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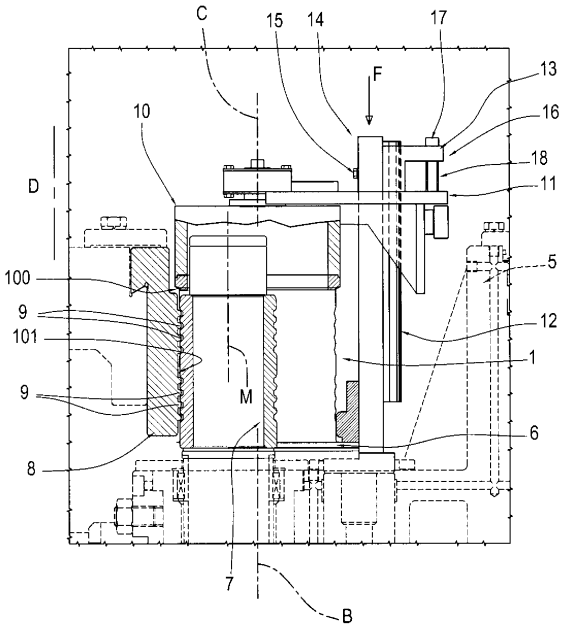
(54) **Beading machine.**

(57) A machine for forming beading on the bodies of containers such as tins (1) or the like having an upper opening (2) delimitated by an end edge (3) comprises a head or carousel (5) able to rotate about a predetermined axis (A), a circular beading sector (8) adjacent to the carousel (5), having a projection (9) designed to form the beading on the tins (1), a tin (1) supporting surface (10) integral with the carousel (5). The tins (1) are able to rotate on the supporting surface (10) about a predetermined axis of rotation (B'); a tin (1) guiding and retaining mandrel (7) is supported by the carousel (5) and is shaped to match the projection (9) of the circular sector (8) so as to force the tin (1) against the beading sector (8) to form the beading on the tin (1); the machine also comprising a plate (10) for contact with the upper opening (2).

FIG.2



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Description

[0001] The present invention relates to a beading machine, in particular relative to the production of container bodies.

[0002] This description refers to tubular container bodies such as tins or cans, without in any way limiting the scope of the invention.

[0003] As is known, the production of spaced beading on the lateral walls of tins or cans prevents the formation of bulges or the collapse of the tins or cans, especially if they are large.

[0004] Tins or cans are made starting with a sheet of plate or metal material which is bent and welded, longitudinally, to form an empty tubular body whose ends are closed, during a step which follows the beading step, by corresponding circular portions or ends, also made of metal material, which are usually applied by welding.

[0005] Therefore, the beading is formed on the lateral surface of the tin before the tin is filled with product and closed.

[0006] Thus, during the beading step, the tin is an empty tubular body with open ends.

[0007] Beading is formed by machines usually equipped with a head or carousel able to rotate, respectively, between a station for feeding the tins on which beading must be formed and a station for unloading the tins on which beading has been formed.

[0008] In this description reference is made to beading machines in which the tins on which beading must be formed are gravity fed, that is to say in which the feed station is raised relative to the beading zone. This allows the tin to be inserted in a mandrel which accompanies the tin along a beading path, forcing it into contact with a circular sector adjacent to the carousel, having a predetermined angle of curvature and having, on the surface which makes contact with the tin, projections which are parallel with one another and designed to form the beading.

[0009] The mandrel keeps the outer surface of the tin in forced contact with the surface of the circular sector having the projections and is shaped to match the latter (that is to say, having circular grooves parallel with one another), allowing the beading to be formed.

[0010] The mandrel rotates relative to the tin and, in turn, the tin rolls without slipping along the circular sector.

[0011] The contact between the mandrel and the surface of the circular sector guarantees that the tin is locked along the direction perpendicular to the tin direction of feed. During its movement in the beading station, the lower part of the tin rests on a ring-shaped fixed supporting surface which is part of a tin gripping and positioning unit.

[0012] Tin sliding along its axis of rotation (vertically) is prevented by a contact plate, which is part of said unit, partly resting on the edge of the tin.

[0013] The contact plate is hinged, on one side, so that it is able to rotate about an axis perpendicular to the tin axis of rotation and it is driven by cam mechanisms.

[0014] The plate remains in contact with the upper end edges of the tin for the entire period during which the tin is along the path defined by the circular sector.

[0015] The force needed to keep the contact plate in contact with the edges of the tin is applied by a screw and a helical spring, located above the contact plate.

[0016] As soon as the tin leaves the circular sector contact zone, that is to say, when the beading has been formed, the gripping unit is raised so that the tin can be released from the mandrel. Then, the upper contact plate, rotating about the pivoting axis, allows the tin to be definitively released to a subsequent station.

[0017] Basically, the following are present:

- an arrival station
- a fixed circular beading sector
- a rotary carousel located inside the sector and having a plurality of idle mandrels
- a plurality of gripping elements comprising a lower supporting surface and a movable upper contact plate.

[0018] Prior art beading machines have several disadvantages.

[0019] During the beading step, particularly if a large amount of close beading must be formed, the forces generated by the circular beading sector projections often tend to move the tin along its axis of rotation, upwards.

[0020] This pushing action must be counteracted by the contact plate, but the contact plate does not apply a uniform pressure on the whole of the tin, which can therefore move along its longitudinal axis or rise up in the zone in which the contact plate applies less force.

[0021] The screw - spring pair, which should guarantee the contact plate grip is not very precise and is difficult to adjust, said adjustment varying according to the dimensions of the tin on which beading must be formed.

[0022] Tin axial upward movement results in the formation of helical beading (even if the angle is limited), not uniform relative to the outer cylindrical surface of the tin.

[0023] A second disadvantage is the fact that the contact plate, which remains stationary relative to the tin during tin rotation, tends to rub the end edges of the tin, with the possibility of removing material or paint, substantially compromising the integrity of the tin.

[0024] The aim of the present invention is therefore to overcome the above-mentioned disadvantages by producing a beading machine which is effective, economical and easy to adjust.

[0025] The technical features of the present invention, in accordance with the above aim, are clear from the content of the claims herein, in particular claim 1 and, preferably, from any of the claims directly or indirectly dependent on claim 1.

[0026] The advantages of the present invention are more evident in the detailed description which follows,

with reference to the accompanying drawings which illustrate a preferred, non-limiting embodiment of the invention, in which:

- Figure 1 is a schematic view with some parts in cross-section of a detail of the machine made in accordance with the present invention, in a first operating configuration;
- Figure 2 is a schematic view with some parts in cross-section of a detail of a beading machine made in accordance with the present invention, in a second operating configuration;
- Figure 3 illustrates an enlarged detail from Figure 2;
- Figure 4 illustrates another embodiment of the detail from Figure 3;
- Figure 5 illustrates another embodiment of a detail of the machine in accordance with the present invention;
- Figure 6 is a schematic perspective side elevation view of a tin made in the machine in accordance with the present invention;
- Figure 7 is a schematic plan view, with some parts cut away, of a machine in accordance with the present invention.

[0027] With reference to the accompanying drawings and in particular with reference to Figure 6, the numeral 1 denotes a generic tin made of metal material or the like.

[0028] The tin 1 has an upper opening 2, delimited by an end edge 3, and a lower opening 4.

[0029] As shown in Figure 7, tin 1 beading is carried out in a beading machine which may comprise a head or carousel 5 able to rotate about a predetermined axis of rotation A (see arrow F5). The carousel 5 moves and supports the tins 1 on which beading must be formed.

[0030] Connected to the carousel 5 there is a plurality of ring-shaped supporting surfaces 6, that is to say, supporting rings 6, on which the tins 1 on which beading must be formed are placed.

[0031] According to a first embodiment, the tin 1 is able to rotate relative to the supporting surface 6 about its own axis of rotation B'.

[0032] Alternatively, according to another embodiment, the supporting surface 6 may rotate idly and rotates together with the tin 1.

[0033] Associated with each supporting surface 6 there is a relative tin 1 guiding and retaining mandrel 7, also integral with the carousel 5 and able to rotate thanks to gears (not illustrated) about an axis M.

[0034] According to another embodiment, not illustrated, the mandrel 7 may rotate idly about its own axis M.

[0035] As Figures 1 and 2 show, the supporting ring 6 moves along its axis B between a raised tin 1 loading position, in which the mandrel 7 is below the supporting ring 6, and a lowered operating position, in which the mandrel 7 is inside the supporting ring 6 and engages the tin 1 positioned on the supporting ring 6.

[0036] The supporting ring 6 movement is driven by known means which are therefore not described in detail.

[0037] As illustrated in Figures 2, 3, 5 and 7, outside the beading machine and adjacent to it, there is a circular beading sector 8 having an inner surface 101 on which there is a plurality of projections 9 designed to form the beading.

[0038] The mandrel 7 is shaped to match the beading sector 8 so that, when the mandrel 7 engages the tin 1, the tin 1 body is inserted between the outer surface of the mandrel 7 and the inner surface 101 of the beading sector 8.

[0039] Also associated with each supporting ring 6 there is a relative contact plate 10.

[0040] Each contact plate 10 is opposite the supporting ring 6 with which it is associated, forming a tin 1 containment zone.

[0041] According to the embodiment illustrated in Figures 4 and 5, the contact plate 10 is a disk having a diameter greater than or equal to that of the tin 1 on which beading must be formed and rests uniformly on the whole of the end edge 3 of the upper opening 2.

[0042] According to another embodiment illustrated in Figures 1, 2 and 3, the contact plate 10 has a section with the shape of an inverted "U", where the concave part of the U faces the tin 1 and the ends of the plate 10 rest on the edge 3 of the tin 1.

[0043] With this type of plate, when the supporting ring 6 is in its lowered position and the mandrel 7 is inside it, the mandrel 7 is inside the portion of space delimited by the plate 10, as shown in Figures 2 and 3.

[0044] Advantageously, the contact plate 10 may have a projecting portion 100 designed to completely fit the tin 1 upper opening 2, as illustrated in Figures 2, 3 and 4.

[0045] According to another embodiment not illustrated, the contact plate 10 may consist of a sector formed by two or more crossed rod-shaped elements, having a plurality of contact points with the edge 3 of the tin 1, said points being symmetrically and uniformly distributed on the edge 3.

[0046] As illustrated in Figures 1 and 2, the contact plate 10 is supported by a plate 11 slidably mounted on a rod-shaped element 12 and is able to move vertically along a direction D, between a raised position in which it is distanced from the tin 1, and a lowered position in which it is in contact with the tin 1.

[0047] The contact plate 10 vertical movement is driven by cam means, of the known type, acting on the supporting plate 11. Figure 1 shows a portion 102 of a cam profile (associated with the carousel 5) engaged by a cam follower 103 associated with the supporting plate 11.

[0048] The rod-shaped element 12 comprises a bracket 13. The first end 14 of the bracket 13 is rigidly connected to the rod-shaped element 12 by a screw 15, and the second end 16 of the bracket is connected to the contact plate 10 supporting plate 11 by a screw 17 and helical spring 18 connection.

[0049] The contact plate 10 is also connected to the supporting plate 11 by, for example, a ball bearing (not

illustrated) and so is able to rotate idly relative to its axis of rotation C (see arrow F10 in Figure 1).

[0050] Advantageously, the contact plate 10 axis of rotation C and the tin 1 axis of rotation B' coincide.

[0051] In practice, a tin 1 on which beading must be formed is fed from a tin 1 feed station, as illustrated in Figure 1.

[0052] During this step the supporting ring 6 is in its raised position to receive the tin 1 arriving from the feed station, and the relative mandrel 7 is below the supporting ring 6.

[0053] During tin 1 positioning on the ring, the contact plate 10 is raised to allow tin 1 positioning on the ring 6. In this configuration the spring 18 connected to the bracket 13 is compressed.

[0054] Once the tin 1 is positioned on the supporting ring 6 and lowering towards the mandrel 7 starts, the contact plate 10 is lowered thanks to the movement transmitted by the cam mechanisms 102 - 103 to the supporting plate 11, to which it is connected.

[0055] In its lowering stroke, the contact plate 10 does not return to its original position, but remains slightly raised, due to the presence of the tin 1.

[0056] This means that the spring 18 does not return to its home position, but remains slightly compressed, consequently applying to the contact plate 10 a downward axial force, with reference to the direction of the arrow F in Figure 2.

[0057] Said force is transmitted to the tin 1, which in this way is subject to extra axial locking, in addition to the normal force applied by the contact plate 10 deriving from the position imposed on it by the cam mechanism.

[0058] Moreover, thanks to its shape, the contact plate 10 rests on the whole of the edge 3 of the tin 1, consequently applying a uniform pressure on the tin 1 and so preventing even small amounts of axial sliding which would compromise the success of the beading operation.

[0059] Once the contact plate 10 is closed, the mandrel 7 is inserted in the tin 1.

[0060] During this step the carousel 5 continued to rotate, bringing the unit consisting of the ring 6, the mandrel 7, the tin 1 and the contact plate 10 close to the zone where the beading sector 8 is located.

[0061] The tin 1 runs along the circular sector 8, forced against it by the action of the mandrel 7.

[0062] In practice, the tin 1 cylindrical body is inserted between the inner surface 101 of the beading sector 8, having the projections 9, and the outer surface of the mandrel 7, shaped to match the inner surface 101 of the beading sector 8.

[0063] In this way, the beading is formed on the tin 1, which rolls without slipping along the beading sector 8 about its own axis of rotation B'.

[0064] Advantageously, the contact 10 plate, able to rotate idly about its own axis C, also rotates with the tin 1, thus preventing the end edge 3 of the tin 1 from being scratched and/or the removal of material or paint from the tin 1.

[0065] When the tin 1 has passed through the whole of the zone corresponding to the beading sector 8, it is moved towards an unloading station then sent on to subsequent stations.

[0066] The invention brings important advantages.

[0067] Firstly, the shape of the contact plate, that is to say, the fact that its surface is made in such a way that its points of contact with the tin are at least uniformly distributed on the whole of the edge of the tin, allows a force distributed on the whole of the edge to be applied and very effective balancing of the axial thrust generated on the tin during its passage in the beading sector.

[0068] Moreover, the connection between the contact plate and the carousel structure, allowing the contact plate to rotate freely about its axis, allows the contact plate to rotate together with the tin, thus avoiding any kind of rubbing or removal of material and/or paint.

[0069] Another advantage also derives from the fact that the contact plate moves vertically and is not hinged at a single point or on one side.

[0070] This guarantees a good contact plate grip even without the aid of the helical spring, meaning that it does not require difficult adjustments depending on the tin on which beading must be formed.

[0071] The invention described above is susceptible of industrial application and may be modified and adapted in several ways without thereby departing from the scope of the inventive concept. Moreover, all details of the invention may be substituted by technically equivalent elements.

Claims

1. A machine for forming beading on the bodies of containers such as tins (1) or the like having an upper opening (2) delimitated by an end edge (3), comprising at least:

- a head or carousel (5) able to rotate about a predetermined axis (A);
- a circular beading sector (8) adjacent to the carousel (5), having at least one projection (9) designed to form the beading on the tins (1);
- at least one tin (1) supporting surface (6) integral with the carousel (5), the tins (1) being able to rotate on said supporting surface (6) about a predetermined axis of rotation (B');
- a tin (1) guiding and retaining mandrel (7) supported by the carousel (5), the mandrel (7) being shaped to match said at least one projection (9) of the circular sector (8) and being designed to force the tin (1) against the beading sector (8) to form the beading on the tin (1);
- a plate (10) for contact with the upper opening (2),

the machine being **characterised in that** the contact

plate (10) comprises a sector forming a plurality of contact points on the upper opening (2) of the tin (1), uniformly distributed along the edge (3) of the tin (1) so as to apply a uniform pressure on the tin (1) to prevent the tin from sliding along the axis (B'); the contact plate (10) being able to rotate idly about a predetermined axis (C).

2. The beading machine according to claim 1, **characterised in that** the contact plate (10) is positioned in contact with the whole of the edge (3) of the upper opening (2).

3. The beading machine according to claim 1 or 2, **characterised in that** the contact plate (10) comprises a projecting portion (100) designed to fit the upper opening (2) of the tin (1).

4. The beading machine according to any of the claims from 1 to 3, **characterised in that** the contact plate (10) consists of a continuous circular disk.

5. The beading machine according to claim 1 or 2, **characterised in that** the contact plate (10) has a concave section, with the concave part facing the upper opening (2) of the tin (1).

6. The beading machine according to claim 5, **characterised in that** said section of the plate (10) is U-shaped.

7. The beading machine according to any of the claims from 1 to 6, **characterised in that** the tin (1) axis of rotation (B') and the contact plate (10) axis of rotation (C) coincide with one another.

8. The beading machine according to any of the claims from 1 to 7, **characterised in that** the contact plate (10) is able to move, driven by a cam mechanism (102, 103), acting between the contact plate (10) and a plate (11) supporting the contact plate (10) slidably mounted on a rod-shaped element (12), along a predetermined direction (D), between a first, raised position in which it allows tin (1) insertion in the mandrel (7) and a lowered position in which it rests on the upper edge (3) of the tin (1) .

9. The beading machine according to any of the claims from 1 to 8, **characterised in that** the supporting surface (6) is ring-shaped.

10. The beading machine according to any of the claims from 1 to 9, **characterised in that** it comprises a screw (17) - helical spring (18) connection for adjusting the contact plate (10).

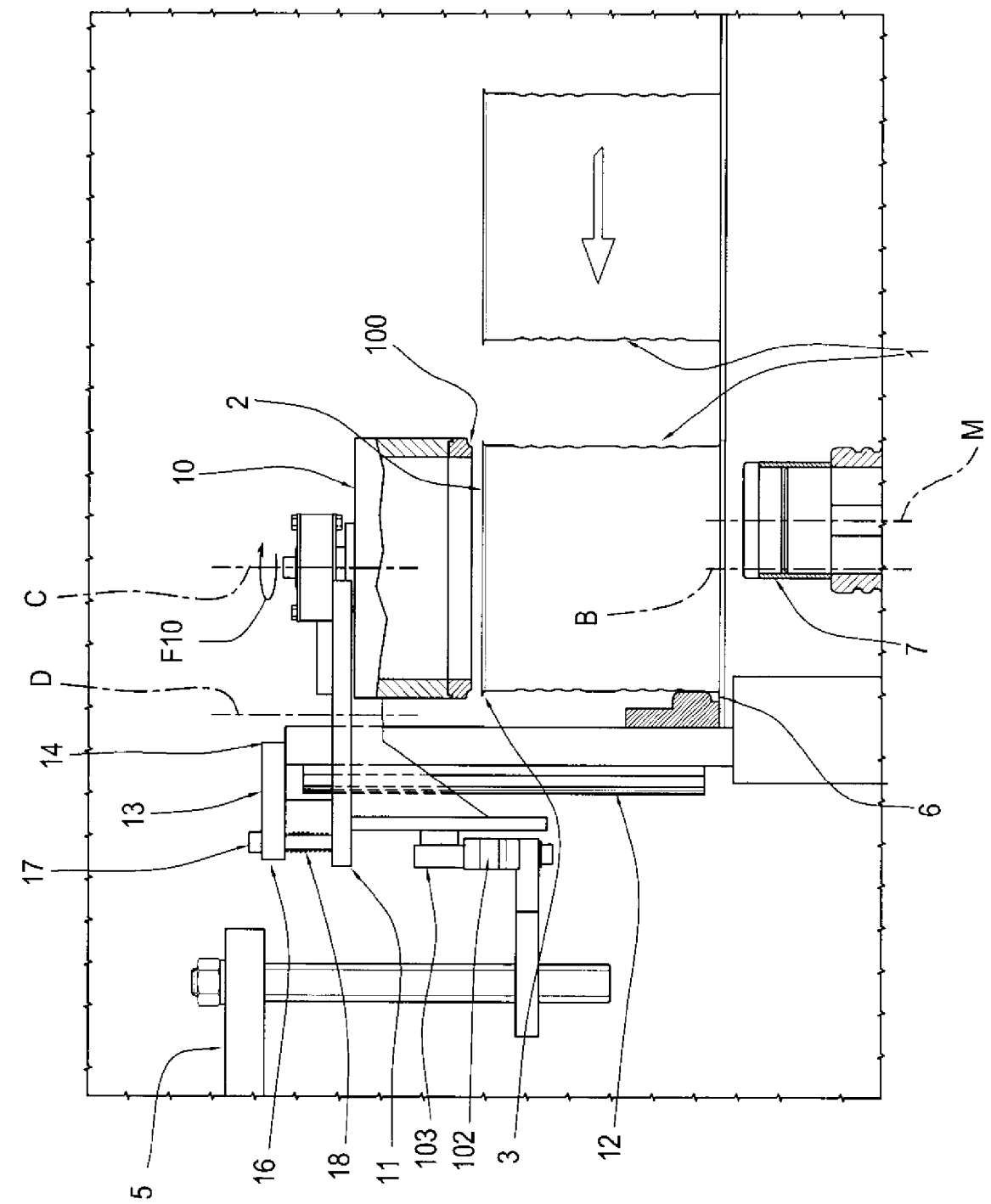


FIG.1

FIG.2

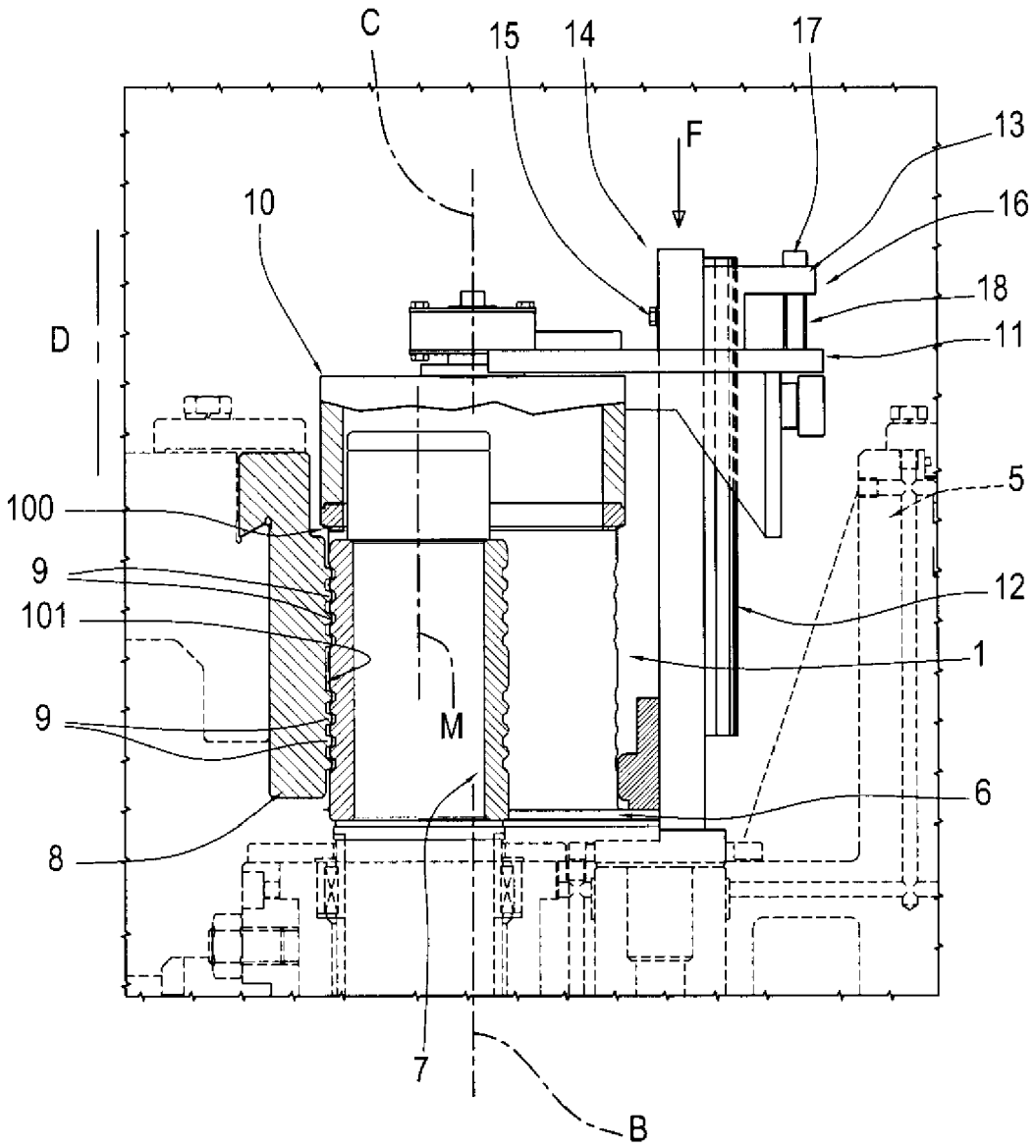


FIG.3

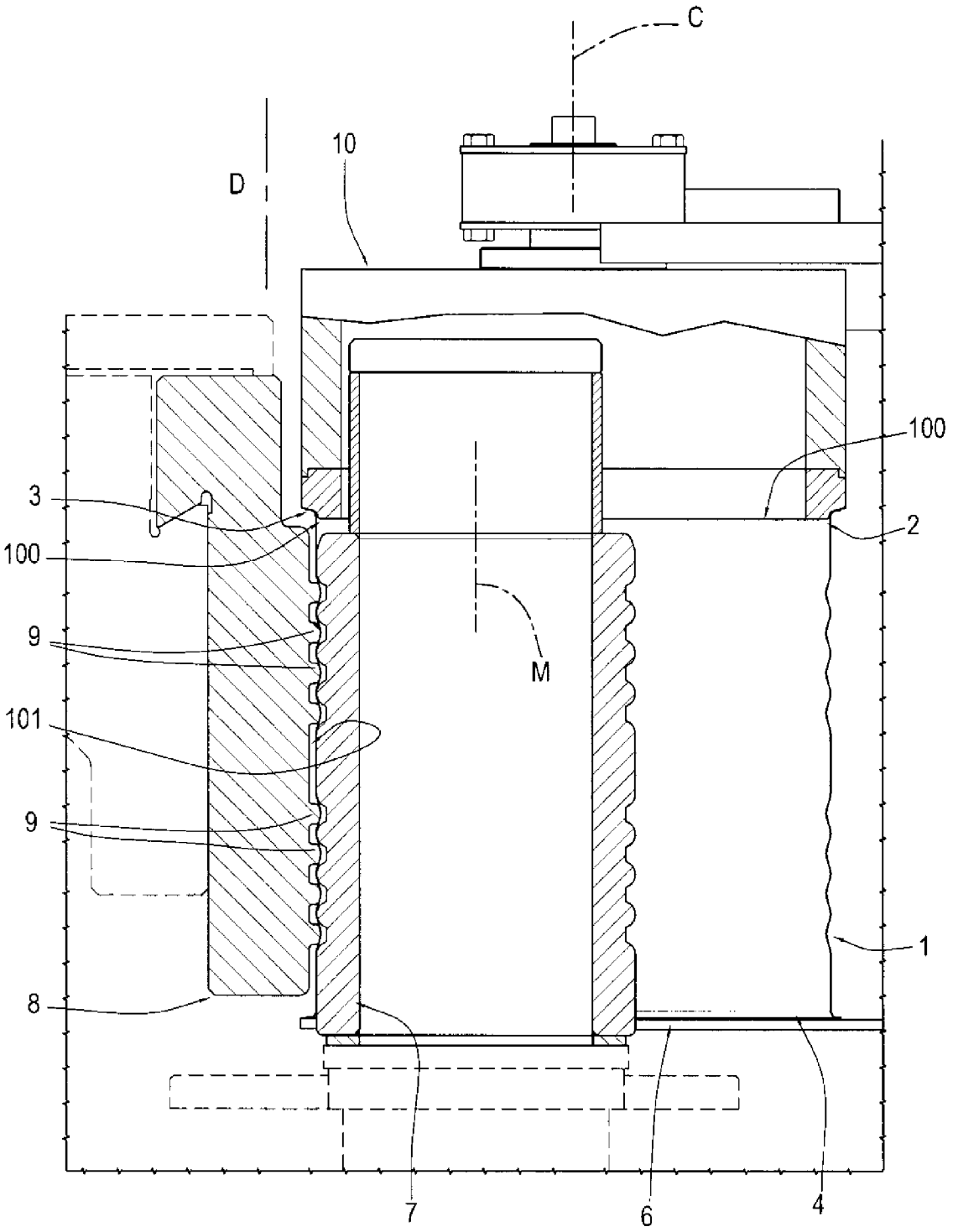


FIG.4

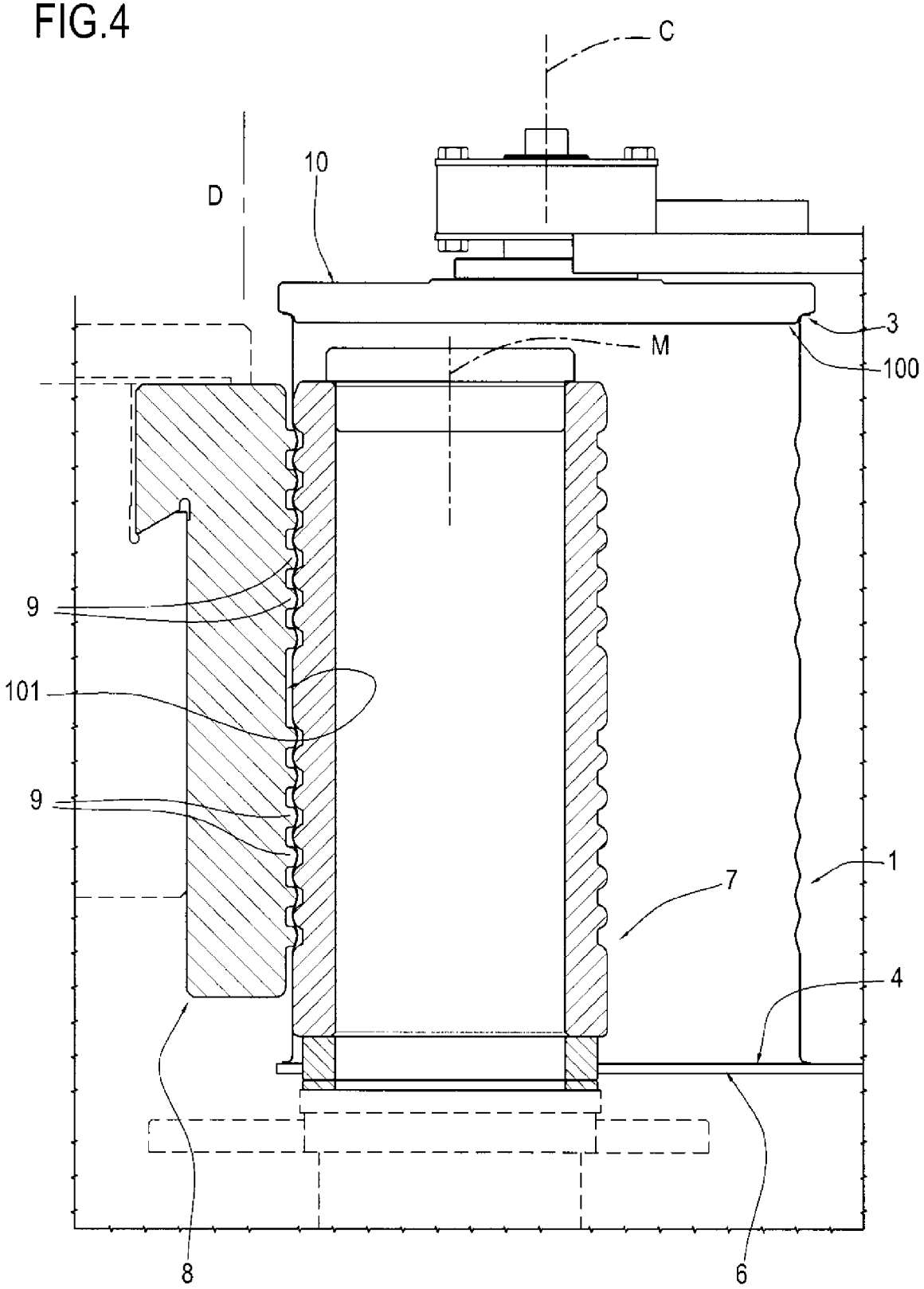


FIG.5

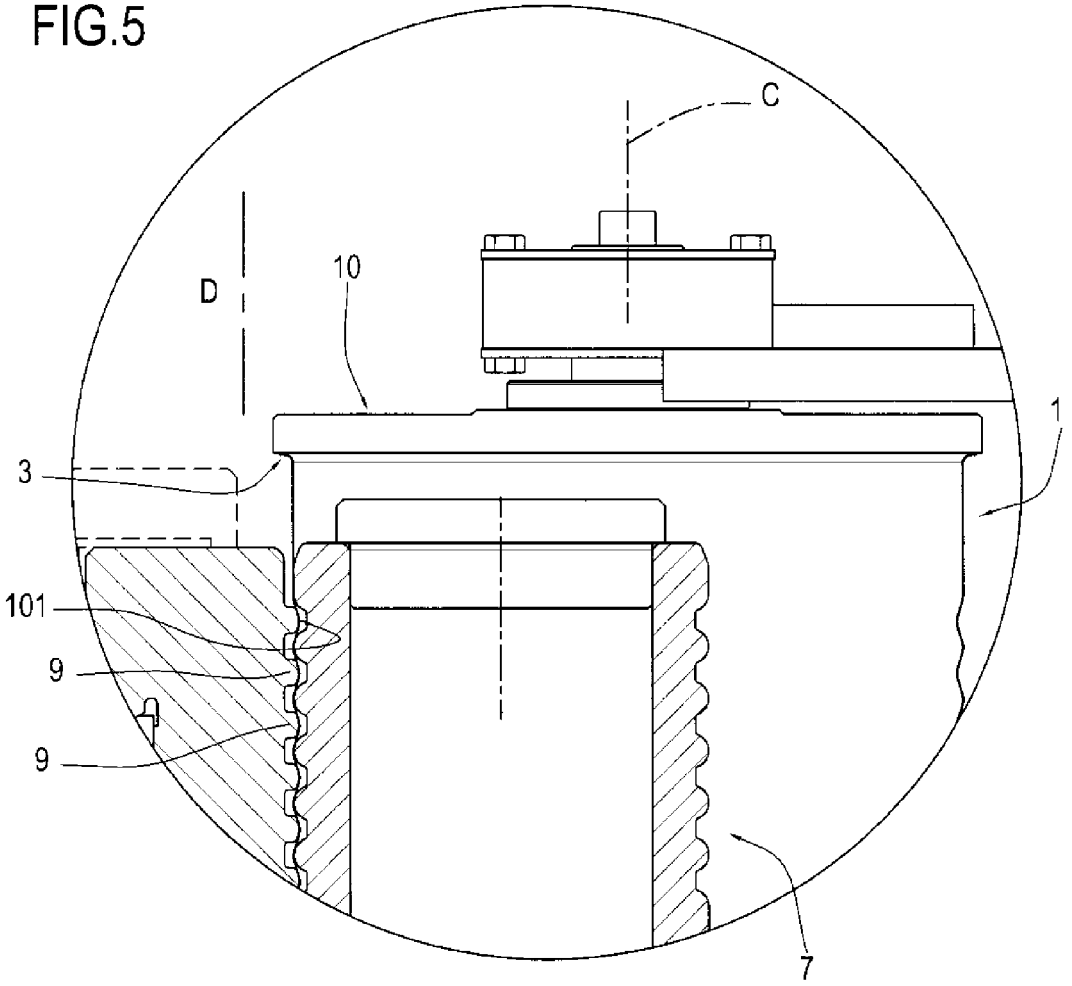
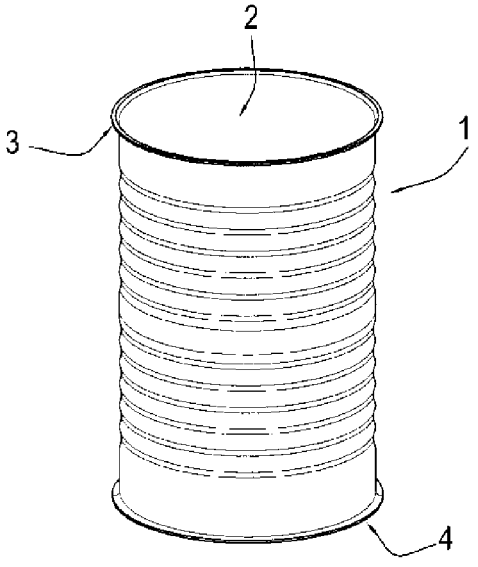


FIG.6



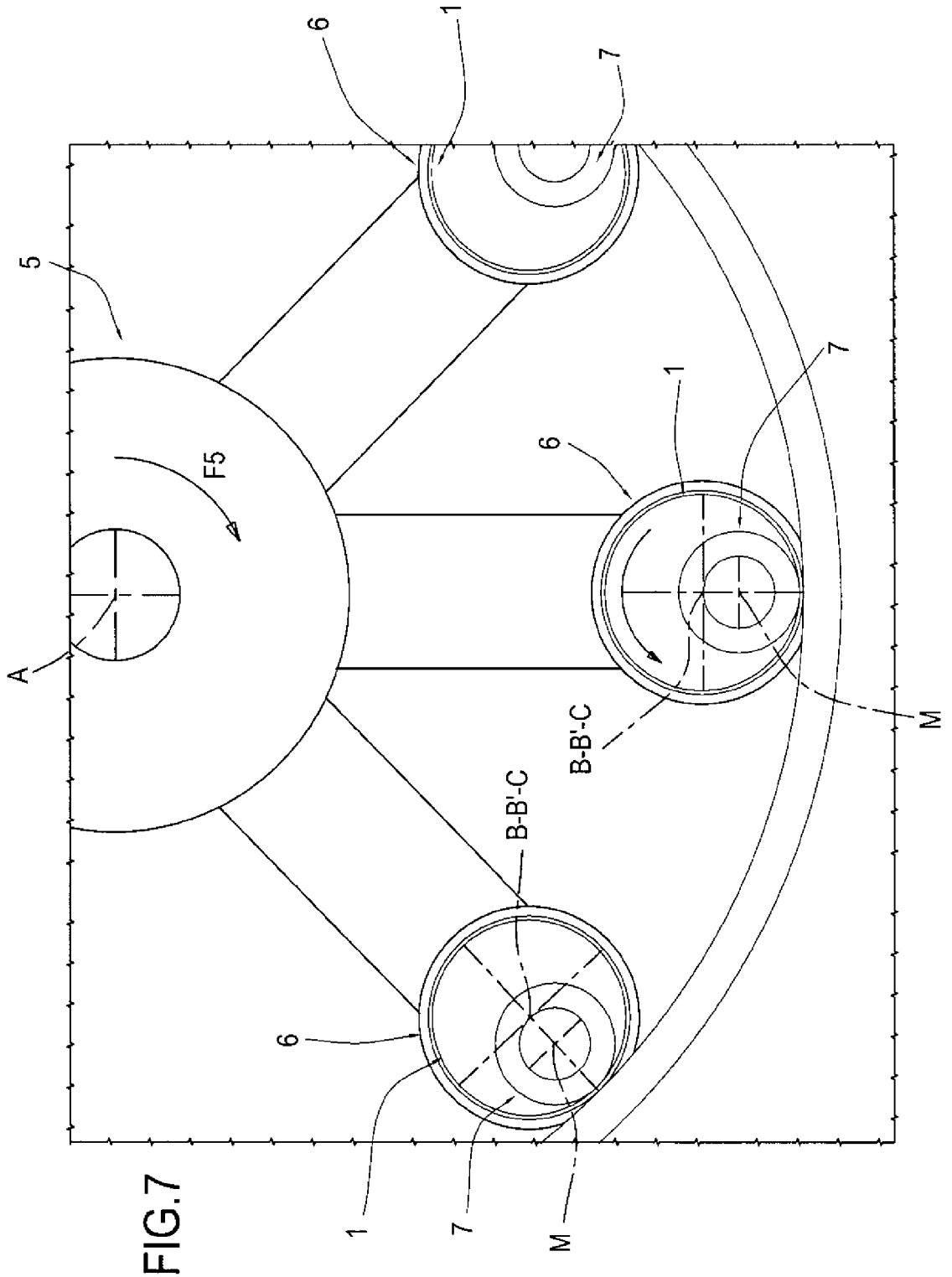


FIG.7

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EUROPEAN SEARCH REPORT

Application Number
EP 07 10 8927

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	DE 197 30 900 A1 (JOST INDUSTRIEBETEILIGUNGSGESE [DE]) 21 January 1999 (1999-01-21) * column 2, lines 45-60; claims 1-4; figures 2-4 * -----	1,2,4	INV. B21D51/26

TECHNICAL FIELDS SEARCHED (IPC)

B21D

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	21 August 2007	Pothmann, Johannes

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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21-08-2007

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 19730900 A1	21-01-1999	EP 0893175 A2	27-01-1999

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