cup and the safety ring in plastic caps.

Background art

Apparatuses are known which produce, on the side wall of plastic caps, a circumferential fracture cut that forms the safety ring that remains attached to the container after tearing the cup from the cap: for this purpose, inside the cup there are retention elements, obtained for example by folding inward the end flap of the ring, which are suitable to engage on the protruding collar provided on the neck of the container.

In these apparatuses, the fracture cut is generally provided by rolling the lateral surface of the cap along a blade whose cutting edge is perpendicular to the axis of said cap by means of a mandrel that engages within the cup. In performing said cap rolling step, the mandrel is substantially axially offset with respect to the cup, since the blade is associated with an inlet portion that is suitable to move said cup with respect to the axis of the mandrel: in rolling the cap, the side wall of the cup is therefore kept pressed by the mandrel against the cutting edge of the blade, thus providing the cut.

At the end of the cap rolling step it is necessary to reposition the cup in axial alignment with respect to the mandrel, so as to be able to proceed correctly with the subsequent operations of the production process: for example, the cup must be removable from the mandrel without encountering the obstacle constituted by the undercuts formed by the presence of the retention elements within said cup.

Repositioning the cup, moreover, is a rather complicated operation in view of the many shapes and dimensions that characterize commercially available caps.

Disclosure of the invention

The technical aim of the present invention is to provide an apparatus for making a fracture cut between the cup and the safety ring in plastic caps that allows, after forming said cut, to reposition the cup in axial alignment with respect to the mandrel inserted therein.

Within the scope of this technical aim, an object of the present invention is to provide an apparatus that is versatile and adaptable to caps of various shapes and dimensions.

Another object of the present invention is to achieve said aim with a structure that is simple, relatively easy to provide in practice, safe in use, effective in operation, and relatively low in cost.

This aim and these objects are all achieved by the present apparatus for making a fracture cut between the cup and the safety ring in plastic caps, which comprises rotary means provided with at least one mandrel that can be arranged inside said cup and is adapted to produce the rolling, about its own axis of symmetry, of the side wall of said cup along the cutting edge of a blade for making said cut, said blade being associated with an inlet path portion adapted to axially offset said cup with respect to the rotation axis of said mandrel by clamping said side wall against said mandrel, characterized in that it comprises means for recentering said cup with respect to said rotation axis.

Advantageously, said rotary means are driven by a motor by way of belt drive elements.

Brief description of the drawings

Further particularities will become better apparent and evident from the detailed description of a preferred but not exclusive embodiment of an apparatus for making a fracture cut between the cup and the sealing ring in plastic caps according to the invention, illustrated by way of non-limitative example in the accompanying drawings, wherein:

Figure 1 is a front view of the apparatus according to the invention;

Figure 2 is a partially sectional detailed front view of said apparatus;

Figure 3 is a detailed plan view of the apparatus in the step for forming the fracture cut;

Figure 4 is a partially sectional detailed side elevation view of the apparatus in the step for forming the fracture cut.

Ways of carrying out the invention

With particular reference to the cited figures, the reference numeral 1 generally designates an apparatus for making a fracture cut between the cup and the sealing ring in plastic caps 2 according to the invention.

The apparatus, of the type suitable to make a fracture cut between the cup 3 and the sealing ring 4 in caps 2 to be applied so as to close containers (the cup 3 being preferably provided with internal retention elements 5 for engagement on a collar provided on the respective container), comprises a footing 6, which protrudes upward with a substantially vertical frame 7 that is constituted by parallel uprights 8 that support a beam 9 (see Figure 1).

The footing 6 rotatably supports a rotary carousel 10, which has a vertical axis and is preset to convey continuously the caps 2 between input and output conveyance means, not shown in the figures. The footing 6 furthermore supports rotary means 11, which are provided with a plurality of mandrels 12 that have a vertical axis; each mandrel can be arranged inside a respective cup 3 and is suitable to roll, about its own axis of symmetry S, the side wall 13 of said cups 3 along the cutting edge 14 of a blade 15 for making the circumferential fracture cut on said side wall 13. For this purpose, the blade 15 is associated with an inlet path portion 16 for the cups 3, which is adjacent thereto and is suitable to axially offset each cup 3 with respect to the rotation axis R of the respective mandrel 12, so as to clamp the side wall 13 between said cutting edge 14 and the mandrel 12.

According to the invention, the apparatus comprises means 17 for recentering each cup 3 with respect to the rotation axis R of the respective mandrel 12 once the fracture cut has been made.

The carousel 10 is associated with means for continuous rotary actuation 18, which are constituted by a gearmotor 19 that is fixed by means of a flange 20 to parts 21 of the footing and has a vertical output shaft 22 that is rigidly connected so that it is coaxial to said carousel 10.

The carousel 10 comprises (Figure 2) a first drum 23, which is provided internally with an axial through cavity 24 and is connected in a downward region to a flanged shaft 25 that is connected to the output shaft 22 of the gearmotor 19 and is affected by multiple peripheral through holes 26 that have a vertical axis and are angularly equidistant for the sliding insertion of respective pillars 27 provided at their upper ends with seats for conveying the caps 2; the seats are preferably constituted by disk-like plates 28, which extend downward with respective stems 29 supported by thrust bearings 30 mounted within respective receptacles 31 provided in the pillars 27. The pillars 27 can be actuated so as to rise from a lower position to an upper position and have respective rollers 32 fixed to their respective lower ends, said rollers being engaged within an annular cam 33 that is coaxial to the extension 25 and monolithic with the footing 6. Multiple lateral through slots 33a are further provided on the first drum 23 and are mutually angularly equidistant.

The first drum 23 is surmounted by a second drum 34, which is rigidly coupled thereto, is substantially annular and is provided with a plurality of cylindrical through seats 35 that have a vertical axis, each seat being coaxial to a respective through hole 26 of the first drum 23: a respective cylindrical bush 36 is locked in each seat 35.

A support 37 is rigidly fixed to the second drum 34 and is constituted by multiple peripheral arms 38, which are extended vertically and are mutually angularly equidistant: each one of the arms 38 is affected by a respective slot 39, which corresponds to a respective seat 35 of the second drum 34.

A vertical column 40, rigidly coupled to the footing 6, is inserted coaxially through the first and second drums 23 and 34; a substantially disk-

like dome 41 is keyed to the top of the column 40 and is provided, in an upward region, with an opening 42 and has, on its lateral surface, a cylindrical cam 43 with a rolling track that has a rectangular transverse cross-section.

The rotary means 11 comprise a sliding block 44, which is provided with a lateral wheel 45 that engages in the cylindrical cam 43; the sliding block 44 is extended downward with a fixing bracket 46 for a rod 47, which is coupled elastically thereto with the interposition of a helical spring 48, which is inserted loosely in an elongated tubular body 49, which is supported so that it can rotate within the corresponding bush 36 and whose lower end ends with a substantially disk-like pad 50.

Each tubular body 49 has the respective mandrel 12 rigidly coupled thereto in a downward region; said mandrel is provided with an axial hole for the passage of the respective rod 47 and has, at its base, a cylindrical hollow 51 (Figure 4); the mandrel 12 is preferably provided, on its lateral surface, with a distribution of collars 52 for the abutment of the retention elements 5 of the cup.

Advantageously, the rotary means 11 are actuated by a motor 53, for example of the brushless type and provided with a vertical axis, by way of belt drive elements 54.

The belt drive elements 54 comprise a sleeve 55, which is supported so that it can rotate along the column 40 and is actuated by the motor 53 at the respective upper end 56; a first toothed pulley 58 and a second toothed pulley 59 are keyed to said sleeve at its respective lower end 57, and a first toothed belt 60 and a second toothed belt 61 are wound around said first and second pulleys respectively, said belts being closed in a loop and being suitable for the rotary actuation of the mandrels 12: the first and second belts 60, 61 are wound, with the aid of suitable tensioning rollers 62, around respective driven pulleys 63, which are keyed to the top of the respective tubular bodies 49.

A third toothed pulley 64 is keyed at the upper end 56 of the sleeve 55, and a third toothed belt 65 is wound around said third pulley; said third belt is closed in a loop and is suitable for connection to the motor 53; a driving pulley 67 is keyed on the output shaft 66 of the motor 53, and the third toothed belt 65 is wound thereon. The output shaft 66 passes through the opening 42 of the dome 41, and its axis is parallel to the axis of the sleeve 55; as an alternative, it is noted that the motor 53 can be connected coaxially directly to the sleeve 55.

The recentering means 17 comprise multiple pushers 68, each of which acts on the side wall 13 of the respective cup 3 in a direction that is substantially radial and centrifugal with respect to the axis of the carousel 10: the pushers 68 can be actuated by way of respective cam means 69.

Each one of the pushers 68 is preferably substantially quadrangular, with a slightly convex surface 70 for contact with the respective cup 3 (Figure 3); the pusher 68 is connected to an arm 71 that continues with a stem 72 that can slide, in a substantially radial direction with respect to the carousel 10, within a respective guiding block 73, which is inserted in a respective slot 33a. A wheel provided with a vertical axis 74 is supported so that it can rotate at right angles at the free end of each stem 72; the cam means 69 are constituted by a flat track 75, which is closed in a loop and is provided in the lower face of a bush 76 that is fixed coaxially to the carousel 10 along the column 40. The track 75 is suitable for the rolling of the wheels 74 having a vertical axis, causing the radial translational motion of the respective pushers 68 in order to move each cup 3 centrifugally, moving the axis of symmetry S of said cup 3 so that it coincides with the rotation axis R of the respective mandrel 13.

There is also a peripheral abutment element 77 for the cups 3 moved by the respective pushers 68, which comprises a supporting bracket 78 that has an elongated shape and ends with an L-shaped portion 79 that can be adjusted radially with respect to the carousel 10 according to the dimensions

of the cups 3.

The blade 15 is packed between a lower reference plate 80 and an upper complementary plate 81, which is locked thereat by virtue of suitable fixing means 82 (for example of the clamp type): the cutting edge 14 has a profile that is shaped substantially like a circular arc that is concentric with respect to the rotational path T of each cup 3 on the carousel 10. The inlet portion 16 is formed on the plate 80 and the complementary plate 81 and is shaped so as to provide an axial offset of the cup 3 in its rolling motion with respect to the rotation axis R of the respective mandrel 13.

The operation of the apparatus according to the invention is as follows: each cap 2 is locked on the carousel 10 between the plate 28 and the pad 50, said pad 50 being actuated so as to descend by virtue of the rolling of the respective lateral wheel 45 in the cylindrical cam 43, the plate 28 being actuated so as to rise to the plane of the blade 15 by virtue of the rolling of the respective roller 32 along the annular cam 33; the presence of the helical spring 48 allows to compensate for even slight size differences among the various caps arising from any manufacturing imperfections.

The rolling of each cup 3 about its own axis of symmetry S, which is substantially parallel to the rotation axis R of the respective mandrel 12 after passing over the inlet portion 16, allows to make the fracture cut along the side wall 13, which is clamped between said mandrel 12 and the blade 15 (see Figure 4).

At this point, the cam means 69 induce the centrifugal radial translational motion of the corresponding stem 72 and therefore of the pusher 68, which by acting on the side wall 13 of the cup 3 makes its axis of symmetry S coincide again with the rotation axis R of the respective mandrel 12; this occurs with the aid of the abutment element 77, which stops precisely the radial movement of the cup 3 (Figure 3).

The apparatus according to the invention ensures, at the end of the provision of the fracture cut, an effective recentering of the cup 3 with

respect to the rotation axis R of the mandrel 12; this operation, moreover, can be performed in a very versatile manner with caps 2 of various shapes and dimensions.

It has thus been shown that the invention achieves the proposed aim and objects.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may further be replaced with other technically equivalent ones.

In practice, the materials used, as well as the shapes and the dimensions, may be any according to requirements without thereby abandoning the scope of the protection of the appended claims

The disclosures in Italian Patent Application no. BO2002A000422, from which this application claims priority, are incorporated herein by reference.

CLAIMS

1. An apparatus for making a fracture cut between the cup and the safety ring in plastic caps, comprising rotary means (11) provided with at least one mandrel (12) that can be arranged inside said cup (3) and is adapted to produce the rolling, about its own axis of symmetry (S), of the side wall (13) of said cup (3) along the cutting edge (14) of a blade (15) for making said cut, said blade (15) being associated with an inlet path portion (16) adapted to axially offset said cup (3) with respect to the rotation axis (R) of said mandrel (12) by clamping said side wall (13) against said mandrel (12), characterized in that it comprises means (17) for recentering said cup (3) with respect to said rotation axis (R).

2. The apparatus according to claim 1, characterized in that it comprises a carousel (10) that has a vertical axis and is provided with multiple peripheral seats (28) for conveying said cups (3) between input and output conveyance means, and a footing (6) that extends upward with a frame (7) that surmounts said carousel (10), said rotary means (11) being actuated by a respective motor (53) by way of belt drive elements (54).

3. The apparatus according to claims 1 and 2, characterized in that said recentering means (17) comprise multiple pushers (68), which act on said side wall (13) of each one of said cups (3) in a direction that is substantially radial and centrifugal with respect to said carousel (10), and are actuated by respective cam means (69).

4. The apparatus according to one or more of the preceding claims, characterized in that each one of said pushers (68) has a substantially quadrangular shape, in which the surface (70) for contact with said cups (3) is convex, said pusher (68) being connected to an arm (71) that extends with a stem (72) that can slide substantially radially with respect to said carousel (10) within a respective guiding block (73), said stem (72) being connected at its free end to a respective wheel (74), said cam means (69) comprising a track (75) that is closed in a loop and is provided on a bush (76) that is

coaxial to said carousel (10) and is monolithic with said footing (6), said track being suitable for the rolling of said wheel (74) and having such a shape as to produce the radial translational motion of said pusher (68).

5. The apparatus according to one or more of the preceding claims, characterized in that said belt drive elements (54) comprise a sleeve (5), which is supported so that it can rotate on a column (40) that is coaxial to said carousel (10), is rigidly coupled to said footing (6), is actuated at the respective upper end (56) by said motor (53), and on which first and second coaxial toothed pulleys (58, 59) are keyed at the respective lower end (57), first and second toothed belts (60, 61) being wound respectively around said pulleys, said belts being closed in a loop and being suitable for the rotary actuation of a plurality of said mandrels (12) that have a vertical axis.

6. The apparatus according to one or more of the preceding claims, characterized in that said motor (53) is coaxially connected to said upper end (56) of said sleeve (55).

7. The apparatus according to one or more of the preceding claims, characterized in that a third toothed pulley (64) is keyed at said upper end (56) of said sleeve (55), a respective third toothed belt (65) being wound around said third pulley, said third belt being closed in a loop and suitable for connection to said motor (53), whose axis is parallel to the axis of said sleeve (55).

8. The apparatus according to one or more of the preceding claims, characterized in that said cutting edge (14) of said blade (15) has a profile that is substantially shaped like a circular arc that is concentric with respect to the path (T) of the rotation of said cups (3) conveyed by said carousel (10), said inlet portion (16) being formed by a plate (80) and a complementary plate (81) for supporting said blade (15).

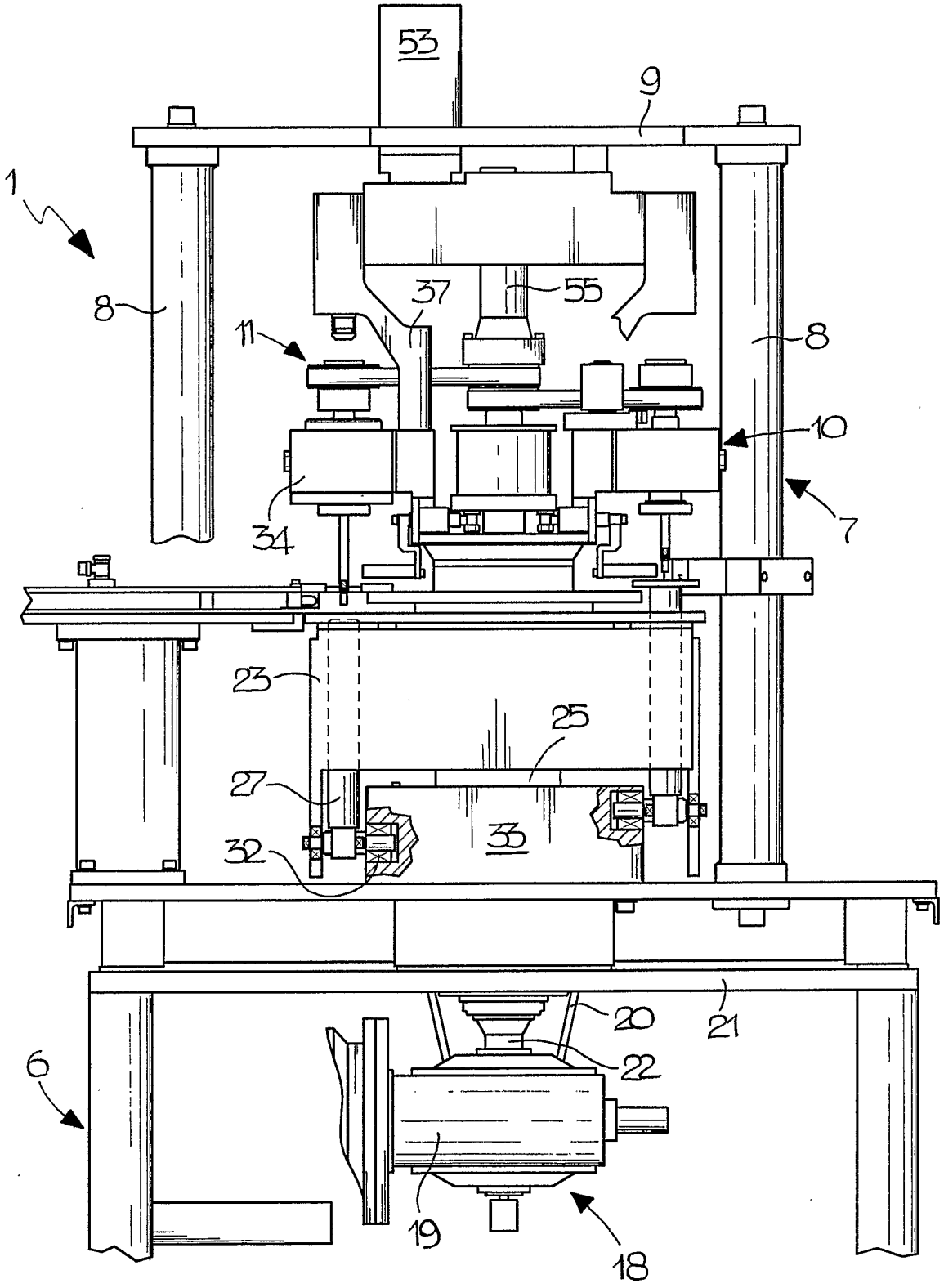


FIG 1

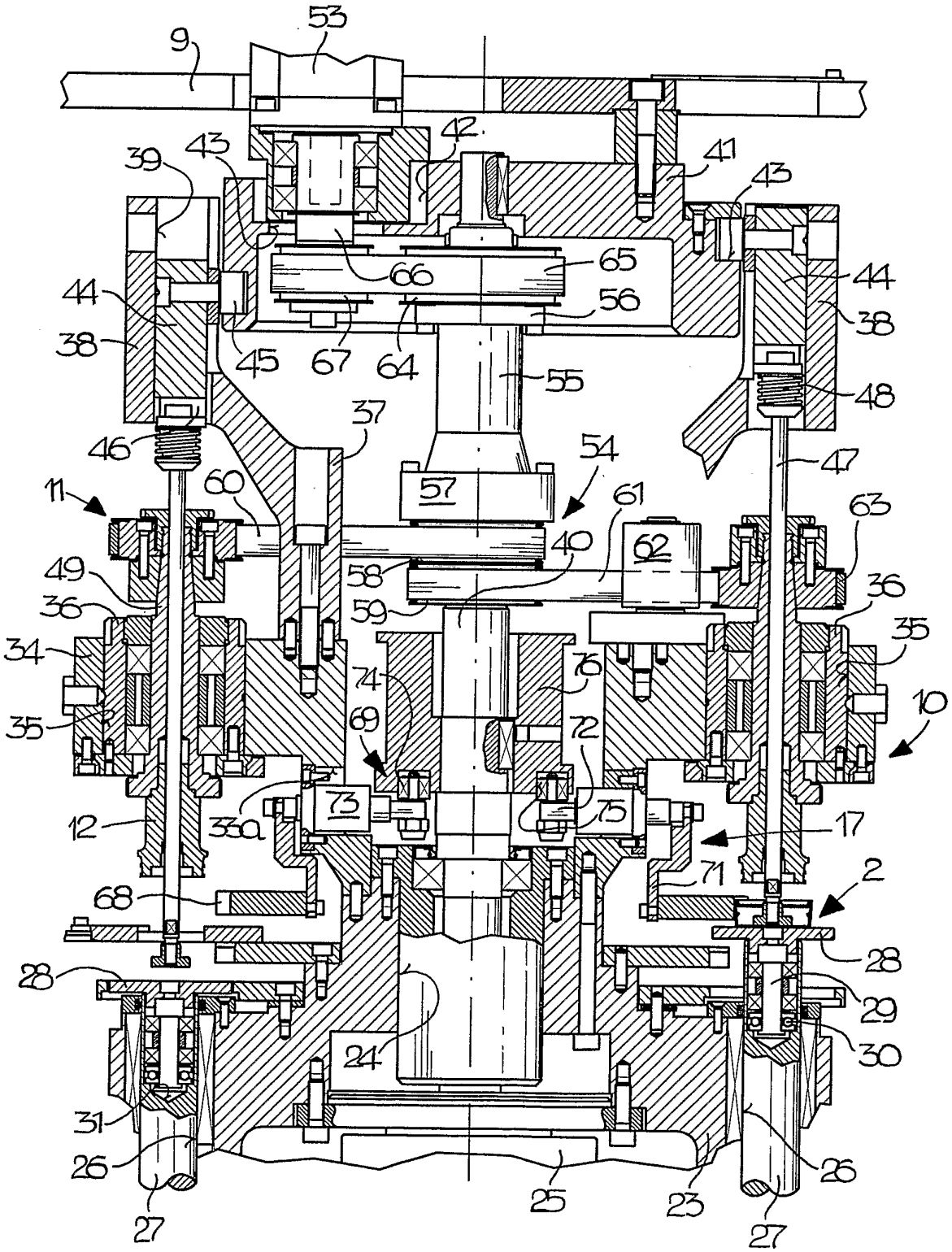

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FIG 2

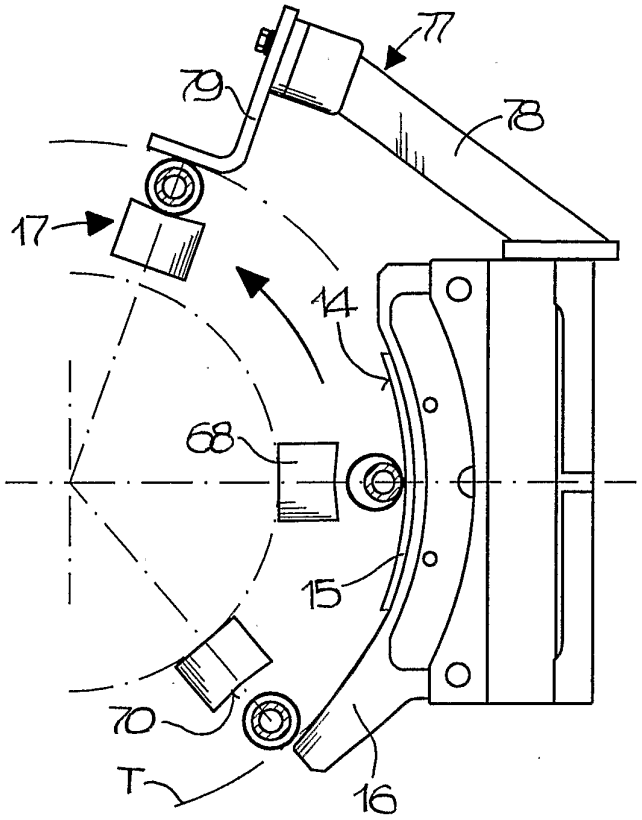

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FIG 3

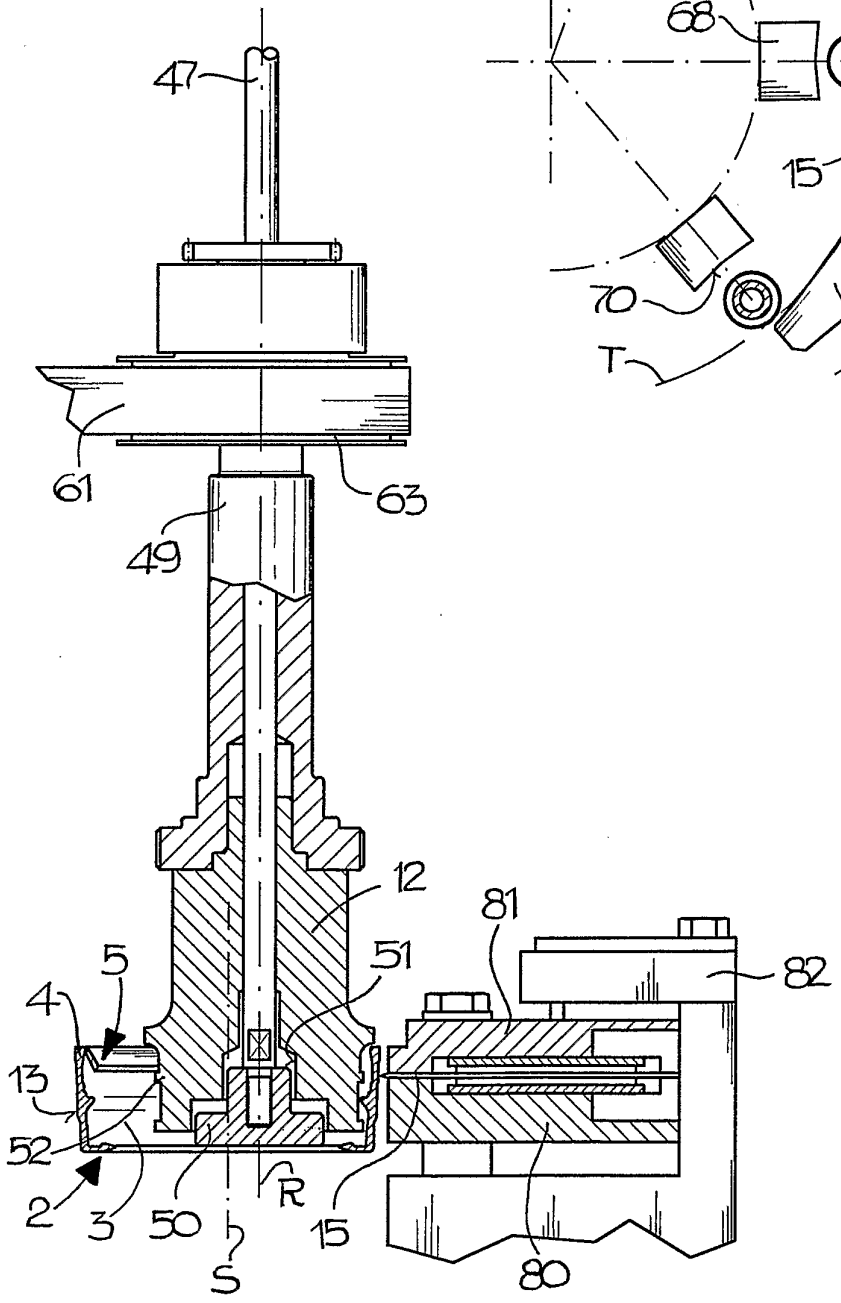

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FIG 4