(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
21 February 2008 (21.02.2008)

PCT

(10) International Publication Number
WO 2008/019455 A2

(51) International Patent Classification:
B65G 39/02 (2006.01)

(21) International Application Number:
PCT/BG2007/000015

(22) International Filing Date: 31 July 2007 (31.07.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
109649 14 August 2006 (14.08.2006) BG

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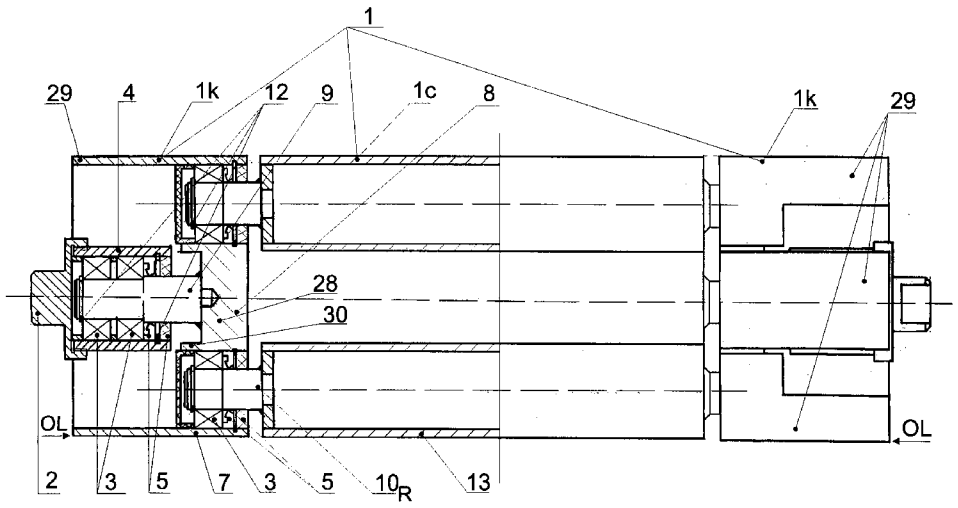
(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:
— *of inventorship (Rule 4.17(iv))*

Published:
— *without international search report and to be republished upon receipt of that report*

(54) Title: ROLLER



(57) Abstract: The roller with a fixed axle (2) with end sectors of special shape runs through the roller faces. A bearing (3) with an external ring fixed to a pass-through bearing housing (4) is fixed at the roller ends. Each fixed axle goes into a cap (6) connected to external end of bearing housing (4). In cylindrical body (1), there are at least two uniformly arranged groups, each of them having at least two uniformly arranged spokes (7), external ends of spokes being welded to internal surface of cylindrical body, and internal ends of spokes going into a flange (8) with a centrally welded mobile axle (9), ends of axle being rigidly connected to respective internal rings of bearings (3). Cylindrical body comprises three parts. Axle (9k) is shortened and fixed to respective flange in each end part (1k), and respective additional fixed axles (10R) are mounted on each of its spokes, a bearing (11) being mounted on each of axles.

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ROLLER

FIELD OF APPLICATION

The invention relates to a roller applicable into devices for continuous transportation, in particular for belt and roller conveyors.

PREVIOUS STATE OF THE ART

It is known a roller [BG109384A], which consists of a cylindrical body. A respective fixed axle runs through each of the faces of said roller. A respective bearing is fixed in a typical manner to each of the ends of said roller, the outer ring of said bearing being fixed to a respective bearing housing. Labyrinth seals, corresponding to each bearing, are intended for protecting against moisture penetration. The bearing housing is a pass-through one. Each fixed axle goes into a cap connected to the external end of the respective bearing housing. In the cylindrical body, there are at least two uniformly arranged groups, each of said groups having at least two uniformly arranged spokes, the external ends of said spokes being welded to the internal surface of said cylindrical body, and the internal ends of said spokes going into a flange with a centrally welded mobile axle, the ends of said axle being rigidly connected to the respective internal rings of said bearings. Said labyrinth seals are arranged on the internal side between the bearing housing and said mobile axle. In an embodiment of the roller intended for operation under inclination, there is a welded pipe bushing to the lowest flange on the side of the lower bearing, said pipe bushing forming with said flange a protective enclosure around the upper part of lower bearing housing. In another embodiment of the roller intended for operation under inclination, the housing of said lower bearing is connected to said mobile axle and additionally welded spokes, and the lower fixed axle has a stop at its internal end and also has an extension, the internal ring of said lower bearing being rigidly connected thereto. Said labyrinth seals are arranged on the lower side of said lower bearing between

said lower fixed axle and the internal surface of said lower bearing housing and fixed by means of a cap with a circlip. It is possible that the mobile axle is a hollow one, the ends of said mobile axle being bearing housings for their respective bearings, and the fixed axles are extended into said bearing housings. Labyrinth seals are arranged between said caps and said mobile axle. The enclosed space in said mobile axle is filled with a lubricant liquid. There is a stopping circlip in the internal end of each extension of said fixed axles, each external ring of said bearings is fixed to said axle with an internal circlip, and each external face of said bearings is fixed by a locking circlip. It is possible that said lubricant liquid in said roller with a hollow mobile axle is of high viscosity. It is possible that said roller has a cylindrical body being uniformly perforated with openings. It is possible that said mobile axle in said roller is connected with said cylindrical body by means of single spokes at equal distances from one another, and each following spoke is displaced at a certain angle with respect to the previous spoke, wherein said spokes form a helical line. It is possible the diameter of said flanges in the roller is greater than the external diameter of said caps.

This roller is of limited applicability and effectiveness as after continuous use the external surface of the roller that operates in contact with the conveyor belt transportation wears off non-uniformly. Wear is maximal in the middle part of the roller, and even leads to rubbing through the material and forming of holes. Edges of those holes are frequently responsible for cutting the belt, which leads to time losses and repair expenses. Such rollers are difficult to be restored as welding of material over the damaged spots causes deformations that disturb the roller alignment and its subsequent utilization worsens the performance of the belt transportation. Moreover, repair welding-over leads to an increase in the roller's weight and respective increase in its inertia, which means that its driving requires more energy. All this leads to higher energy consumption of belt conveyance.

The aim of the invention consists in creating a roller characterized by extended applicability and increased maintainability and effectiveness.

TECHNICAL ESSENCE OF THE INVENTION

This aim is attained by creating a roller with cylindrical body. A respective fixed axle with connection-shaped end sectors passes through each of the faces of said roller. At each end of the roller, a respective bearing is fixed, the external ring of which is fixed to the respective bearing housing. Labyrinth seals, corresponding to each bearing, are intended for protecting against moisture penetration. The bearing housing is a pass-through one. Each fixed axle goes into a cap connected to the external end of the respective bearing housing. In said cylindrical body there are at least two uniformly arranged groups, each of them having at least two uniformly arranged N spokes, the external ends of said spokes being welded to the internal surface of said cylindrical body, and their internal ends going into a flange with a centrally welded mobile axle, the ends of said axle being rigidly connected with the respective internal rings of said bearings. Said labyrinth seals are arranged on the internal side between said bearing housing and said mobile axle. Said flanges are arranged at a distance of 0.16 to 0.25 parts of the length of said roller from their respective ends of said roller. Said cylindrical body consists of three parts – two end ones and a middle one. In each end part, said axle is shortened and fixed to said respective flange, and respective additional fixed axles are mounted on each of its spokes, on each of said axles being placed a respective bearing, fixed with a circlip to a pipe with diameter providing a unitary operating line of the external surfaces of the two end parts and the middle one.

In this roller, said bearing housing may be massive and made either of steel ST45 or ST3, or of industrial plastic material with parameters coinciding with those of steel ST45 or ST3, or of aluminium alloys, said bearing housing simultaneously being a flange as well. The fixed axles are fixed in said massive bearing housing by means of positioning locks in said openings.

It is possible the roller has a middle part, representing a set of P pipes, which are fixed to two special-shape flanges, each of said flanges representing a disk with a central opening for assembling fixation to its respective axle, as well as with P

openings, uniformly arranged along the periphery, for fixing said pipes. The center of each of said openings is located at a distance, equal to d/2, from the external end of said flanges. At least three pipes, arranged at an interval of 120°, have connection bolts welded at their face ends, said bolts passing through their respective openings and fixed to said flanges by their respective nuts. Said remaining pipes have connection pins welded at their face ends, passing freely through their respective openings, wherein short pipes having the same diameter as said pipes are welded as a mirror-image of the pipes on the external side of each flange.

It is possible that in said roller said bearings are sliding or radial ones, or angle ones with configuration of assembling, coinciding with that of said bearings, and arranged in the internal space between the respective flange and the face of said roller on its respective end. Said fixed axles are welded from outside to the face ends of their respective pipes, and said flange has a thickened middle part, to which said spokes being are welded, said spokes being of the form of seats for their respective bearings and having an external segment for providing an operating line, wherein their internal segment is shortened.

The number P of said pipes and their diameter d are mutually related in accordance with the following relationship:

$$P = \frac{0.013D \times w}{d} \quad ,$$

where:

D is the diameter of the operating line,

d is the external diameter of each pipe,

w is the number of revolutions per minute of said roller,

0.013 is a constant empirically defined coefficient.

It is possible that said roller has said cylindrical body and said respective fixed axle running through each of the faces of said roller. A respective bearing is

fixed at each end of said roller, the external ring of said bearing being fixed to a respective bearing housing. Labyrinth seals, corresponding to each bearing, are intended for protecting against moisture penetration. The bearing housing is a pass-through one, and each fixed axle goes into a cap connected to the external end of the respective bearing housing. In said cylindrical body there are at least two uniformly arranged groups, each of said groups having at least two uniformly arranged N spokes, the external ends of said spokes being connected to the internal surface of the cylindrical body, and their internal ends going into a flange with a centrally positioned mobile hollow axle, the ends of said axle being rigidly connected to the respective internal rings of said bearings. Said labyrinth seals are arranged on the internal side between said bearing housing and said mobile axle. Said flanges are arranged at a distance of 0.16 to 0.25 parts of the length of said roller. Said cylindrical body consists of multiple parts – two end ones and M middle ones (M = 1 to m). In each end part: said axle is fixed to the respective flange, and each middle part has spokes with flanges at both its face sides. Said flanges with their respective spokes and their respective end parts represent a monolithic body of metal or technical plastic material. Said axle has a non-round section form the first flange to the last one. All middle flanges have extensions on both their faces. The two end flanges have an extension solely on the side towards the group of middle parts. The whole group of all flanges is fixed by nuts on both sides.

In said roller said axle may be hollow and have an additional external flange with a lubricator mounted in its connection opening.

In said roller said external flange, said fixed axle, said cap and said bearing housing may form a monolithic seat for said bearings. Said flanges have protruding arresters uniformly arranged along their periphery. A respective half-pipe is welded on each two arresters which are arranged on one longitudinal line. The mobile axles are fixed to their respective flanges by means of a self-locking nut.

In said roller it is possible that said labyrinth seal 5 consists of a wiper seal between said bearing and said circlip, and there is a tightly packed plastic protective washer to said labyrinth seal and said circlip.

An advantage of said roller is that it features extended applicability and increased maintainability and effectiveness.

DESCRIPTION OF ACCOMPANYING FIGURES

The invention is explained in more details with the aid of one exemplary embodiment of said roller shown in the accompanying figures, where:

- Fig. 1 is a longitudinal section of a first embodiment of said roller;
- Fig. 2 is a transversal section along AA through the middle of the roller of Fig. 1;
- Fig. 3 is a transversal section along BB through a flange of the roller of Fig. 1;
- Fig. 4 is a longitudinal section of a second embodiment of said roller;
- Fig. 5 is a longitudinal section of a third embodiment of said roller;
- Fig. 6 is a transversal section along CC through the middle of the roller of Fig. 5;
- Fig. 7 is a transversal section along DD before a flange of the roller of Fig. 5;
- Fig. 8 is a longitudinal section of a fourth embodiment of said roller;
- Fig. 9 is the flange of the roller of Fig. 8;
- Fig. 10 is a transversal section of the flange of the roller of Fig. 8;
- Fig. 11 is a longitudinal section of another roller;
- Fig. 12 is a transversal section along EE of the middle part of the roller of Fig.11;
- Fig. 13 is a longitudinal section along FF of a middle flange of the roller of Fig. 11;

- Fig. 14 is a transversal section along GG of an end part of the roller of Fig. 11;
- Fig. 15 is a longitudinal section of the roller with flanges with arresters;
- Fig. 16 is a transversal section along HH of the roller of Fig. 15;
- Fig. 17 is a transversal section along JJ of the roller of Fig. 15;
- Fig. 18 is a section of said labyrinth seal.

PREFERRED EMBODIMENT AND FUNCTIONING OF THE INVENTION

The roller of Fig.1, 2 and 3 has a cylindrical body 1. A respective fixed axle 2 with connection-shaped end sectors runs through each of the faces of the roller. A respective bearing 3 is fixed at each end of the roller, the external ring of said bearing 3 being fixed to respective bearing housing 4. Labyrinth seals 5 corresponding to each bearing 3 are intended for protecting against moisture penetration. The bearing housing 4 is a pass-through one. Each fixed axle 2 goes into a cap 6 connected to the external end of the respective bearing housing 4. In said cylindrical body 1 there are at least two uniformly arranged groups, each of these groups having at least two uniformly arranged N spokes 7, the external ends of said spokes being welded to the internal surface of said cylindrical body 1, and their internal ends go into the flange 8 with a centrally welded mobile axle 9, the ends of said mobile axle being rigidly connected to the respective internal rings of bearings 3. The labyrinth seals 5 are arranged on the internal side between the bearing housing 4 and the mobile axle 9. The flanges 8 are arranged on their respective ends of the roller at a distance of 0.16 to 0.25 parts of the length of said roller. Said cylindrical body 1 consists of three parts – two end parts 1k and a middle one 1c. In each end part 1k, said axle 9k is shortened and fixed in the respective flange 8, and on each of its spokes 7 there are mounted respective additional fixed axles 10_R, on each of said axles a respective bearing 11 being placed and fixed with a circlip 12 to a pipe 13 with diameter providing a unitary

operating line OL of the external surfaces of the two end parts 1k and the middle part 1c.

In said roller (Fig. 4), the bearing housing 4 may be massive and made either of steel ST45 or ST3, or of industrial plastic with parameters, coinciding with those of steel ST45 or ST3, or of aluminium alloys, and at the same time said bearing housing is also a flange. In this massive bearing housing 4 there are fixed axles 10_R, which are fixed by means of respective positioning locks 14 in the openings 15.

It is possible that the roller (Fig. 5, 6, and 7) has a middle part 1c, representing a set of P pipes 21p, which are fixed to two flanges 22 (in the place of flanges 8), each of them representing a disk with a central opening 23 for assembling fixation to its respective axle 9 as well as with P openings 24, uniformly arranged along the periphery, for fixing the pipes 21p. The center of each of these openings is at a distance from the external end of flanges 22, which is equal to d/2. At least three pipes 21, arranged at an interval of 120°, have connection bolts 25, welded at their face ends, which pass through their respective openings 24 and are fixed to said flanges 22 by their respective nuts 26. The remaining pipes 21 have connection pins 27, welded at their face ends, which pass freely through their respective openings 24, wherein short pipes 33 with the same diameter as pipes 21 are welded on the external side of each flange 22 as a mirror-image of pipes 21.

It is possible in the roller (Fig. 8, 9 and 10) that the bearings 11 are sliding or radial, or angle bearings with a configuration of assembling, which coincides with that of bearings 3, and are arranged in the internal space between the respective flange 8 and the face of the roller on its respective end. The fixed axles 10_R are welded from outside to the face ends of their respective pipes 13, and the flange 8 has a thickened middle part 28, to which the spokes 7 are welded, said spokes being of the form of seats for their respective bearings 3 and having an external

segment 29 for ensuring the operating line OL, wherein their internal segment 30 is shortened.

The number P of pipes 13 and 21 and their diameter d are related in accordance with the following relationship:

$$P = \frac{0.013D \times w}{d},$$

where:

D is the diameter of the operating line OL,

d is the external diameter of each pipe 21,

w is the number of revolutions per minute of said roller,

0.013 is a constant empirically defined coefficient.

It is possible that the roller (Fig. 11, 12, 13, and 14) has a cylindrical body 1 and a respective fixed axle 2 passing through each of the faces of said roller. At each end of said roller a respective bearing 3 is fixed, the external ring of said bearing 3 being fixed to respective bearing housing 4. Labyrinth seals, corresponding to each bearing 3, are intended for protecting against moisture penetration. The bearing housing 4 is a pass-through one, and each fixed axle 2 goes into a cap 6 connected to the external end of the respective bearing housing 4. In the cylindrical body 1 there are at least two uniformly arranged groups, each of these groups having at least two uniformly arranged N spokes 7, the external ends of said spokes being connected to the internal surface of said cylindrical body 1, and their internal ends go into flange 8 with a centrally positioned mobile hollow axle 9, the ends of said axle 9 being rigidly connected to the respective internal rings of the bearings 3. The labyrinth seals 5 are arranged on the internal side between the bearing housing 4 and the mobile axle 9. The flanges 8 are arranged at a distance of 0.16 to 0.25 parts of the length of said roller. The cylindrical body 1 consists of multiple parts – two end ones 1k and M middle ones 1cm (M = 1 to m). Each end part 1k of said axle 9 is fixed to the respective flange 8, and each middle

part 1cm has spokes 7 with flanges 8 of its two face sides. The flanges 8 with their respective spokes 7 and respective parts 1k represent a monolithic body of metal or technical plastic material. Said axle 9 has a non-round section from the first flange 8 to the last one. All flanges 8c have extensions 16 on their two faces. The two flanges 8k have an extension 16 solely on the side towards the group of middle parts 1c. The whole group of all flanges 8 is fixed by nuts 17 on both sides.

In the roller (Fig. 11), said axle 2 is hollow and has an additional external flange 32, a lubricator 31 being mounted in the connection opening of said flange 32.

In the roller (Fig. 15, 16 and 17), the external flange 32, the fixed axle 2, the cap 6 and the bearing housing 4 form a monolithic seat of the bearings 3. The flanges 22 have protruding arresters 34 uniformly arranged along their periphery. A respective half-pipe 35 is welded on every two arresters 34, which are arranged on one longitudinal line. The mobile axles 9 are fixed to the respective flanges 22 with a self-locking nut 36.

It is possible that in the roller (Fig. 18) the labyrinth seal 5 consists of a wiper seal 5.1 between the bearing 3 and the circlip 12.1, and there is a tightly packed plastic protective washer 5.2 to said labyrinth seal 5 and said circlip 12.1.

The roller functions as follows:

In the embodiment of Figs. 1 to 4 and 8, the roller 1 in operating position is placed on a conveyor, and with its operating line OL of its constituting two end rollers 1k and the middle constituting roller 1c it touches the working belt which is constantly moving over it (not shown in the figures). As a result, the friction between the roller and the belt is diminished because the pipe 13 rotates around its own axles 10_R and 10_L. This leads to decreasing of the energy required for driving the conveyor belt. At the same time, the wear of the operating surface of the roller and of that surface of the belt which is in contact with the roller is also diminished due to the same reason. This is so, because of this rotation of pipes 13 the belt does not slip, but rolls over these pipes. Here, even when the belt is slightly loaded, its

contact with the roller is sufficient for starting the rotation of pipes 13. This is so, due to the fact that as a result of the complex support formed by the bearings 3 and 11 in pipes 13 and in the roller as a whole, the pipes start rotating at a lesser force. The diminishment of the force for starting the rotation is also a result from the decreased mass of each of the pipes 13. This prevents the irregular wear of the operating surface of the roller, which may result from the continuous friction of the belt on its fixed operating surface. At eventual locking of said axle 10_R or 10_L, which stops the rotation of respective pipe 13 around said axle, under the action of the belt that starts slipping over that pipe 13, the entire roller will rotate around said axle 9 to a position in which at least one other trouble-free pipe 13 will be in rolling contact with the belt. In another case, when the main axle 9 is wedged and the roller stops rotating, in the same way that of pipes 13, which was the last and continues to be in contact with the belt, will go on ensuring the normal operation of the conveyor as it itself turns around its axle 10.

Bearings 3 or 11 for pipes 13 facilitate the operation of bearings 3 of the main axle 9, considerably prolonging in such a way the operational life of the roller.

To ensure the smooth operation of the roller, the number P of pipes 13 and 21 and their diameter d are related in accordance with the following relationship:

$$P = \frac{0.013D \times w}{d} \quad ,$$

where:

D is the diameter of the operating line OL,

d is the external diameter of each pipe 21,

w is the average number of revolutions per minute of said roller,

0.013 is a constant empirically defined coefficient.

As P may be a non-integer number, it should be rounded.

It is obvious that the smaller the diameter d of pipes 13 and 21 and the

greater the diameter D of the roller, the larger the number of pipes P. For example, for a diameter of the roller D = 133 mm and diameter of pipes d = 20 mm, and for an average number of revolutions per minute w = 100, P is equal to 8.645, and the real number of pipes 21 is 8 (Figs. 6 and 7). In another example for a diameter of the roller D = 133 mm and diameter of pipes d = 45 mm, and for an average number of revolutions per minute w = 100, P is equal to 3.758, and the real number of pipes 21 is 4 (Figs. 2 and 10).

At the same time, the clearance obtained between the belt and two adjacent rollers 13 or 21, when the belt is in contact with both adjacent rollers, allows additional ventilating of the conveyor, and in such a way it also facilitates the self-cleaning of the conveyor, because the eventually penetrating pollutants are easily self-removed through that clearance during motion.

The choice of material for the massive bearing housing 4 (Fig. 4) is conformed with the necessity of making the roller lighter, and for that reason the material is either steel ST45 or ST3, or industrial plastic or aluminium alloy with parameters coinciding with or close to those of steel ST45 or ST3. The lighter roller consumes less energy in rotation starting and features diminished loading of bearings.

In all embodiments of the roller with rotating pipes 13 or fixed pipes 21, the most probable failure is the wedging or rubbing-through of one of these pipes. It is sufficient to replace that pipe 21 and the roller is completely restored. This makes the roller and the entire conveyor easy for maintaining, which is accompanied by lower maintenance cost.

The fixed axles 2 on caps 6 (Fig. 1) ensure the engagement of said roller to the roller bearers (not shown in the figures) of the conveyor. These caps 6 close the bearing housing 4 and in this way they protect the bearings 3 from pollution, at the same time retaining the lubricant liquid. Labyrinth seals 5 close said bearing housing 4 from its internal side and also protect its from external pollutants as well as from leakage of the lubricant liquid. A unitary operating line OL is provided by

the flanges 8 through the form of their spokes 7 (Figs. 2 and 3) and the arrangement of connection openings on the spokes 7 for the central axle 9 and for all rollers 1c, as well as through the rollers 1k connected to the external ends of spokes 7. The circlips 12 block the bearings 3 and 11 to their respective axles 9 and $10_R - 10_L$. Nuts 14 fix their respective axles $10_R - 10_L$ in their respective spokes 7 of flanges 8.

In the embodiment of Fig. 4 the nuts 14 fix the axles $10_R - 10_L$ in seats 15 in the integrated bearing housing 4, which performs simultaneously also the functions of the flange 8 with spokes 7. Here, fixed axles 9 through their external shanks serve for engaging the roller to the roller bearers (not shown in the figure) of the conveyor. For in this case bearing housings 4 are not pass-through ones, their length is smaller and as a result the pipes 13 are longer, which increases the reliability of said roller under higher loads. This structure of the bearing housing 4 diminishes the weight of the roller and in addition simplifies its assembling and disassembling.

In the embodiment of Figs. 8, 9, and 10, the flanges 8 with a thickened middle part 28 and the formed bearing seats of the external segment 29 and the internal one 30 provide for said bearings 3 the possibility of operating with increased reliability, whereas, at the same time, the external segments 29 also provide an operating line OL as they are aligned with the operating line of pipes 13. Due to the fact that the bearing housings are located outside of the rollers 13, in case of eventual replacement of failed such rollers the bearings 3 are not discarded, and if they are in good condition, they remain in use with a new roller 13 mounted in them.

In the embodiment of Fig. 5, 6, and 7, the pipes 21 do not rotate around their axis. Due to this fact, only those surfaces of pipes 21 are rubbed through during operation, which are in contact with the conveyor belt. When a pipe 21 is rubbed through, the structure allows its loosening by means of the bolt 25 and nut 26, that are securing it, as well as its rotating to a position in which a new non-worn

segment makes contact with the belt. When any of pipes 21 becomes worn off over all its sides, it can be easily dismantled and replaced by a new one. Here, the flange 22 is modified in such a way that it ensures the formation of the appropriate clearance between adjacent pipes 21. These possibilities prolong the operational life of the roller at a minimum cost. Those pipes 21, which are not fixed with bolt 25 and nut 26, are fixed easily to flanges 22 with the shields 27. Pipes 33 are welded to the flange 22 on the sides towards the ends of said roller 1, said pipes being mirror-image extensions of the pipes 21 as well as not being subject to replacement for they are almost without any wear.

In the embodiment of Figs. 11, 12, 13, and 14, which represents a second independent solution, the middle part of said roller 1 is divided into M separate rollers 1cm. Extensions 16 of said flanges 8c provide a clearance between said rollers 1cm. Said clearance serves for self-cleaning of said roller under the impact of gravitational and centrifugal forces. At the two ends of the package of rollers 1cm there are similar one-sided extensions 16 of the two end rollers 1k. To stabilize the structure, the package of all rollers 1k and 1cm is fixed on said hollow axle 9 by nuts 17. The irregular form of said axle 9 coincides with respective clearance with the central openings of all flanges 8. This irregular form prevents any of the rollers 1cm from undesired rotation.

Here, said lubricator 31 at the end of one of the fixed axles 2 provides the possibility of lubricating the two bearing seats through the hollow axle that serves simultaneously as a container for the lubricant liquid. An additional flange 32 at the end of each fixed axle 2 does not allow the roller 1 to get out of the stands of the roller bearer (not shown in the figure) and cause a failure of the conveyor.

In this case, assembling is performed as follows: first of all, all rollers 1k and 1cm are placed on the hollow axle 9 and fixed by means of nuts 17. Then preliminarily prepared assemblies of said bearing housings 4 and bearings 3 along with said labyrinth seals 5 and circlips 12.1 are mounted on the two journals of said axle 9. After that, fixation of the structure is performed by using the circlips

12.2. At first, the fixed axle 2 without any lubricator is mounted with the aid of the massive cap 6.1. Then said axle 9 is set upright with the opening for lubricator facing up and filled with lubricant liquid along with the bearing spaces. After that, the second fixed axle 2 is mounted by means of the pass-through massive cap 6.2 with lubricator 31, and the roller is ready for use. Using said lubricator 31, it is possible to perform periodically additional introduction of lubricant liquid into the system. If necessary to replace any of the middle rollers 1cm, disassembling is easily done in reverse order. For a set of axles 9 with a length difference, which is a multiple of the length of one middle roller 1cm, it is possible to assemble easily rollers of various lengths, wherein, if necessary, only the worn-off rollers are replaced. This leads to savings of resources and materials due to the fact that no entire roller is replaced.

In the embodiment of Figs. 15, 16, and 17, the roller features simplified assembling as the bearing seat is monolithic and unites the external flange 32, fixed axle 2, cap 6, and bearing housing 4. Additionally, said roller is made lighter due to using half-pipes 35 instead of entire pipes 21. When one of the half-pipes 35 is more or less worn away, it is easily replaced by being cut off, its seat is cleaned up, and a new pipe 35 is welded in its place.

All embodiments may use a known labyrinth seal 5, but in this case a special such labyrinth seal has been developed, wherein said washer 5.2 additionally protects said wiper seal 5.1 and respectively the bearing 3 itself against penetration of external pollutants. Washer 5.2 is made of technical acid- and heat-resistant plastic material.

PATENT CLAIMS

1. A roller with a cylindrical body, wherein a respective fixed axle with connection-shaped end sectors passes through each of the faces of said roller, a respective bearing being fixed at each end of said roller, the external ring of said bearing being fixed to a respective bearing housing, wherein labyrinth seals corresponding to each bearing are intended for protecting against moisture penetration, said bearing housing being a pass-through one, and each fixed axle going into a cap connected to the external end of said respective bearing housing, there being at least two groups, uniformly arranged, in the cylindrical body, each of said groups having at least two uniformly arranged N spokes, the external ends of said spokes being welded to the internal surface of said cylindrical body, and their internal ends going into a flange with a centrally welded mobile axle, the ends of said axle being rigidly connected to the respective internal rings of said bearings, and said labyrinth seals being arranged on the internal side between said bearing body and said mobile axle, **characterized in that** the flanges (8) are arranged at a distance of 0.16 to 0.25 parts of the length of said roller from their respective ends of said roller, and said cylindrical body (1) comprises three parts – two end ones (1k) and a middle one (1c), said axle (9k) being shortened and fixed to said respective flange (8) in each end part (1k), and respective additional fixed axles (10_R) being mounted on each of its spokes (7), a respective bearing (11) being mounted on each of said axles and fixed with a circlip (12) to a pipe (13) with diameter providing a unitary operating line (OL) of the external surfaces of both end parts (1k) and the middle one (1c).

2. A roller according to Claim 1, **characterized in that** the bearing housing (4) is a massive one and made either of steel ST45 or ST3, or of industrial plastic material with parameters coinciding with those of steel ST45 or ST3, or of aluminium alloys, said bearing housing simultaneously being a flange as well, the

fixed axles (10_R) being fixed in said massive bearing housing (4) by means of a respective positioning lock (14) in the openings (15).

3. A roller according to Claim 1, **characterized in that** its middle part (1c) represents a set of P pipes (21p), which are fixed to two flanges (22) (in place of said flanges 8), each of which representing a disk of a central opening (23) for assembling fixation to its respective axle (9), as well as with P openings (24), uniformly arranged along the periphery, for fixation of said pipes (21p), the center of each of these openings being at a distance from the external end of said flanges (22) equal to d/2, wherein at least three pipes (21), arranged at intervals of 120°, have connection bolts (25), welded at their faces, passing through their respective openings (24) and fixed to said flanges (22) with their respective nuts (26), and said remaining pipes (21) have connection pins (27), welded at their faces, passing freely through their respective openings (24), whereas on the external side of each flange (22), as a mirror-image of said pipes (21), there are welded short pipes (33) having the same diameter as said pipes (21).

4. A roller according to Claim 1, **characterized in that** said bearings (11) are sliding or radial ones, or angle ones having a configuration of assembling, coinciding with that of said bearings (3), and are arranged in the internal space between the respective flange (8) and the face of said roller at its respective end, wherein said fixed axles (10_R) are welded from outside to the face ends of their respective pipes (13), and said flange (8) has a thickened middle part (28), to which said spokes (7) are welded, said spokes being of the form of seats for their respective bearings (3) and having an external segment (29) for ensuring said operating line (OL), whereas their internal segment (30) is shortened;

5. A roller according to Claims 1 to 4, **characterized in that** the number P of pipes (13) and (21) and their diameter d are mutually related in accordance with the following relationship:

$$P = \frac{0.013D \times w}{d},$$

where:

D is the diameter of the operating line OL,

d is the external diameter of each pipe 21,

w is the number of revolutions per minute of said roller,

0.013 is a constant, empirically defined coefficient.

6. A roller with a cylindrical body 1, wherein a respective fixed axle runs through each of the faces of said roller, a respective bearing being fixed at each end of said roller, wherein the external ring of said bearing is fixed to a respective bearing housing, wherein labyrinth seals corresponding to each bearing are intended for protecting against moisture penetration, said bearing housing being a pass-through one, and each fixed axle going into a cap connected with the external end of the respective bearing housing, there being at least two uniformly arranged groups in said cylindrical body, each group having at least two uniformly arranged N spokes, the external ends of said spokes being connected to the internal surface of the cylindrical body, and their internal ends go into a flange, a mobile hollow axle being positioned centrally to said flange, the ends of said mobile hollow axle are rigidly connected to the respective internal rings of said bearings, and said labyrinth seals being arranged on the internal side between said bearing housing and said mobile axle, **characterized in that**, said flanges (8) are arranged at a distance of 0.16 to 0.25 parts of the length of said roller, and said cylindrical body (1) consists of multiple parts – two end ones (1k) and M middle ones (1cm) (M = 1 to m), the axle (9) being fixed in the respective flange (8) in each end part

(1k), and each middle part (1cm) having spokes (7) with flanges (8) on both its face sides, wherein said flanges (8) with their respective spokes (7) and respective parts (1k) represent a monolithic body of metal or technical plastic material, and said axle (9) has a non-round section from the first flange to the last one (8), all the flanges (8c) having extensions (16) on both their faces, both flanges (8k) having an extension (16) solely on the side to the group of middle parts (1c), and the whole group of all flanges (8) being fixed on both sides by means of nuts (17).

7. A roller according to Claims 1 to 5, **characterized in that** the axle (2) is a hollow one and has an additional external flange (32), a lubricator (31) being placed in the connection opening of said flange.

8. A roller according to Claims 1 to 5, **characterized in that** said external flange (32), said fixed axle (2), said cap (6) and said bearing housing (4) form a monolithic seat of said bearings (3), wherein said flanges (22) have protruding arresters (34) uniformly arranged along their periphery, a respective half-pipe (35) being welded on each two arresters (34), which are arranged on one longitudinal line, and said mobile axles (9) being fixed to their respective flanges (22) by means of a self-locking nut (36).

9. A roller according to Claims 1 to 5, **characterized in that** the labyrinth seal (5) consists of a wiper seal (5.1) between the bearing (3) and the circlip (12.1), and there is a tightly packed plastic protective washer (5.2) to said labyrinth seal (5) and said circlip (12.1).

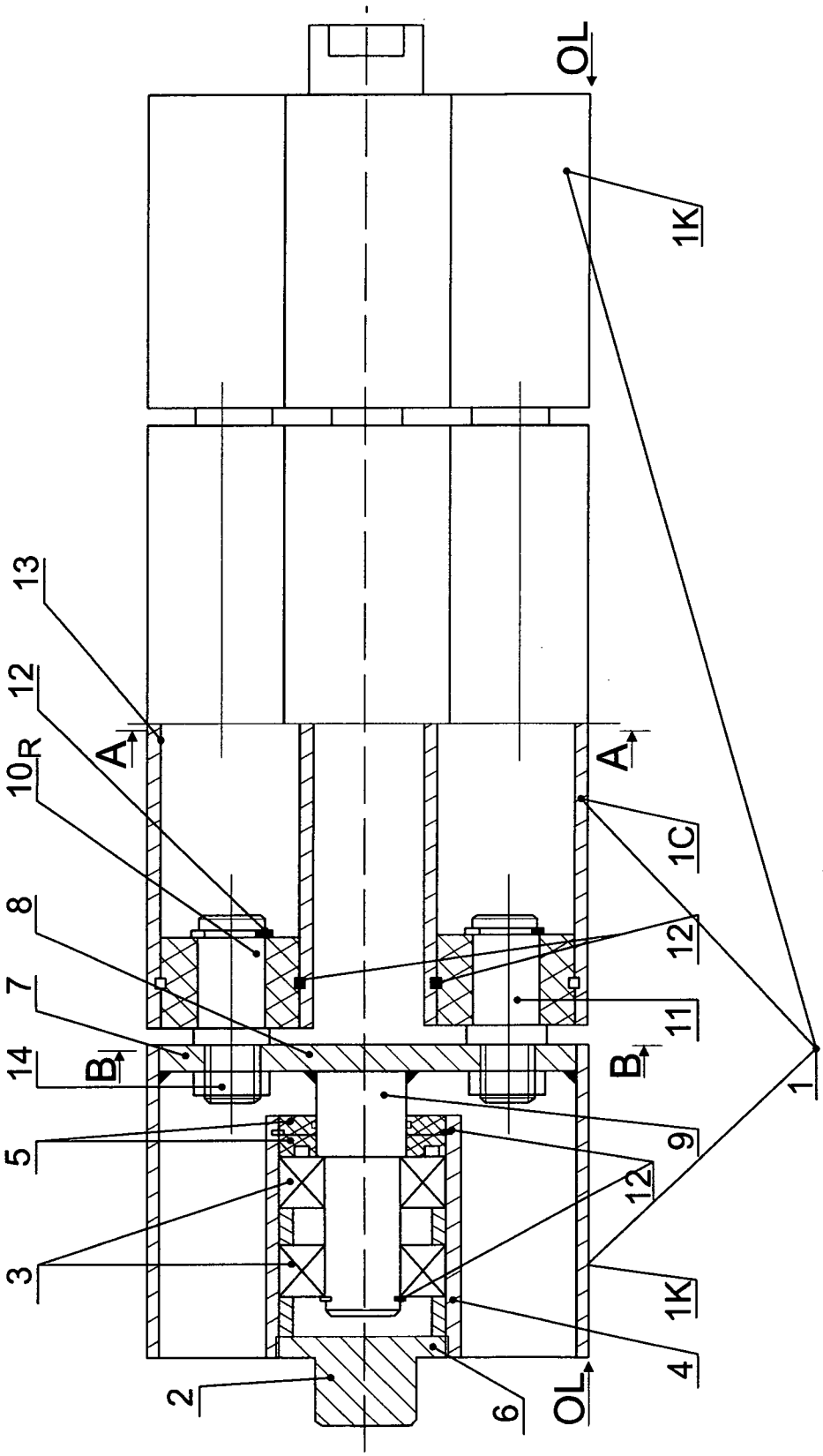


Fig. 1

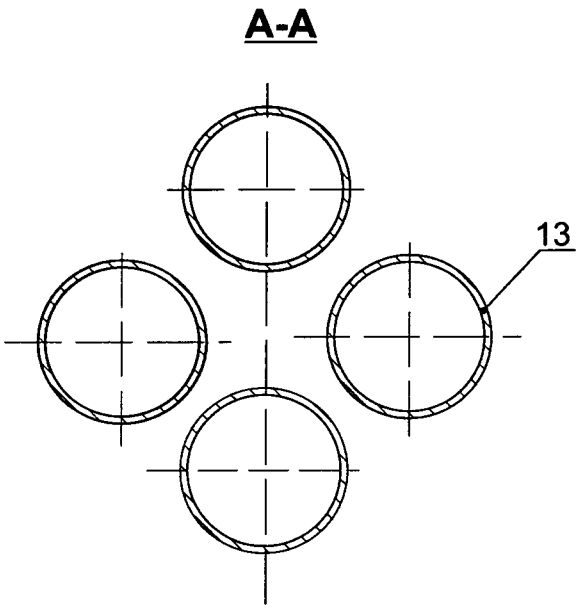


Fig. 2

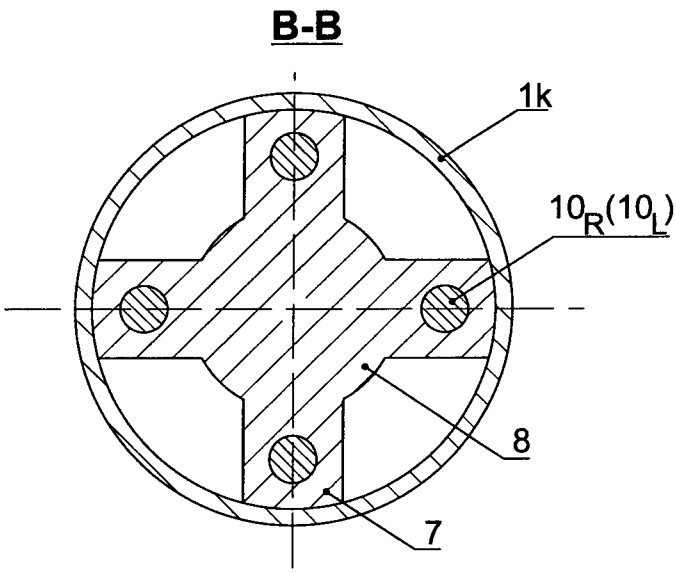


Fig. 3

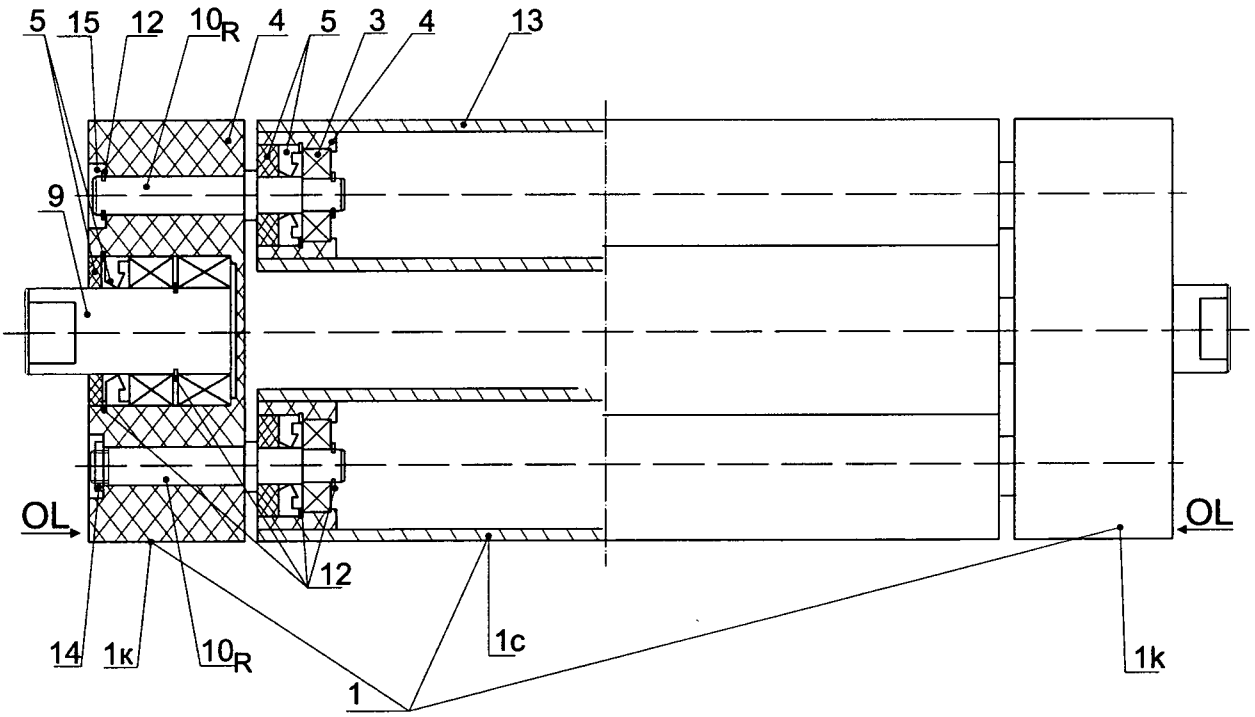


Fig. 4

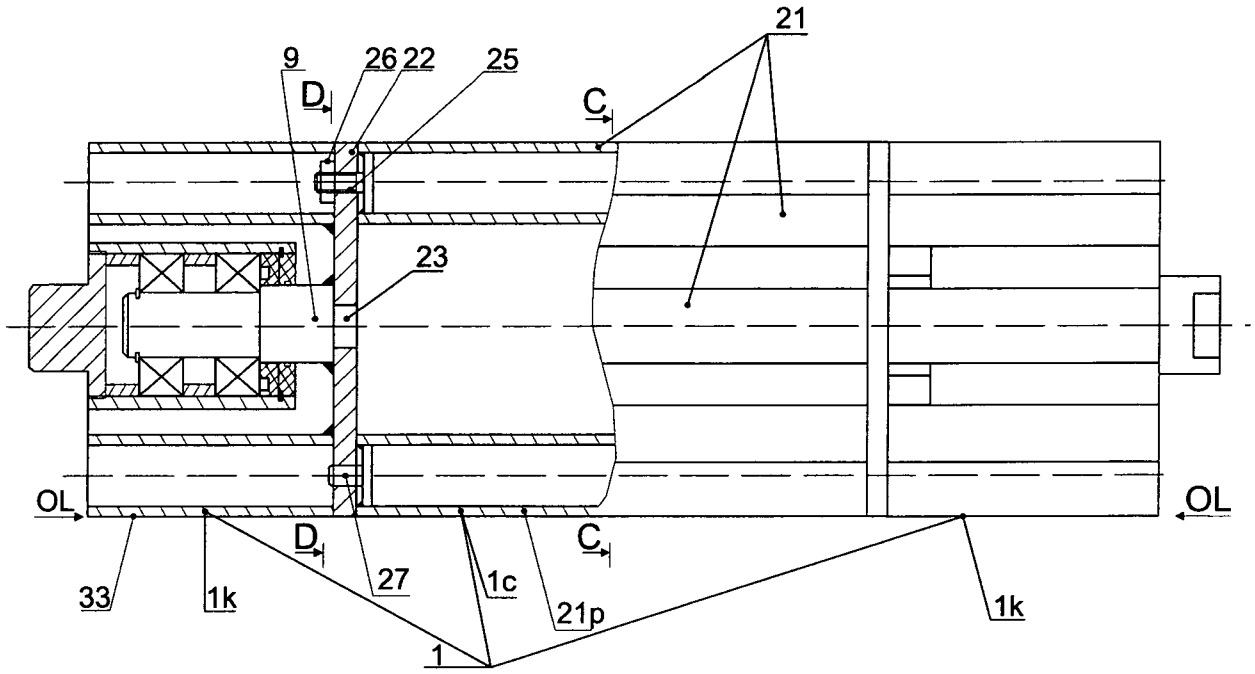


Fig. 5

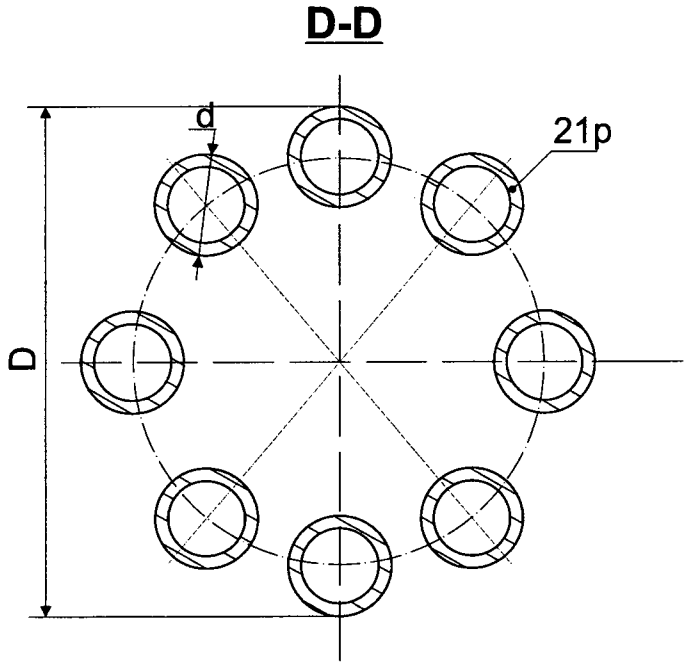


Fig. 6

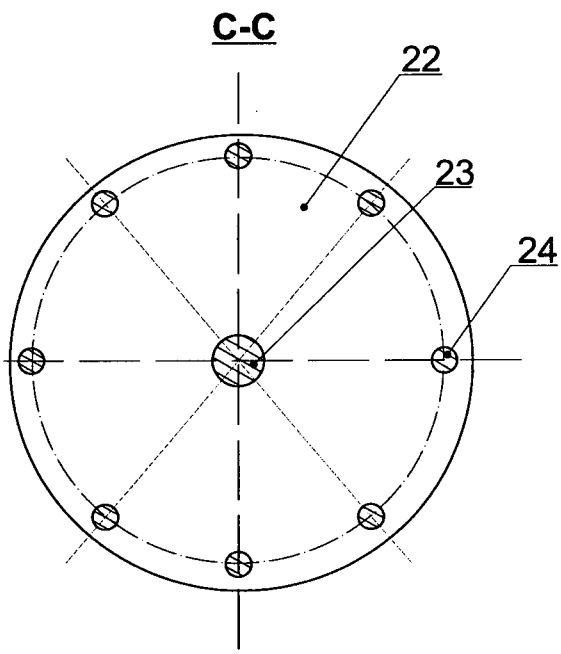
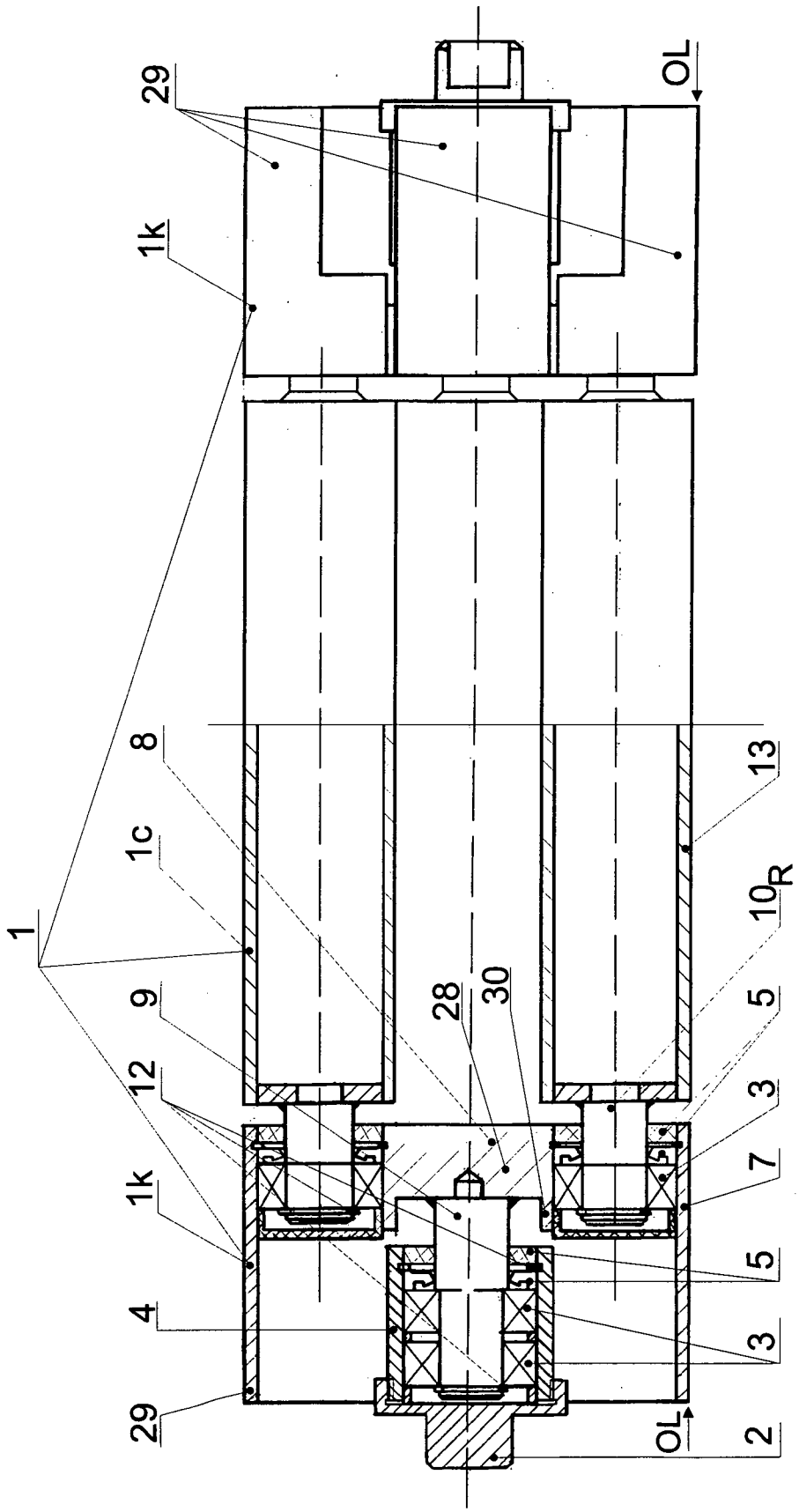


Fig. 7



Фиг. 8

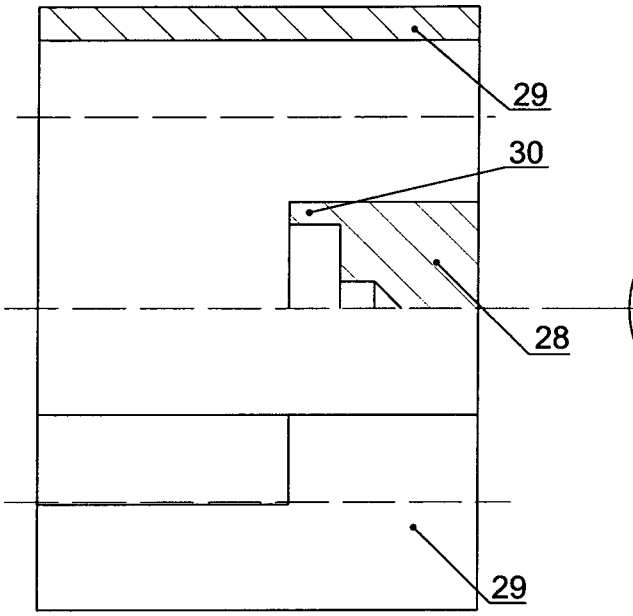


Fig. 9

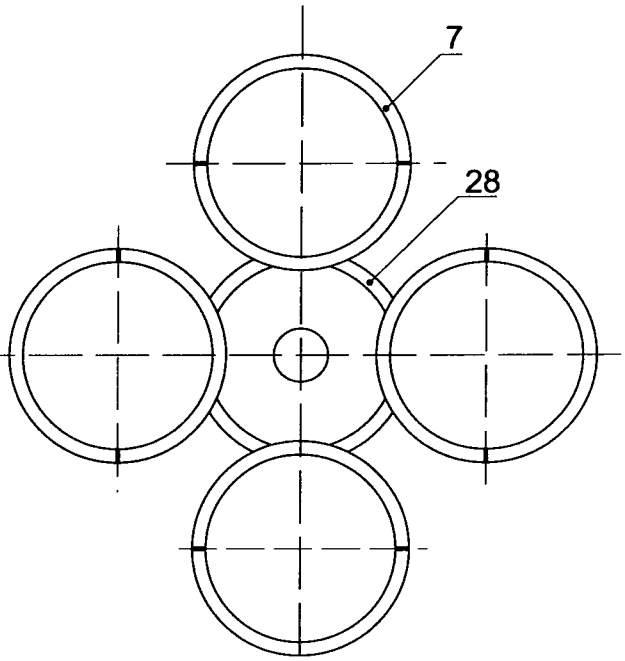


Fig. 10

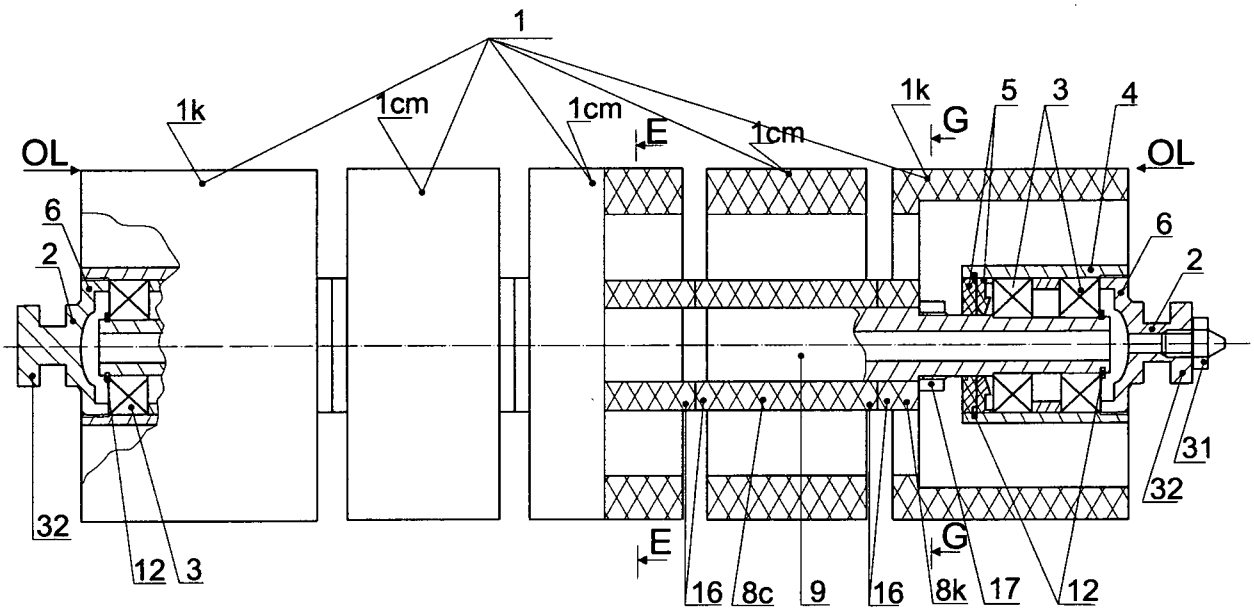


Fig. 11

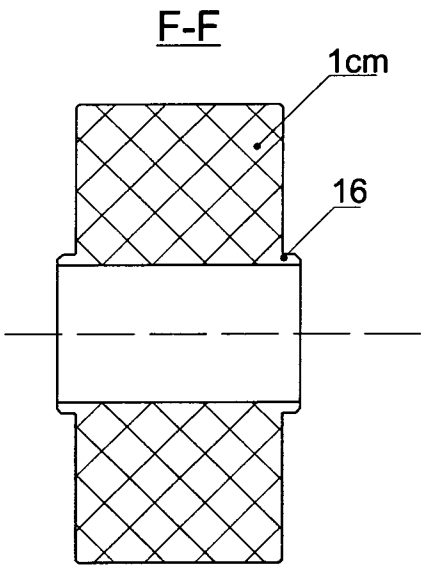


Fig. 13

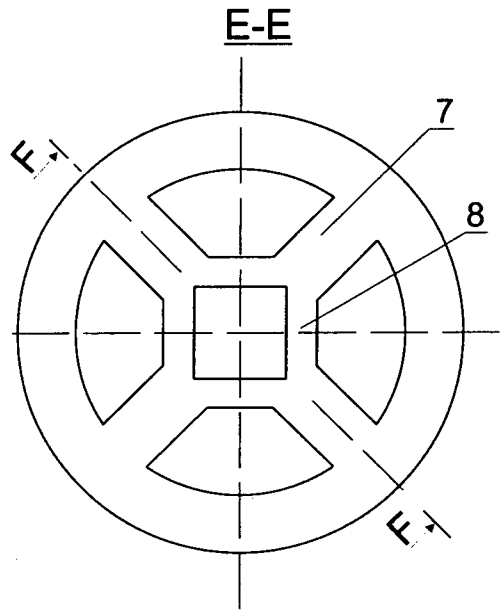


Fig. 12

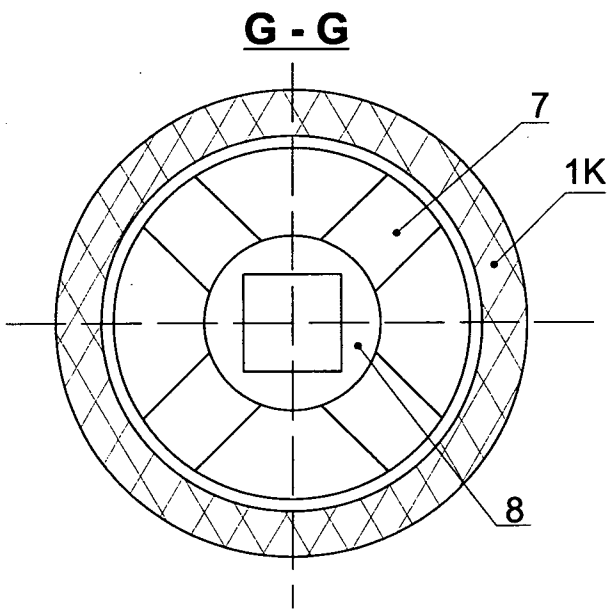


Fig. 14

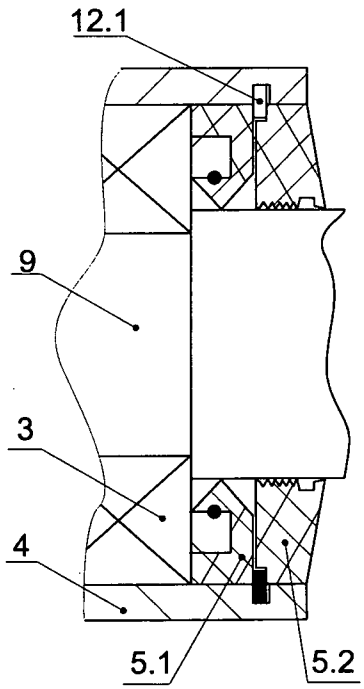


Fig. 18

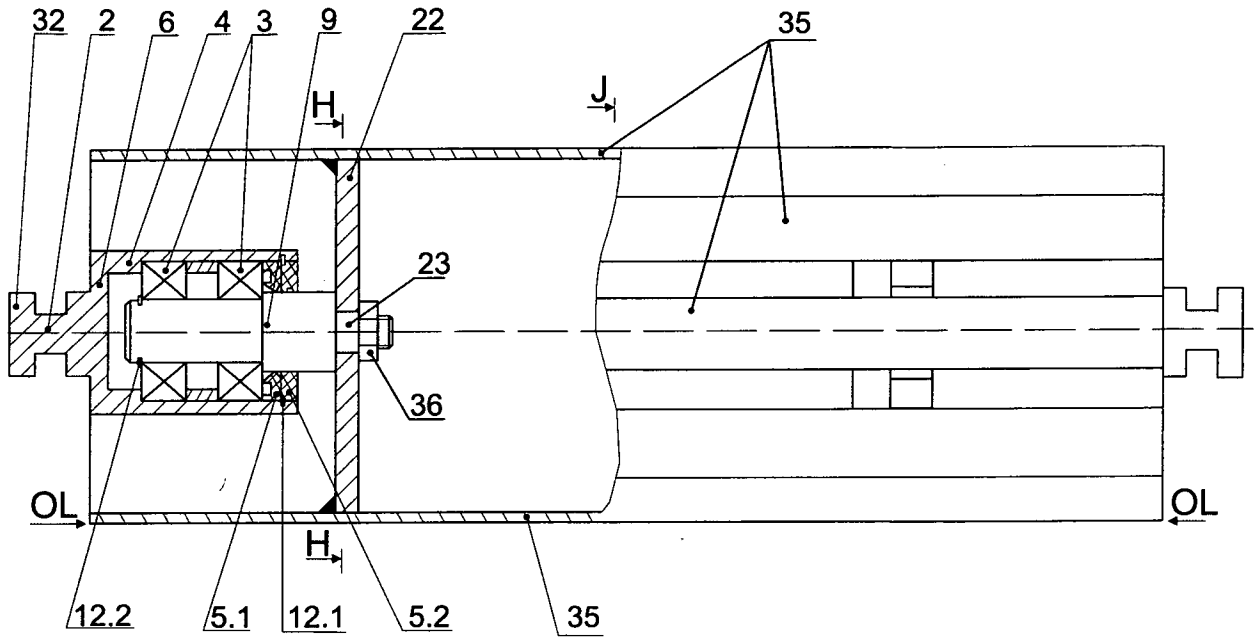


Fig. 15

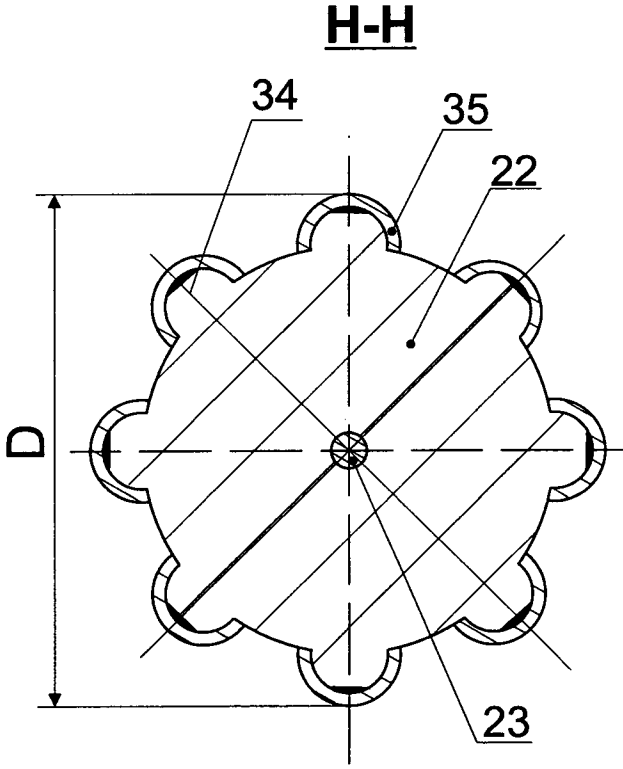


Fig. 16

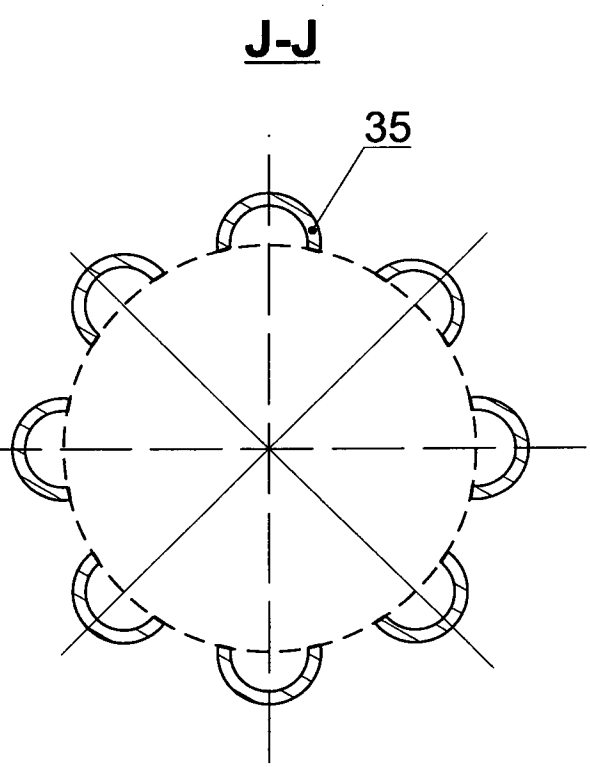


Fig. 17