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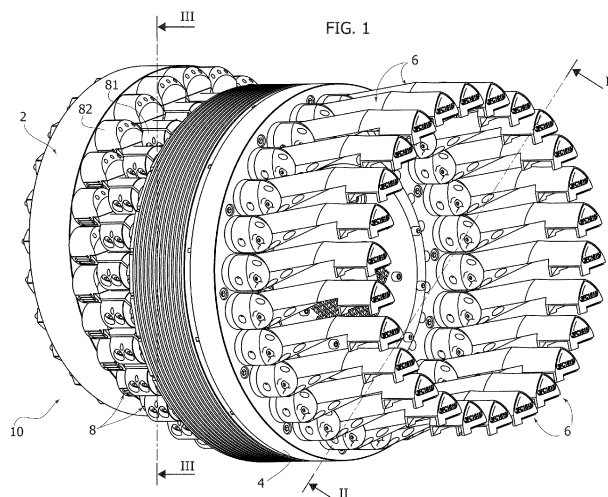
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(54) **A DEVICE FOR CONVEYING SMOKING ARTICLES OR PARTS OF SMOKING ARTICLES**

(57) A device is described for conveying smoking articles or parts of smoking articles, comprising:
- a first rotor (2), rotatable about a first rotation axis (I1);
- a second rotor (4), rotatable about a second rotation axis (I2) parallel to the first rotation axis (I1) and moved away with respect to the latter along a reference axis (R); and
- a plurality of conveying members (6) for receiving smoking articles or parts of smoking articles, which are mounted on the second rotor (4), according to an arrangement in series around the second rotation axis (I2), and each one is rotatable about a respective rotation axis (Ii) parallel to the second rotation axis (I2) of the second rotor (4);

- a plurality of members (8) for rotationally connecting the first rotor (2) to the second rotor (4), which are arranged in series around the first and the second rotation axis (I1, I2), and each have a first end (82) that is coupled in a rotatable manner to the first rotor (2), and a second end (81) that is coupled in a rotatable manner to the second rotor (4), and is fixed to a respective conveying member (6) of the plurality of conveying members.

The device is characterized in that each connecting member (8) comprises a weakened portion (84) such that it causes a privileged deformation of the connecting member (8) inducing a movement of the first end (81) with respect to the second end (82), along a direction parallel to the reference axis (R).



Description

Field of the invention

[0001] The present invention relates to a device for conveying smoking articles or parts of smoking articles, comprising:

- a first rotor, rotatable about a first rotation axis;
- a second rotor, rotatable about a second rotation axis parallel to the first rotation axis, and moved away with respect to the latter along a reference axis; and
- a plurality of conveying members for receiving smoking articles or parts of smoking articles, which are mounted on the second rotor, according to a arrangement in series around the second rotation axis, and each one is rotatable about a respective rotation axis parallel to the second rotation axis of the second rotor;
- a plurality of members for rotationally connecting the first rotor to the second rotor, which are arranged in series around the first and the second rotation axis, and each have a first end that is coupled in a rotatable manner to the first rotor, and a second end that is coupled in a rotatable manner to the second rotor, and is fixed to a respective conveying member of the plurality of conveying members.

[0002] The structure of such a device requires a very high manufacturing precision to ensure that all the connecting members are coupled, each in a correct way, to the two rotors of the device. Any deviations in manufacturing tolerances may lead to forced couplings wherein the components have internal stresses which - in the long run - lead to premature wear of the components and a greater risk of breakage.

[0003] The present invention aims to provide an improved solution, in particular, which is capable of operating efficiently even in the presence of deviations in manufacturing tolerances.

[0004] This object is achieved by means of a conveying device having the characteristics referred to in claim 1. The present invention also relates to an assembly method according to claim 9.

[0005] The claims form an integral part of the disclosure provided here.

[0006] Further characteristics and advantages of the invention will become evident from the description that follows with reference to the attached drawings, provided purely by way of non-limiting example, wherein:

Figure 1 represents an example of a conveying device according to the present invention, according to an axonometric view;

- Figure 2 is a cross-sectional view of the device of Figure 1, according to the cross-sectional plane II-II of Figure 1;
- Figure 3 is another cross-sectional view of the device

of Figure 1, according to the cross-sectional plane III-III of Figure 1;

- Figure 4 represents a connection member of the device of Figure 1, according to an axonometric view;
- Figure 5 represents a front view of the connecting member of Figure 4;
- Figure 6 represents a cross-sectional view of the connecting member of Figure 4, according to the plane VI-VI of Figure 5.

[0007] In the following description, various specific details are illustrated aimed at a thorough understanding of the embodiments. The embodiments may be implemented without one or more of the specific details, or with other methods, components, materials, etc. In other cases, known structures, materials or operations are not shown or described in detail to avoid obscuring various aspects of the embodiments.

[0008] The references used here are only for convenience and do not therefore define the field of protection or the scope of the embodiments.

[0009] The conveyor device described here is intended for applications in the field of the production of smoking articles, in particular, for transporting smoking articles or parts of smoking articles.

[0010] With reference to the Figures, the device described here, indicated as a whole with the reference number 10, comprises:

- a first rotor 2, rotatable about a first rotation axis 11;
- a second rotor 4, rotatable about a second rotation axis 12, parallel to the rotation axis 11 and moved away with respect to the latter along a reference axis R;
- a plurality of transport members 6 for receiving the smoking articles or the parts of smoking articles, which are mounted on the second rotor 4; and
- a plurality of members 8 for connecting the rotor 2 to the rotor 4 in rotation.

[0011] The transport members 6 are mounted on the rotor 4 in a series, circular arrangement around the rotation axis 12.

[0012] Each transport member 6 has a seat 6A for housing a smoking article or a part of a smoking article.

[0013] As will be seen in detail below, during operation, the transport members 6 rotate around the rotation axis 12, due to the rotation of the rotor 4 around this axis, maintaining the same orientation regardless of the angular position assumed around the rotation axis 12.

[0014] The transport members 6 are mounted on the rotor 4 so as to be rotatable, each around a respective rotation axis 1i parallel to the rotation axis 12 of the rotor 4.

[0015] In particular, in one or more preferred embodiments, such as the one illustrated, the transport members 6 are directly fixed to the ends 31 of respective shafts 30 mounted in the rotor 4 in a rotatable manner around the rotation axes 1i.

[0016] Opposite ends 32 of the shafts 30 project from the rotor 4 in the opposite direction to the transport members 6, and engage the connection members 8.

[0017] The connecting members 8 are also arranged in a circular series, around the rotation axes 12 and 11, in positions corresponding to the transport members 6.

[0018] With reference to Figures 4, 5 and 6, each connecting member 8 comprises a first end portion 81, substantially cylindrical, which is engaged by the end 32 of the shaft 30, and a second end portion 82, also substantially cylindrical, which is attached to the rotor 2.

[0019] The connecting member 8 also comprises a connecting portion 83, which connects the two end portions 81, 82 to each other. The portion 81 comprises an inner cavity 81A, which is rotatably coupled with the end 32 of the shaft 30. On the other hand, the portion 82 also comprises a cavity 82A, which is rotatably engaged by a fixing pin 11 carried by the rotor 2.

[0020] In view of the above, the person skilled in the art will understand that the configuration illustrated above reproduces a mechanism with operation of the Schmidt joint type, or rather, wherein the connecting members 8 perform both the function of transmitting the rotation of the rotor 2 to the rotor 4, and the function of making the shafts 30 - and therefore the transport members 6 - rotate around the rotation axes Ii so that the orientation of the transport members 6 with respect to the rotation axes I1, I2 remains constant.

[0021] According to an important characteristic of the solution described here, the connecting members 8 each comprise a weakened portion 84 such as to cause a privileged deformation of the connecting member 8, which induces a displacement of the end portion 81 with respect to the end portion 82 along a direction parallel to the reference axis R.

[0022] Figure 3 schematically represents the relative movement between the two portions 81, 82 of each connecting member 8, made possible by the presence of the weakened portion 84.

[0023] Preferably, the movement indicated above has a single component, which is located on a plane orthogonal to the rotation axes 11, 12 and is parallel to the reference axis R.

[0024] The weakened portion 84 may have various configurations depending on the structure of the connecting member 8 and on the operating requirements of the specific applications.

[0025] With reference to the embodiment illustrated in the figures, the weakened portion 84 is obtained on the end portion 82. Alternatively, the weakened portion 84 may instead be obtained on the end portion 81.

[0026] In one or more preferred embodiments, such as the one illustrated, the weakened portion 84 is made by means of a plurality of through-slits 84A, which join opposite sides of the outer side surface of the end portion 82 and which extend on planes parallel to each other.

[0027] The slits 84A identify layer regions 84B in the same portion 82, which are superimposed and separated

from each other by the slits 84A.

[0028] The slits 84A have closed ends 84A' defining bridge portions 84C, which each connect two adjacent layer regions 84B.

[0029] The bridge portions 84C are arranged alternately in opposite positions with respect to an axis K parallel to the reference axis R.

[0030] Each layer region 84B is detachable from the adjacent layer region by the effect of a bending deformation of the respective bridge portion 84C. This removal of the layer region occurs according to a rotation movement, around an ideal axis passing through the bridge portion, according to a given direction of rotation, which is variable according to the position wherein the relative bridge portion 84C is located with respect to the reference axis K.

[0031] Specifically, with reference to Figure 6, where the relative bridge portion 84C is to the left of the axis K, the layer region 84B moves away from the adjacent layer region 84B, which lies below (with reference to the Figure), according to a counterclockwise rotation movement. On the contrary, where the relative bridge portion 84C is positioned to the right of the axis K, the layer region 84B moves away from the adjacent lower layer region 84B according to a clockwise rotation movement.

[0032] The alternation of the bridge portions 84C in positioning with respect to the axis K causes the reciprocal removal of the layer regions 84B to cause an overall displacement of the portion 81 - or at least of its seat 81A - with respect to the portion 82 along the axis K.

[0033] Thanks to the movement indicated, each connecting member 8 of the device described here is able to find an alignment between its own end portions 81, 82 and the seats intended to receive them obtained in the two rotors 2, 4 - or rather, the shafts 30 and the pins 11 in the illustrated embodiment -, so as to compensate for any deviations from an ideal position by the aforesaid seats.

[0034] This is achieved through, only, a deformation of the weakened portion 84, in a controlled manner as described above, so that in the connecting member 8 no deteriorating internal stresses are generated for the component and the means with which it cooperates.

[0035] This solution, therefore, ensures operating efficiency regardless of the actual manufacturing precision of the device components, and also facilitates the assembly operation of the device itself.

[0036] Of course, without prejudice to the principle of the invention, the details of construction and the embodiments may vary, even significantly, with respect to those illustrated here, purely by way of non-limiting example, without departing from the scope of the invention as defined by the attached claims.

Claims

1. A device for conveying smoking articles or parts of

smoking articles, comprising:

- a first rotor (2), rotatable about a first rotation axis (11);
- a second rotor (4), rotatable about a second rotation axis (12) parallel to the first rotation axis (11) and moved away with respect to the latter along a reference axis (R); and
- a plurality of conveying members (6) for receiving smoking articles or parts of smoking articles, which are mounted on the second rotor (4), according to an arrangement in series around the second rotation axis (12), and each one is rotatable about a respective rotation axis (li) parallel to the second rotation axis (12) of the second rotor (4);
- a plurality of members (8) for rotationally connecting the first rotor (2) to the second rotor (4), which are arranged in series around the first and the second rotation axis (11, 12), and each have a first end (82) that is coupled in a rotatable manner to the first rotor (2), and a second end (81) that is coupled in a rotatable manner to the second rotor (4), and is fixed to a respective conveying member (6) of the plurality of conveying members;

said device being **characterized in that:**

- each connecting member (8) comprises a weakened portion (84) such that it causes a privileged deformation of the connecting member (8) inducing a movement of the first end (81) with respect to the second end (82), along a direction parallel to the reference axis (R).
2. A device according to claim 1, wherein the weakened portion (84) is made by means of removing material, preferably wire electro-erosion.
 3. A device according to claims 1 or 2, wherein the weakened portion (84) has a plurality of localised regions (84C) with increased flexure deformability with respect to the surrounding regions, which, when subjected to flexure deformation, cause an overall movement of the first end (82) with respect to the second end (81), along a direction parallel to the reference axis (R).
 4. A device according to any one of the preceding claims, wherein each connecting member (8) comprises a first portion that is substantially cylindrical (82) defining the first end of the connecting member, a second portion that is substantially cylindrical (81) defining the second end of the connecting member, which is parallel and displaced with respect to the first cylindrical portion (81), and a third portion (83) connecting the first portion (82) to the second portion

(81), and wherein the weakened portion (84) is obtained on the first or second portion (81, 82).

5. A device according to claim 4, wherein on the first or second cylindrical portion (81, 82) a plurality of through-slits (84A) are made, which join together opposite sides of the outer side surface of the cylindrical portion (81), and extend on planes that are parallel to one another, said slits defining layer regions (84B) in the cylindrical portion (81), which are superimposed to one another and separated from one another by the plurality of slits (84A).
6. A device according to claim 5, wherein the layer regions (84B) are each connected to an adjacent layer region via respective bridge portions (84C), which are made at closed ends (84') of the slits (84A), each layer region (84B) being movable away from the adjacent layer region as a result of flexure deformation of the respective bridge portion (84C).
7. A device according to claim 6, wherein the bridge portions (84C) are alternately arranged in opposite positions with respect to an axis (K) parallel to the reference axis (R), so that each layer region can be moved away from an adjacent layer region according to a rotation movement in a first rotation direction, and another layer region successive to the adjacent layer region can be moved away from the adjacent layer region according to a rotation movement in a second direction opposite to the first direction.
8. A device according to any one of the preceding claims, wherein the second end (81) of the connecting member (8) is rotatable about the same rotation axis (li) of the respective conveying member (6).
9. A method for assembling a conveyor device according to any one of the preceding claims, comprising the steps of:
 - providing the first rotor (2), which can rotate about the first rotation axis (11);
 - providing the second rotor (4) which can rotate about the second rotation axis (12); and
 - mounting the plurality of conveying members (6) on the second rotor (4), according to an arrangement in series about the second rotation axis (12), and so that each conveying member (6) can rotate about a respective rotation axis (li) parallel to the second rotation axis (12) of the second rotor;
 - mounting the plurality of connecting members (8) on the first rotor and on the second rotor (2, 4) for rotationally connecting the first rotor (2) to the second rotor (4),
 wherein mounting each connecting member (8) comprises coupling the first end (82) of the con-

necting member (8) in a rotatable manner to the first rotor (2), and coupling the second end (81) of the connecting member (8) in a rotatable manner to the second rotor (4), and it is fixed to a respective conveying member (6) of the plurality of conveying members;

and

wherein coupling the first or the second end of the connecting member includes moving the first or the second end (82, 81) with respect to the second or first end (81, 82) of the connecting member, along a direction parallel to the reference axis (R), exclusively deforming the weakened portion (84) of the connecting member, for aligning the first or second end (82, 81) of the connecting member (8) to a respective seat made on the first or second rotor (2, 4), which is configured to receive the first or second end (82, 81) of the connecting member (8).

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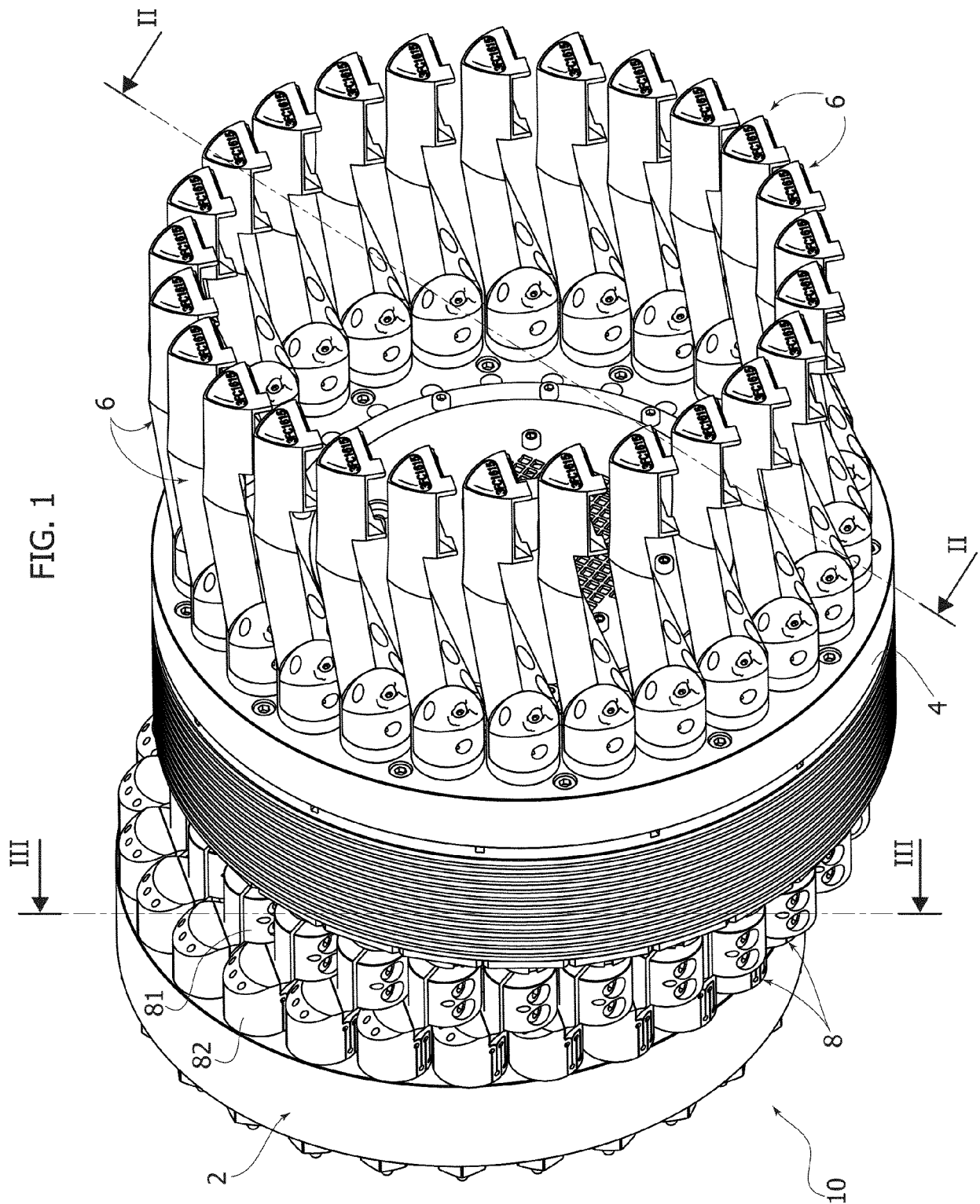
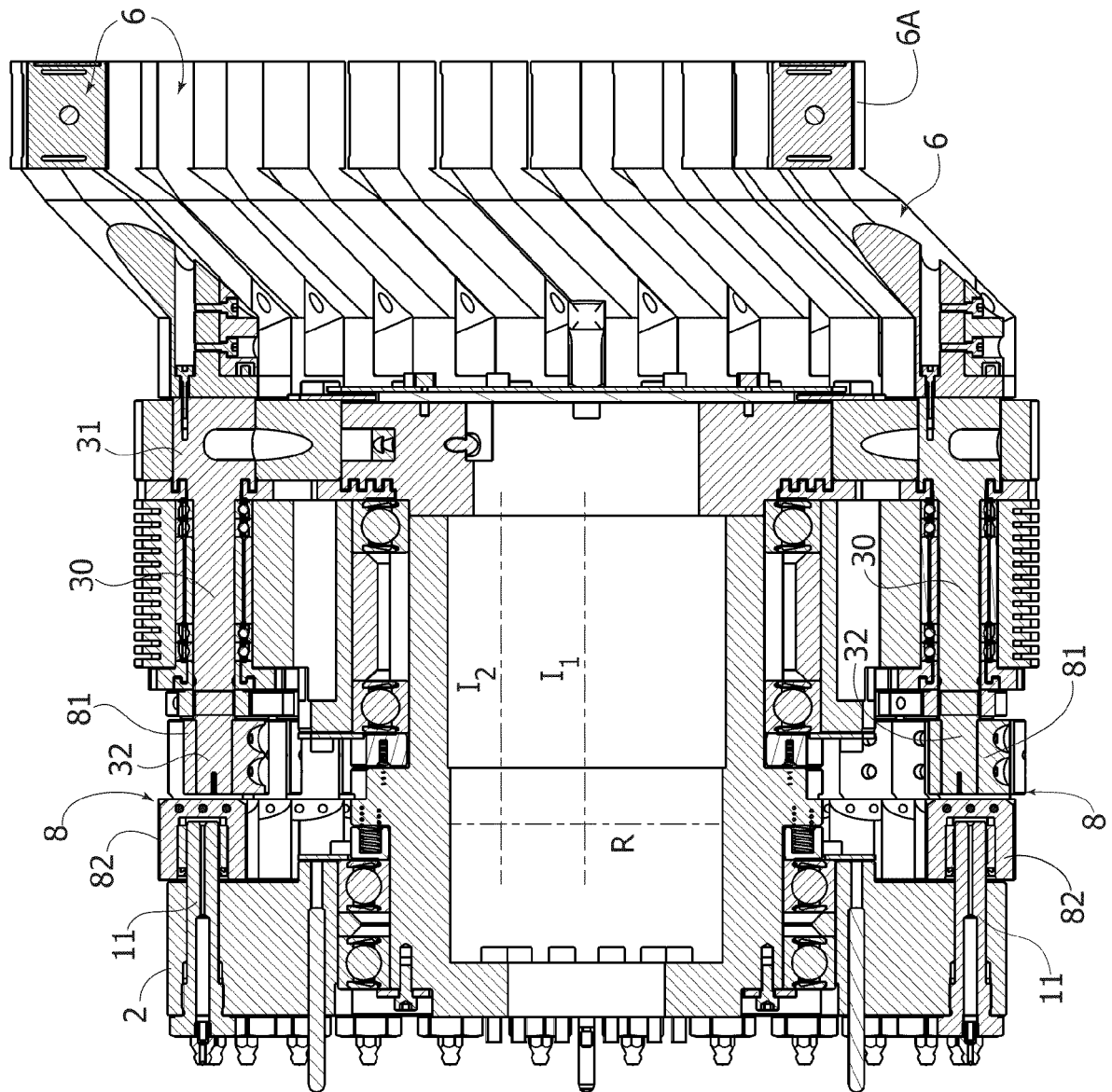


FIG. 2



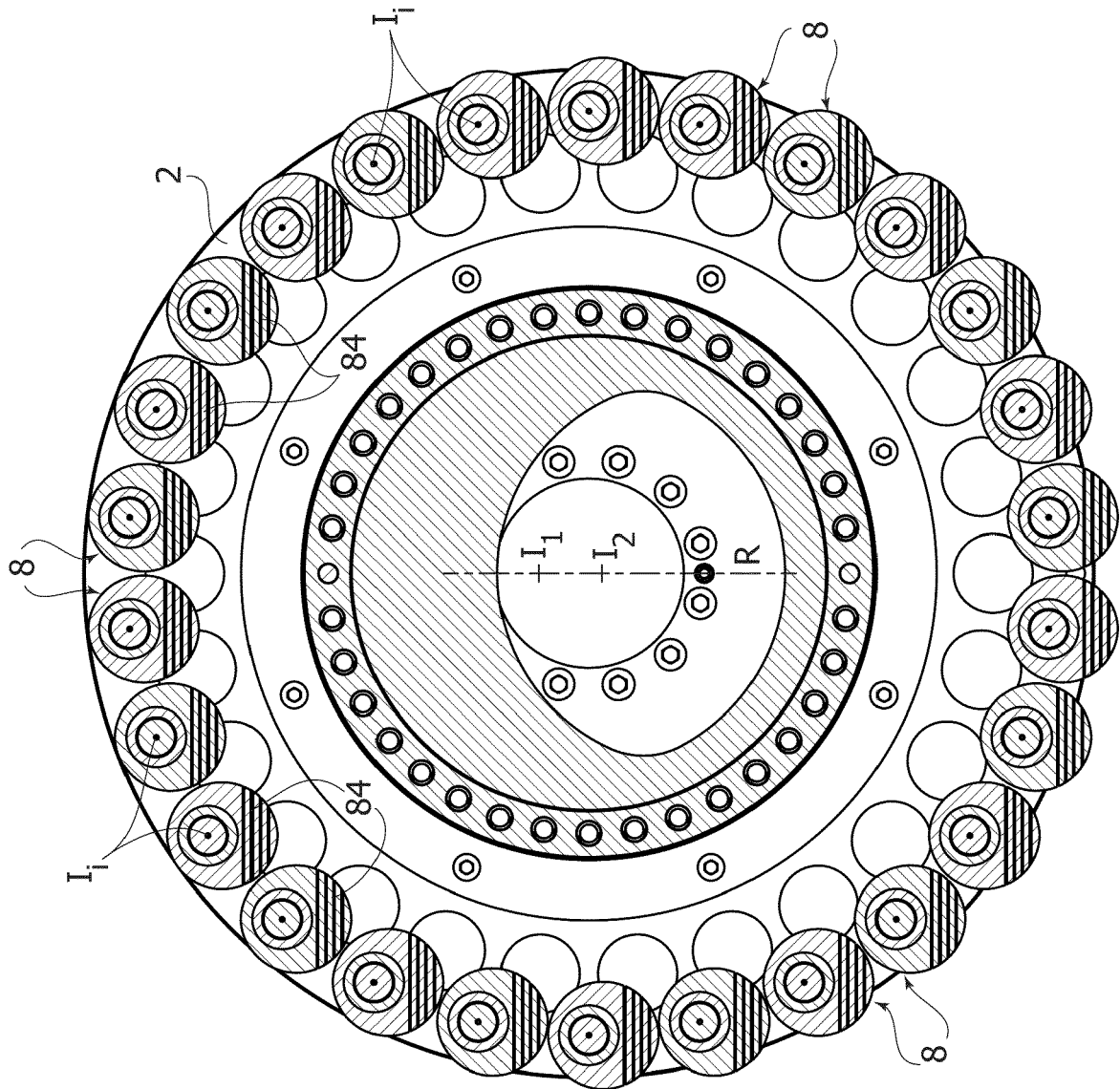
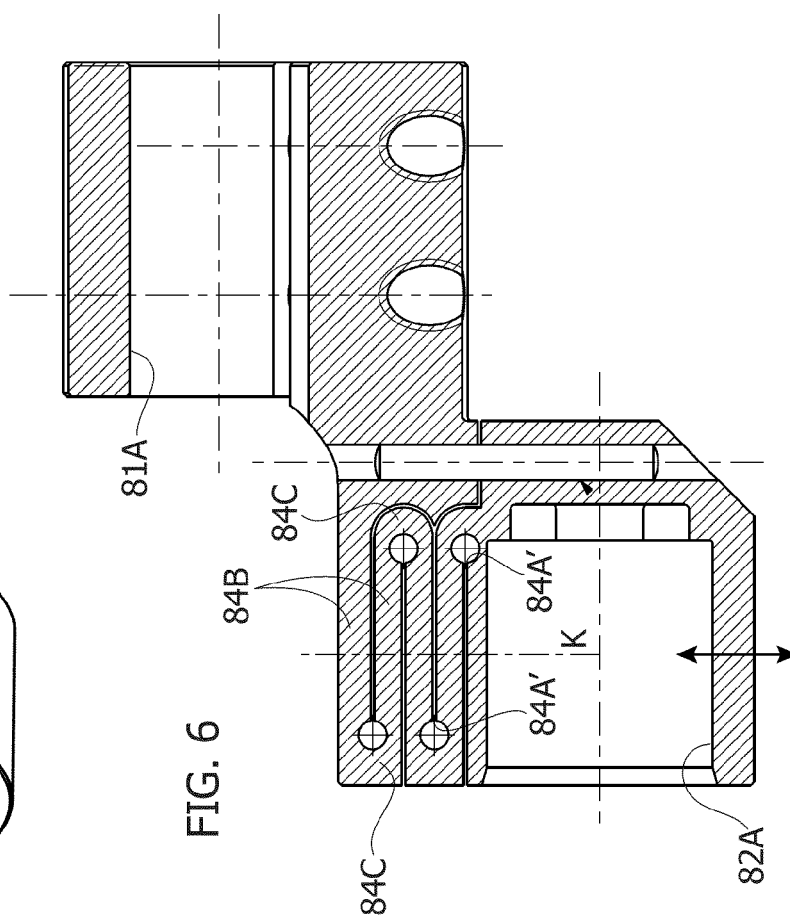
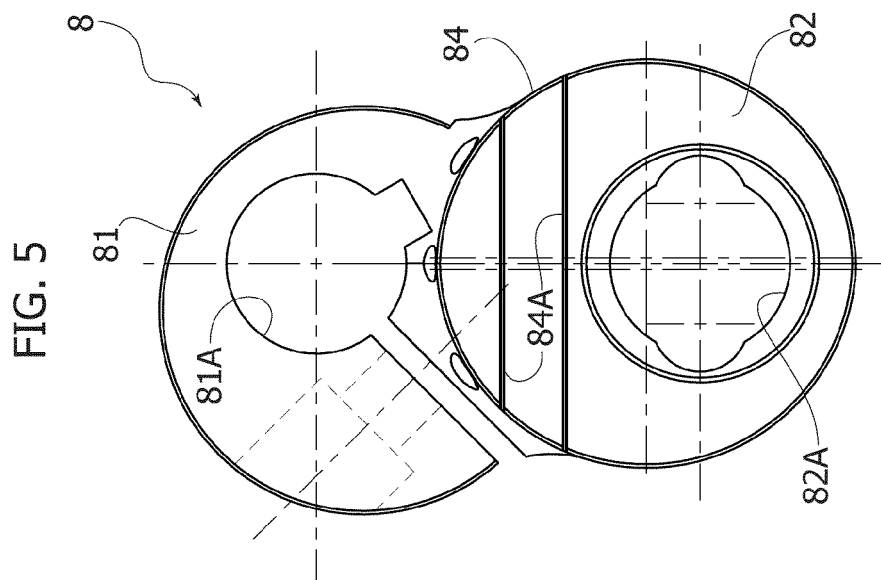
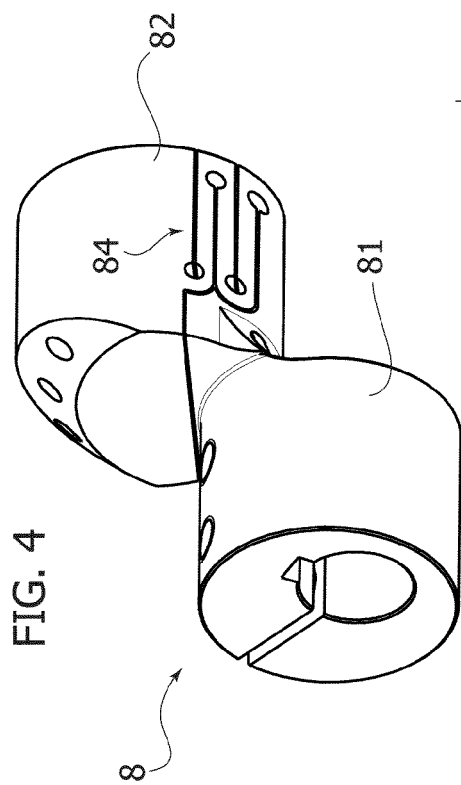


FIG. 3





EUROPEAN SEARCH REPORT

Application Number

EP 22 18 0450

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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			TECHNICAL FIELDS SEARCHED (IPC)
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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
Munich		10 November 2022	Cabrele, Silvio
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			
T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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**ANNEX TO THE EUROPEAN SEARCH REPORT
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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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