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(54) **RECONFIGURABLE TRANSPORT DRUM**

(57) A transport drum (11) for transporting a product (4) and having: a cylindrical body (12), which is mounted in a rotary manner around a first rotation axis (13); a plurality of supply channels (18), which are obtained inside the cylindrical body (12), are axially oriented and are distributed around the first rotation axis (13); a plurality of suction ducts (19), each of which is radially oriented, originates from a respective supply channel (18) and is directed towards the outside of the cylindrical body (12); and a plurality of distribution pipes (20), each of which is inserted inside a respective supply channel (18) so as to rotate around a second rotation axis (21) parallel to the first rotation axis (13) and can be connected to a suction source (16). Each distribution pipe (20) has a plurality of through holes (22), each of which can be aligned with a corresponding suction duct (19) by suitably rotating the distribution pipe (20) around the second rotation axis (21) in order to establish a connection between the suction duct (19) and the suction source (16).

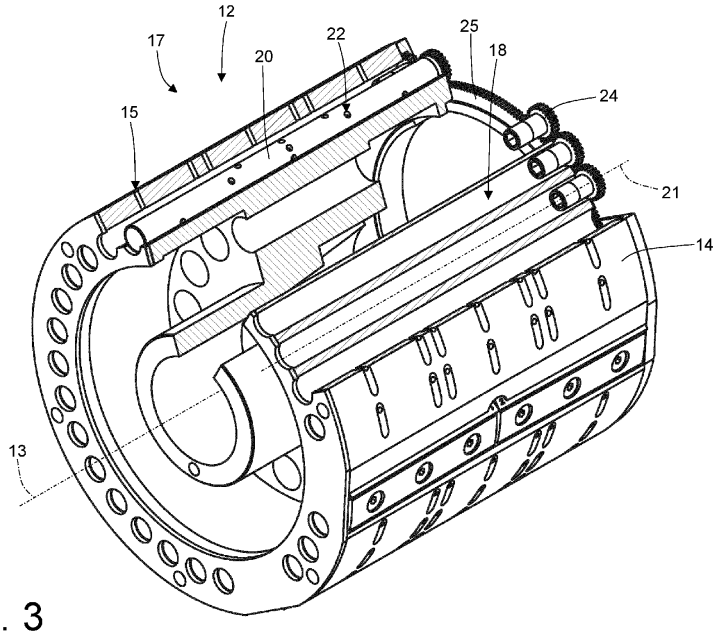

Fig. 3

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Description

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This patent application claims priority from Italian patent application no. 102023000008589 filed on May 2, 2023, the entire disclosure of which is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a transport drum.

[0003] The present invention can be applied advantageously to a transport drum for moving wrapping sheets (in particular made of metallized paper) intended for the production of wraps of rigid packs of cigarettes with hinged lids, to which the following discussion will make explicit reference without any loss of generality.

PRIOR ART

[0004] A rigid pack of cigarettes with a hinged lid comprises a wrap consisting of a group of cigarettes wrapped in a sheet of metallized paper and a rigid outer shell which houses the wrap therein. The outer shell consists of a cup-shaped container, which houses the group of cigarettes and has an open upper end, and a lid, which is also cup-shaped and is hinged to the container so as to rotate, relative to the container, between an open position and a closed position of the open end.

[0005] A cigarette packer machine, for example as described in the patent application EP3725691A1, comprises a wrapping unit in which wraps intended to be successively inserted into rigid outer shells are produced by folding wrapping sheets made of metallized paper around the respective groups of cigarettes, the wrapping sheets being separated by transversely cutting a band of wrapping material unwound from a reel. In particular, a wrapping-sheet supply unit comprises one or more suctioning transport drums (i.e. provided with a series of suction holes that are cyclically connected to a suction source) around which the wrapping sheets are wound so as to move the wrapping sheets towards a folding area.

[0006] To ensure a proper adhesion of a wrapping sheet to the outer surface of a transport drum, it is necessary for the suction holes to be arranged on two circumferences close to the edges of the wrapping sheet. To adjust a transport drum to wrapping sheets of different widths, it is necessary to provide a series of transport drums, each having the suction holes arranged with different spacings, whereby it is necessary to mount each time the appropriate transport drum for the format of the wrapping sheet it is desired to use; however, this solution is particularly expensive (it being necessary to produce different transport drums) and involves quite a long format-change operation (removing a transport drum and mounting a new one requires a lot of time and the intervention of a particularly skilled technician).

[0007] In order to at least partially resolve these drawbacks, it has been proposed to make a single transport drum with a series of suction-hole circumferences with different spacings and then to close (by means of disposable plugs which are temporary and removable) the suction holes that are not used as a function of the format of the wrapping sheet it is desired to use; this solution greatly reduces costs (the disposable plugs are small pieces of plastic that are very modest in cost) but still involves a fairly long format-change operation (removing the old disposable plugs and inserting new ones when the transport drum is mounted in the packer machine is a relatively simple operation, but quite slow). The patent application EP1457444A2 describes a roller for transporting a band or sheet of paper in paper-converting machines, for example, a rewinding machine, a winding machine, an interfolding machine; the roller consists of an outer cylindrical body equipped with a plurality of radial holes, arranged according to longitudinal rows, capable of rotating with respect to a fixed inner body coaxial to it and connected to a suction system.

[0008] The patent application US2006261120A1 describes a roller configured to select and remove pieces that have been cut or severed from a band or sheet of flexible material; the roller comprises an external surface with a plurality of through apertures and a plurality of valves in fluid communication with the plurality of apertures.

DESCRIPTION OF THE INVENTION

[0009] The object of the present invention is to provide a transport drum which makes it possible to perform, quickly and at a lost cost, a format-change operation designed to allow the supply of a product of a different size.

[0010] According to the present invention, a transport drum is provided as claimed in the appended claims.

[0011] The claims describe embodiments of the present invention and constitute an integral part of the present description.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] The present invention will now be described with reference to the accompanying drawings, which illustrate a non-limiting embodiment thereof, wherein:

- Figure 1 is a perspective and schematic view of a part of a cigarette packer machine provided with a wrapping-sheet supply device;
- Figure 2 is a front perspective view of a transport drum of the supply device of Figure 1;
- Figure 3 is a front perspective and partially sectioned view of the transport drum of Figure 2;
- Figure 4 is a rear perspective view, with parts removed for clarity, of the transport drum of Figure 2;
- Figure 5 is a rear perspective and exploded view of

the transport drum of Figure 2;

- Figure 6 is a perspective view of a group of distribution pipes of the transport drum of Figure 2; and
- Figures 7 and 8 are two different cross-sectional views of a part of the transport drum of Figure 2.

PREFERRED EMBODIMENTS OF THE INVENTION

[0013] In Figure 1, the reference number 1 indicates, as a whole, a packer machine which produces a rigid pack 2 of cigarettes with a hinged lid comprising a cup-shaped outer container made of rigid cardboard or paperboard and a wrap 3 accommodated inside the container 2. Each wrap 3 consists of a wrapping sheet 4 made of metallized paper, which is folded around a group 5 of cigarettes that is parallelepiped in shape.

[0014] The packer machine 1 comprises a forming unit (not illustrated) in which the groups 5 of cigarettes are formed in succession, a wrapping unit 6 in which a respective wrapping sheet 4 is wrapped around each group 5 of cigarettes so as to produce a wrap 3, and a wrapping unit (not illustrated) in which a collar and a blank are wrapped around each wrap 3 so as to produce an outer container provided with a lid.

[0015] The wrapping unit 6 comprises a supply device 7 which cyclically supplies the wrapping sheets 4 into the folding area, i.e. arranges each wrapping sheet 4 in such a manner that the wrapping sheet 4 is intercepted by a corresponding group 5 of cigarettes moving along a wrapping path. The supply device 7 comprises an unwinding station in which a band 8 of wrapping material is unwound from a reel 9 and is moved towards a cutting member 10 of a known type which cyclically performs a cross cut of the band 8 of wrapping material so as to separate the individual wrapping sheets 4 from the band 8 of wrapping material. Arranged in succession downstream of the cutting member are two suctioning transport drums 11 (i.e. which hold the wrapping sheets 4 through suction), which move the wrapping sheets 4 to the wrapping area.

[0016] As illustrated in Figures 2 and 3, each transport drum 11 comprises a cylindrical body 12, which is mounted in a rotary manner around a rotation axis 13 and which has a side surface 14 that is cylindrical in shape, around which the wrapping sheets 4 moved by the transport drum 11 are wound in use. A plurality of suction openings 15 open through the side surface 14 and, in use, are connected (in the manner described in the following) to a suction source 16 (schematically illustrated in Figure 2) so as to hold the wrapping sheets 4 through suction on the side surface 14.

[0017] The suction openings 15 are arranged in groups 17 configured to adjust to different formats of the wrapping sheets 4 (in particular to different widths of the wrapping sheets 4, i.e. to different axial dimensions, measured parallel to the rotation axis 13, of the wrapping sheets 4); in particular, three different groups 17 of suction openings 15 configured to adjust to three different formats of the wrapping sheets 4 are provided. Each group 17 of suction openings 15 comprises two circular and lateral rows of suction openings 15 arranged laterally and one circular and central row of suction openings 15: the one circular and central row of suction openings 15 is common to all three groups 17 of suction openings 15 while each group 17 of suction openings 15 comprises two circular and lateral rows of dedicated suction openings 15, i.e. which only form part of one group 17 of suction openings 15 and do not form part of the other groups 17 of suction openings 15.

[0018] As a function of the format (size) of the wrapping sheets 4 that are to be handled, each transport drum 11 must be configured so as to enable the group 17 of suction openings 15 corresponding to the selected format and disable the groups 17 of suction openings 15 that do not correspond to the selected format; only in this manner, in fact, is it possible to obtain at the same time an adequate adhesion of the wrapping sheets 4 to the side surface 14 of the cylindrical body 12 and a congruous *"consumption"* of suction (by avoiding the application of suction through suction openings 15 which in use are never covered by the wrapping sheets 4).

[0019] As better illustrated in Figure 3, each transport drum 11 comprises a plurality of supply channels 18, which are obtained inside the cylindrical body 12, are axially oriented (i.e. parallel to the rotation axis 13) and are distributed (not completely uniformly, i.e. not everywhere with the same pitch) around the rotation axis 13. Furthermore, and as better illustrated in Figures 7 and 8, each transport drum 11 comprises a plurality of suction ducts 19, each of which is radially oriented (i.e., perpendicularly to the rotation axis 13), originates from a respective supply channel 18 and is directed towards the outside of the cylindrical body 12, ending in a respective suction opening 15 which opens through the side surface 14 of the cylindrical body 12. In other words, each suction opening 15 corresponds to a respective supply channel 18, and vice versa, so that, exactly as the three groups 17 of suction openings 15 were defined, three groups 17 of supply channels 18 are defined analogously.

[0020] As better illustrated in Figure 3, each transport drum 11 comprises a plurality of distribution pipes 20, each of which is inserted inside a respective supply channel 18 so as to rotate around a rotation axis 21 parallel to the rotation axis 13 and can be connected to the suction source 16. Furthermore, and as better illustrated in Figures 7 and 8, each distribution pipe 20 comprises a plurality of through holes 22, each of which can be aligned with a corresponding suction duct 19 by suitably rotating the distribution pipe 20 around the rotation axis 21 in order to establish a connection between the suction duct 19 and the suction source 16. Figure 7 shows an example where through holes 22 of a few distribution pipes 20 are not aligned with the respective suction ducts 19 (so that the suction ducts 19 are isolated from the respective distribution pipes 20 and from the suction source 16), while Figure 8 shows an example where through holes 22 of

a few distribution pipes 20 are aligned with the respective suction ducts 19 (so that the suction ducts 19 are connected to the respective distribution pipes 20 and to the suction source 16).

[0021] As better illustrated in Figures 7 and 8, the through holes 22 of each distribution pipe 20 are angularly misaligned relative to one another, i.e. in each distribution pipe 20, only the through holes 22 corresponding to a same format of the wrapping sheet 4 are angularly aligned with one another. In this manner, the through holes 22 of each distribution pipe 20 are arranged so as to be aligned with a single group 17 of suction ducts 19 at a time depending on the angular position of the distribution pipe 20 relative to the corresponding supply channel 18.

[0022] As better illustrated in Figures 4, 5 and 6, each transport drum 11 comprises a transmission system 23, which connects all distribution pipes 20 to one another and synchronizes the rotation of all distribution pipes 20 relative to the corresponding rotation axes 21. Thus, by imparting a rotation to a single distribution pipe 20, the same identical rotation is transmitted to all the other distribution pipes 20 because of the action of the transmission system 23. In particular, the transmission system 23 comprises, for each distribution pipe 20, a corresponding peripheral (satellite) gear wheel 24, which is integral to the distribution pipe 20 (for example, is screwed into the distribution pipe 20); in addition, the transmission system 23 comprises a central (solar) gear wheel 25, which is mounted in a rotary manner on the cylindrical body 12 so as to rotate around the rotation axis 13 and meshes with all peripheral gear wheels 24, so that the rotational movement of all peripheral gear wheels 24 is always synchronized.

[0023] According to a preferred embodiment, the transmission system 23 comprises a braking device, which applies a friction to the central gear wheel 25 in order to counter the rotation of the central gear wheel 25 around the first rotation axis 13. Preferably, the braking device comprises a friction ring 26 made of an elastic material, which is interposed between the cylindrical body 12 and the central gear wheel 25 and presses against a surface of the central gear wheel 25. The function of the braking device is to make the rotation of the central gear wheel 25 relative to the cylindrical body 12 and around the rotation axis 13 (and thus the rotation of all peripheral gear wheels 24 around their respective rotation axes 21) *"difficult",* i.e. to require the application of a high driving torque to obtain the rotation of the central gear wheel 25 relative to the cylindrical body 12 and around the rotation axis 13 (and thus the rotation of all peripheral gear wheels 24 around their respective rotation axes 21); in this manner, in use, the peripheral gear wheels 24 do not rotate around their respective rotation axes 21 in an uncontrolled and undesirable manner because of the forces to which they are subjected due to the rotation of the cylindrical body 12 around the rotation axis 13. In other words, the function of the braking device is to lock the angular position of the peripheral gear wheels 24 (i.e. of the distribution pipes 20) during normal use of the transport drum 11 in such a manner that the configuration of the transport drum 11 cannot be modified in an uncontrolled and undesirable manner during normal use of the transport drum 11.

[0024] According to a preferred embodiment, each peripheral gear wheel 24 has, at the centre, a dead hole 27 (so as to maintain the pneumatic isolation of the respective distribution pipe 20), which has a non-circular shape (for example, a hexagonal shape as illustrated in Figures 7 and 8 or a star shape) and is designed to be engaged by a tip of a tool shaped so as to apply a rotational torque. Typically, the tool is inserted inside a distribution pipe 20 from the side opposite the peripheral gear wheel 24 and thus has an appropriate length (i.e. longer than the axial length of the distribution pipe 20).

[0025] According to a preferred embodiment best illustrated in Figure 3, each supply channel 18 is a through channel so that a rear end of each distribution pipe 20 axially projects out of the cylindrical body 12 and supports the respective peripheral gear wheel 24.

[0026] Each transport drum 11 comprises a pneumatic distributor (known and not illustrated), which is arranged at an end of the cylindrical body 12 opposite the end at which the peripheral gear wheels 24 are arranged and which is configured to connect the distribution pipes 20 to the suction source 16.

[0027] In the non-limiting embodiment described above, the suctioning transport drum 11 is configured to move a wrapping sheet 4; according to other embodiments not illustrated, the transport drum 11 could be configured to move another type of product of a flat shape or even of another shape (for example of a cylindrical shape such as cigarettes, cigarette filters, cigarette components, components for cigarette filters...).

[0028] The embodiments described herein can be combined with one another without departing from the scope of protection of the present invention.

[0029] The transport drum 11 described in the foregoing has numerous advantages.

[0030] First, the transport drum 11 described above makes it possible to perform, quickly and at a low cost, a format-change operation designed to allow the supply of a product of a different size; in fact, it is sufficient to apply a rotation (with an ordinary tool available in any workshop) to a peripheral gear wheel 24 in order to transmit the same rotation to all other peripheral gear wheels 24 and thereby quickly adjust the angular position of all distribution pipes 20 and establish which group 17 of suction openings 15 (or which group 17 of suction ducts 19) must be pneumatically connected to the distribution pipes 20 so as to receive suction from the distribution pipes 20.

[0031] Furthermore, by calibrating the angular position of the distribution pipes 20, it is also possible to not open the passage to the suction ducts 19 completely, thereby throttling the suctioning action and thus mechanically calibrating the degree of suction that is exerted through the

suction openings 15.

[0032] Finally, the transport drum 11 described above is of a relatively simple and economical design.

LIST OF THE REFERENCE NUMBERS OF THE FIGURES

[0033]

1	packer machine
2	pack of cigarettes
3	wrap
4	wrapping sheet
5	group of cigarettes
6	wrapping unit
7	supply device
8	band
9	reel
10	cutting member
11	transport drums
12	cylindrical body
13	rotation axis
14	side surface
15	suction opening
16	suction source
17	group
18	supply channels
19	suction ducts
20	distribution pipes
21	rotation axis
22	through holes
23	transmission system
24	peripheral gear wheel
25	central gear wheel
26	friction ring
27	dead hole

Claims

1. A transport drum (11) to transport a product (4) and comprising:

a cylindrical body (12), which is mounted in a rotary manner around a first rotation axis (13);
a plurality of supply channels (18), which are obtained inside the cylindrical body (12), are axially oriented and are distributed around the first rotation axis (13); and
a plurality of suction ducts (19), each of which is radially oriented, originates from a respective supply channel (18) and is directed towards the outside of the cylindrical body (12);
the transport drum (11) is **characterized in that:**

a plurality of distribution pipes (20) is provided, each of which is inserted inside a respective supply channel (18) so as to rotate around a second rotation axis (21) parallel to the first rotation axis (13) and can be connected to a suction source (16); and
each distribution pipe (20) comprises a plurality of through holes (22), each of which can be aligned with a corresponding suction duct (19) by suitably rotating the distribution pipe (20) around the second rotation axis (21) in order to establish a connection between the suction duct (19) and the suction source (16).

2. The transport drum (11) according to claim 1, wherein the through holes (22) of each distribution pipe (20) are angularly misaligned relative to one another.

3. The transport drum (11) according to claim 1 or 2, wherein:

in each distribution pipe (20), only the through holes (22) corresponding to a same format of the product (4) are angularly aligned with one another; and
at least two different groups of through holes (22) corresponding to different formats of the product (4) are present.

4. The transport drum (11) according to claim 1, 2 or 3, wherein the suction ducts (19) are divided into at least two distinct groups (17) configured to adjust to two different formats of the product (4).

5. The transport drum (11) according to claim 4, wherein the through holes (22) of each distribution pipe (20) are arranged so as to be aligned with a single group (17) of suction ducts (19) at a time depending on the angular position of the distribution pipe (20) relative to the corresponding supply channel (18).

6. The transport drum (11) according to one of the claims from 1 to 5 and comprising a transmission system (23), which connects all distribution pipes (20) to one another and synchronizes the rotation of all distribution pipes (20) relative to the corresponding second rotation axes (21).

7. The transport drum (11) according to claim 6, wherein, by imparting a rotation to a single distribution pipe (20), the same identical rotation is transmitted to all the other distribution pipes (20) because of the action of the transmission system (23).

8. The transport drum (11) according to claim 6 or 7, wherein the transmission system (23) comprises, for each distribution pipe (20), a corresponding peripheral gear wheel (24), which is integral to the distribution pipe (20).

9. The transport drum (11) according to claim 8, wherein the transmission system (23) comprises a central gear wheel (25), which is mounted in a rotary manner on the cylindrical body (12) so as to rotate around the first rotation axis (13) and meshes with all peripheral gear wheels (24).

10. The transport drum (11) according to claim 9, wherein the transmission system (23) comprises a braking device, which applies a friction to the central gear wheel (25) in order to counter the rotation of the central gear wheel (25) around the first rotation axis (13).

11. The transport drum (11) according to claim 10, wherein the braking device comprises a friction ring (26) made of an elastic material, which is interposed between the cylindrical body (12) and the central gear wheel (25) and presses against a surface of the central gear wheel (25).

12. The transport drum (11) according to one of the claims from 8 to 11, wherein each supply channel (18) is a through channel so that a rear end of each distribution pipe (20) axially projects out of the cylindrical body (12) and supports the respective peripheral gear wheel (24).

13. The transport drum (11) according to one of the claims from 8 to 12, wherein each peripheral gear wheel (24) has, at the centre, a dead hole (27), which has a non-circular shape and is designed to be engaged by a tip of a tool shaped so as to apply a rotation torque.

14. The transport drum (11) according to one of the claims from 6 to 13, wherein the transmission system (23) comprises a braking device, which applies a friction to each distribution pipe (20) in order to counter the rotation of the distribution pipe (20) around the respective second rotation axis (21).

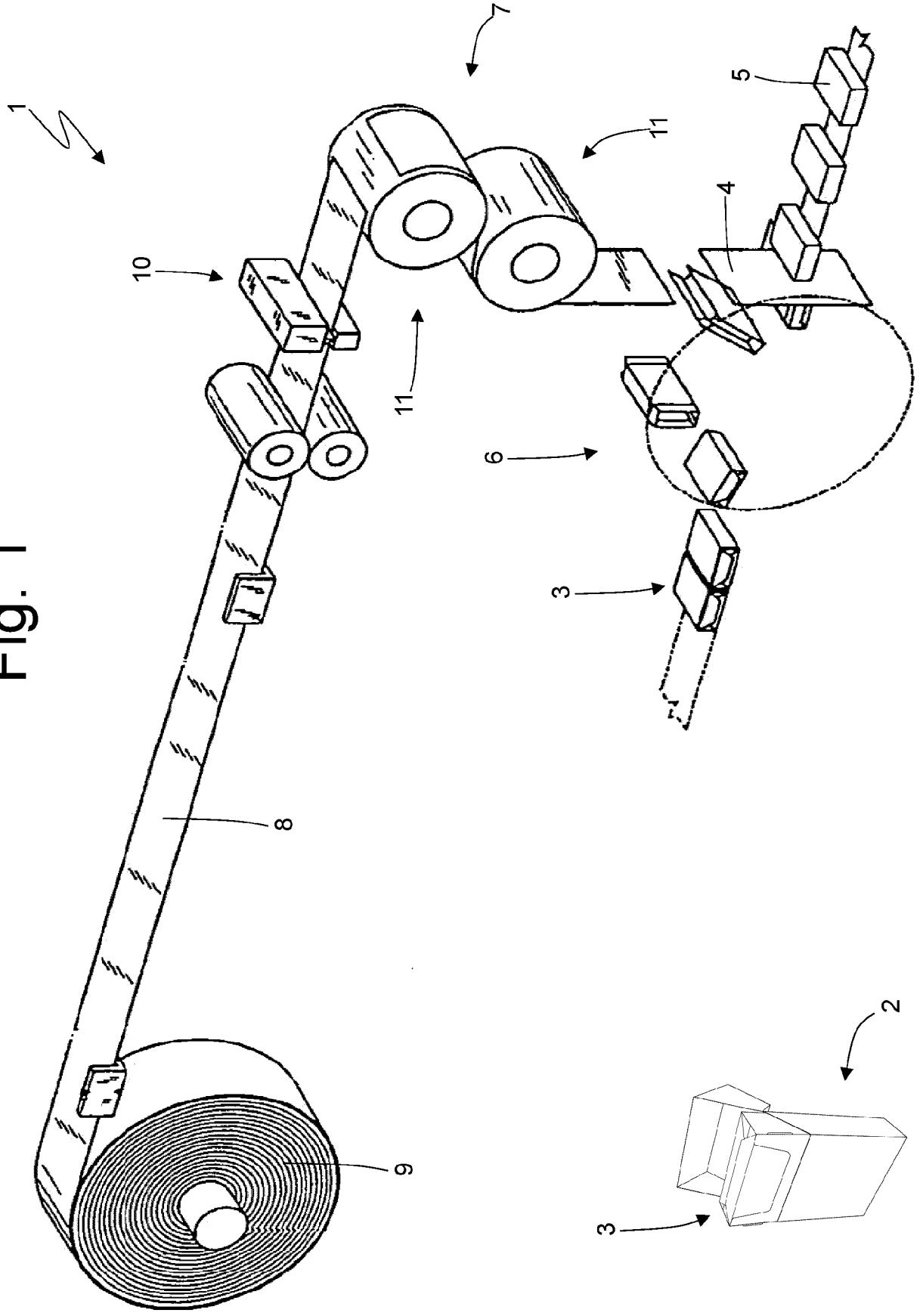
15. The transport drum (11) according to one of the claims from 1 to 14 and comprising a pneumatic distributor, which is arranged at an end of the cylindrical body (12) and is configured to connect the distribution pipes (20) to the suction source (16).

16. The transport drum (11) according to one of the claims from 1 to 15, wherein each suction duct (19) leads to a suction opening (15), which opens through a side surface (14) of the cylindrical body (12).

17. The transport drum (11) according to one of the claims from 1 to 16, wherein the transport drum (11) is configured to move a wrapping sheet (4), which is held, through suction, on a side surface (14) of the cylindrical body (12).

18. A device (7) to supply wrapping sheets (4) in a packer machine (1), preferably for smoking articles; the supply device (7) comprises at least one transport drum (11) according to one of the claims from 1 to 17.

Fig. 1



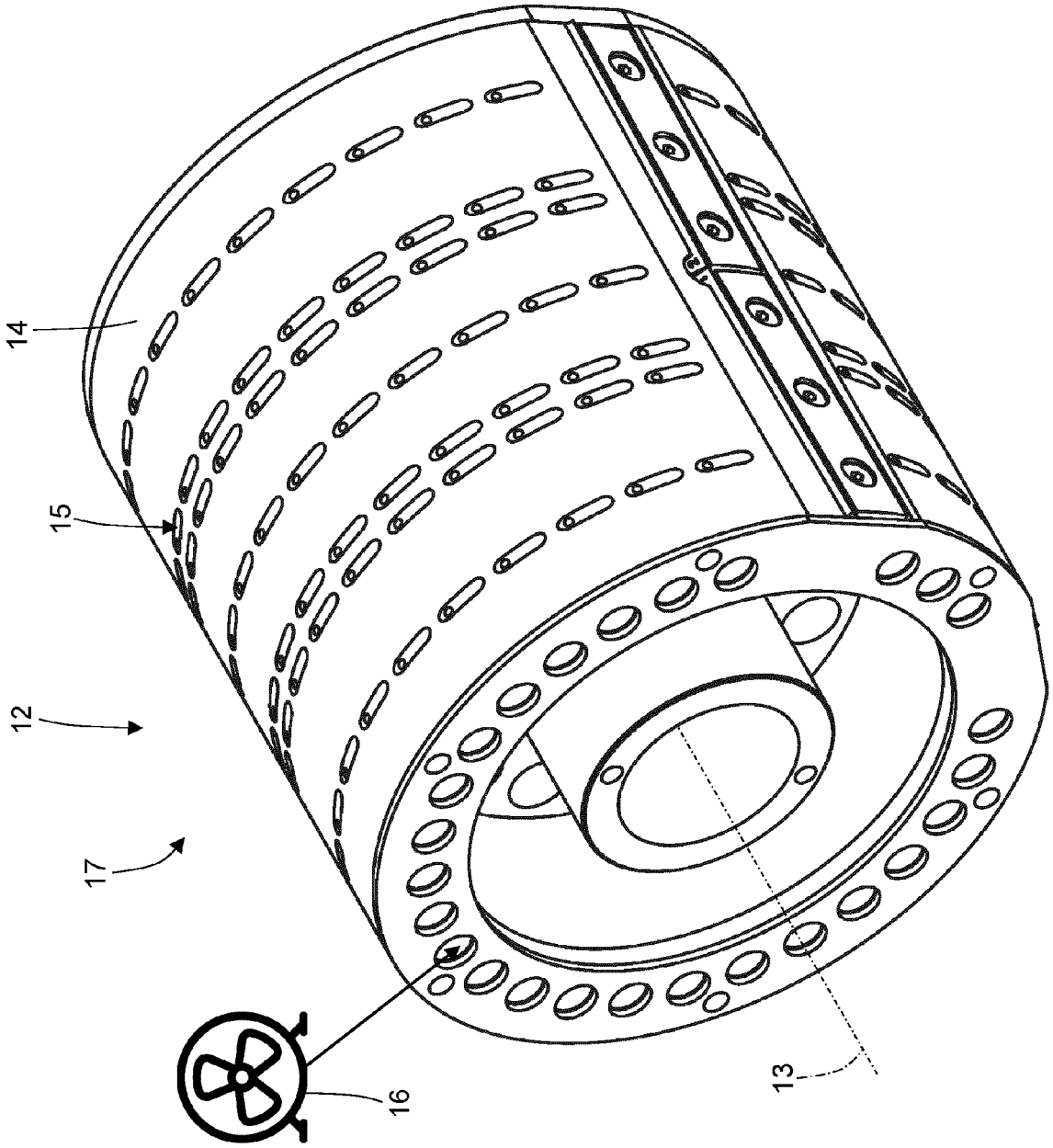


Fig. 2

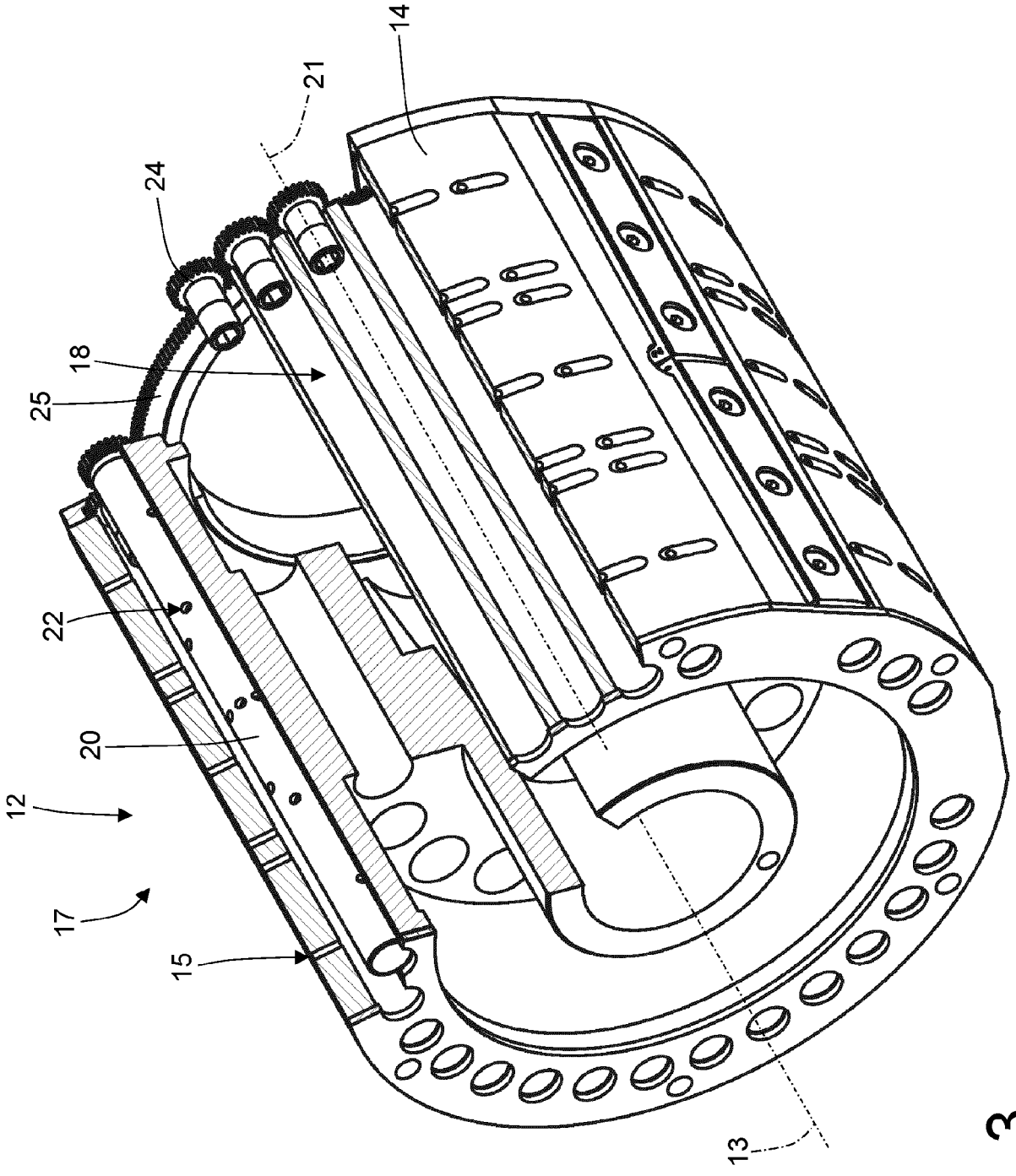


Fig. 3

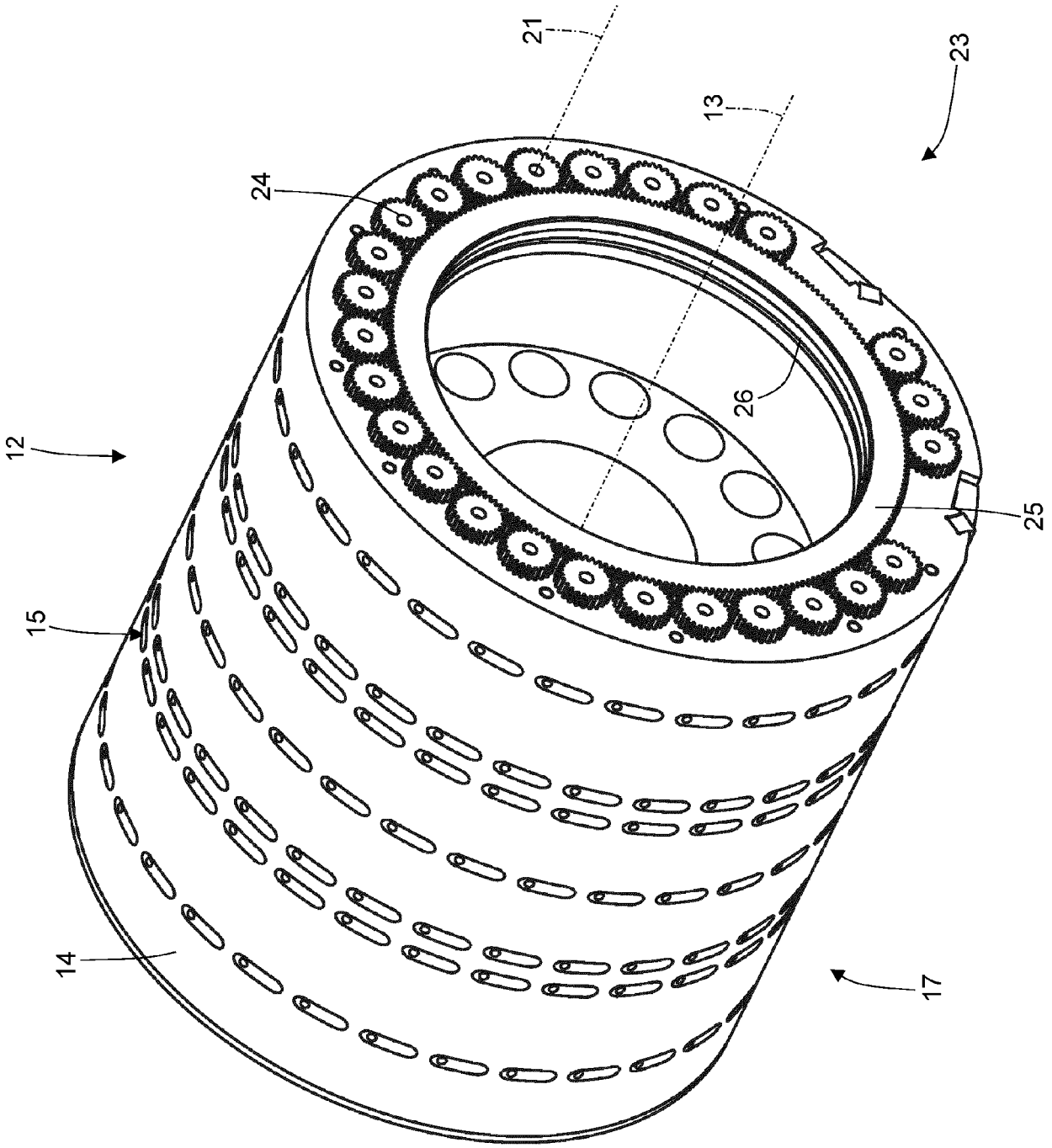


Fig. 4

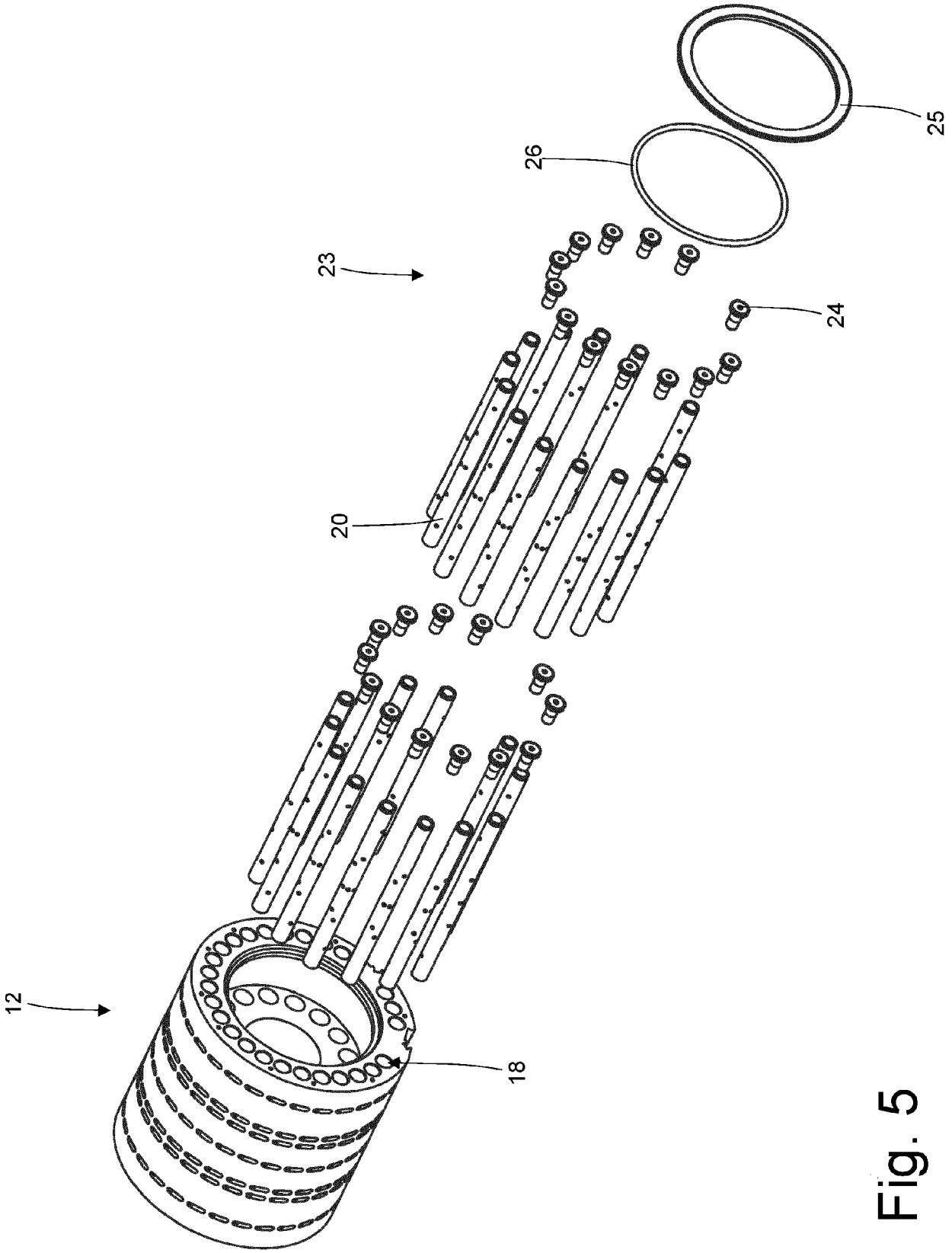


Fig. 5

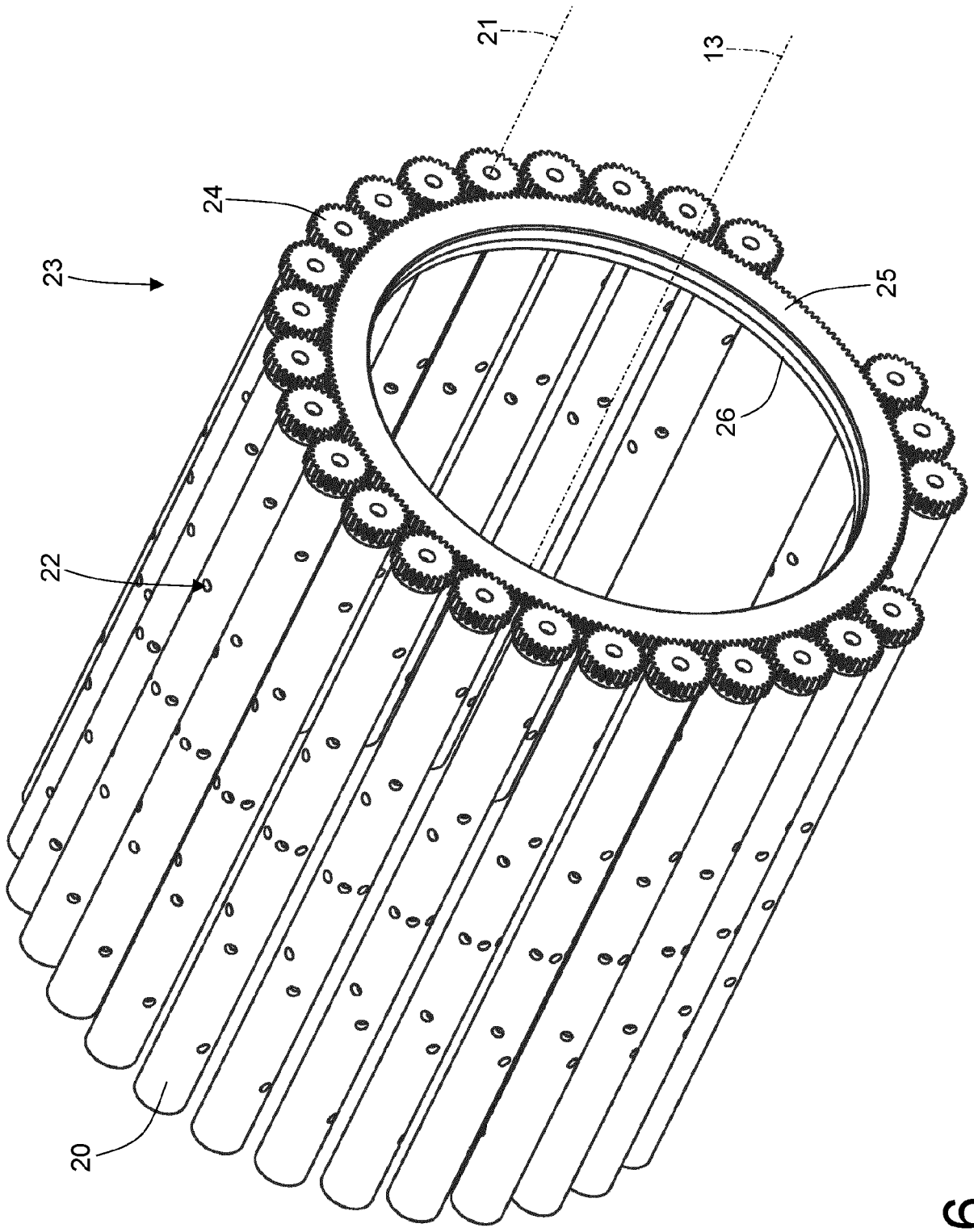


Fig. 6

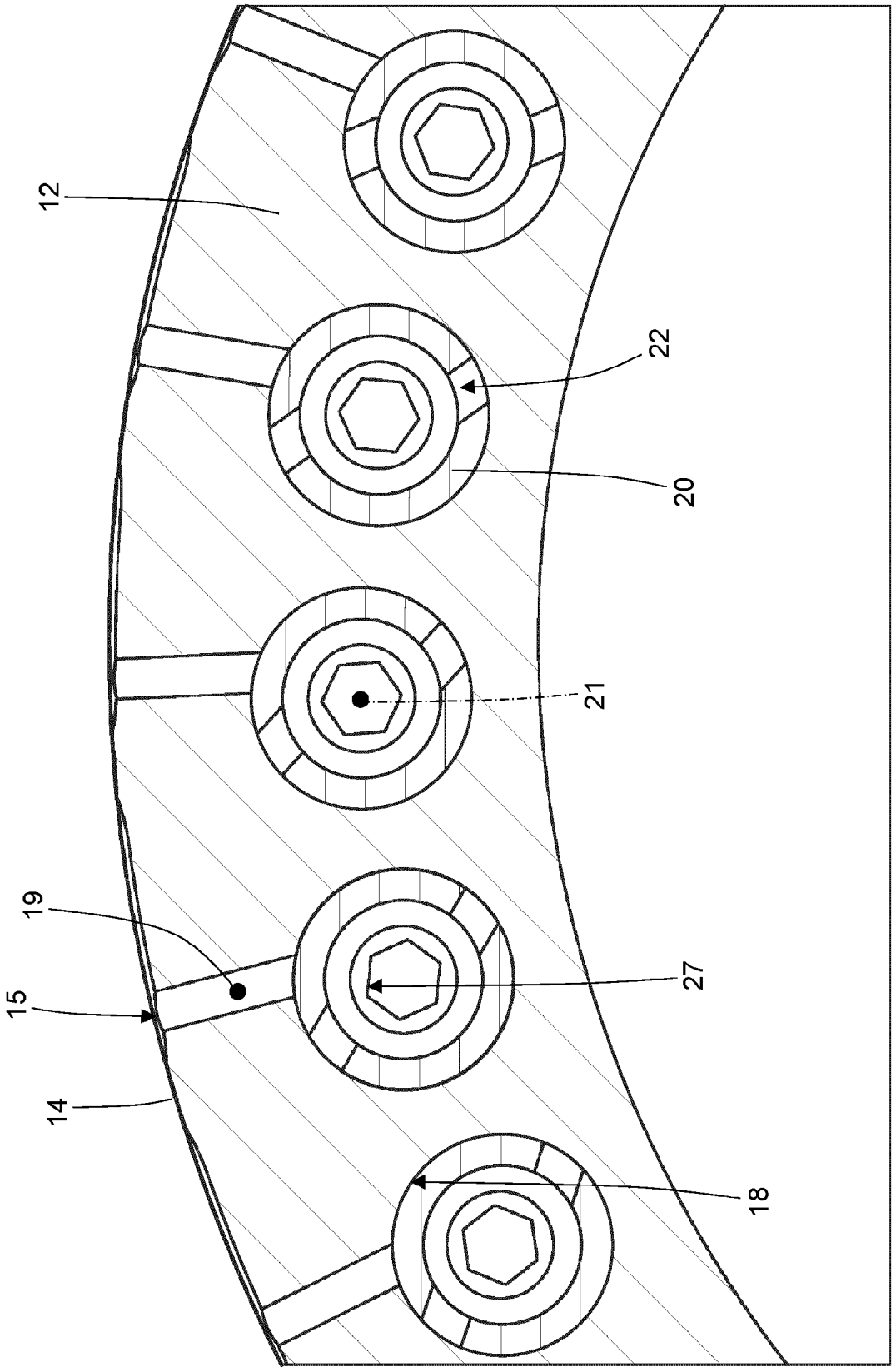


Fig. 7

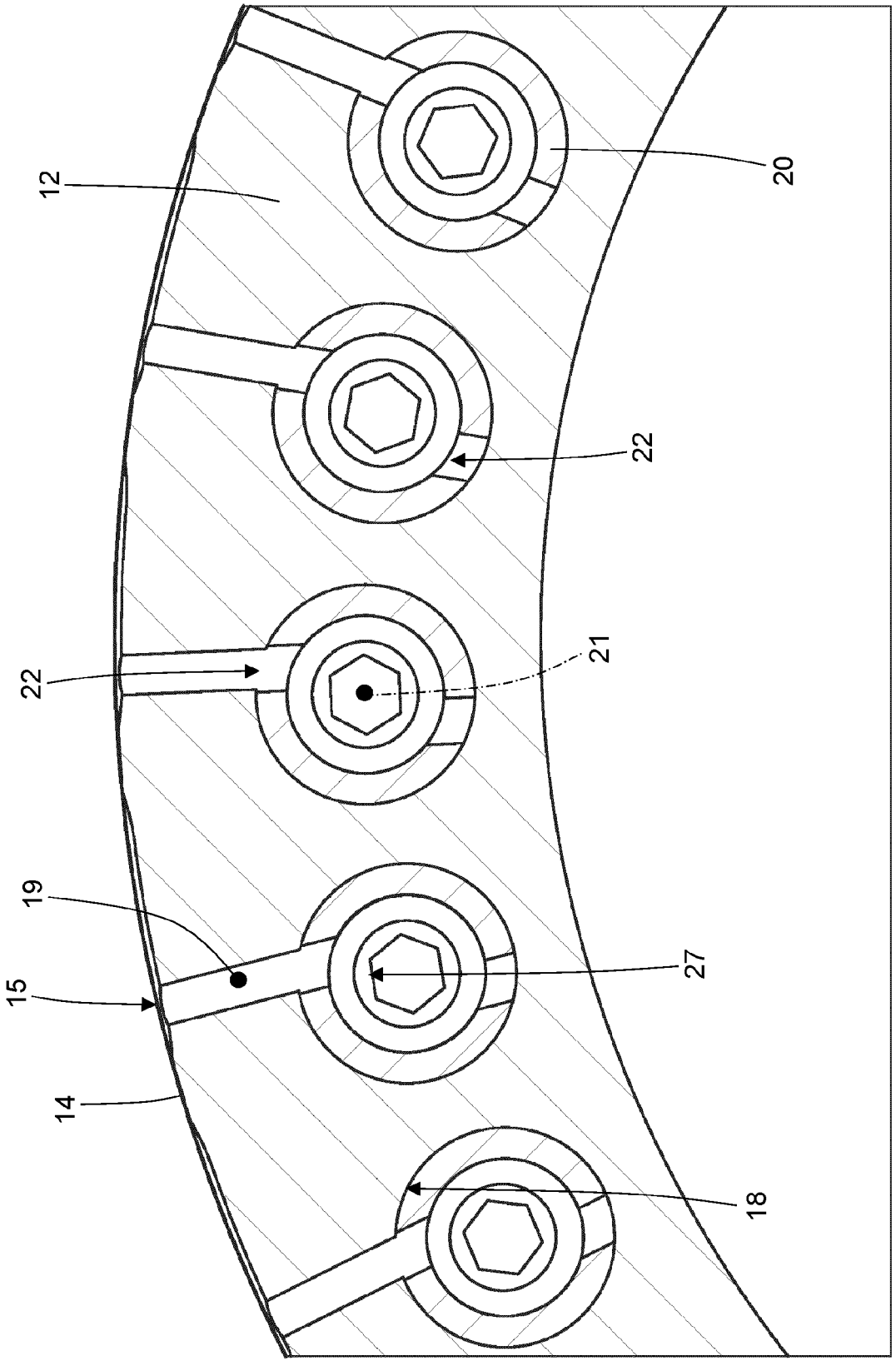


Fig. 8

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EUROPEAN SEARCH REPORT

Application Number
EP 24 17 2928

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	EP 1 457 444 A2 (MTC MACCHINE TRASFORMAZIONE [IT]) 15 September 2004 (2004-09-15)	1,4, 15-18	INV. B65H27/00
A	* paragraph [0035] - paragraph [0037]; figures 6-9 *	2,3,5-14	
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TECHNICAL FIELDS SEARCHED (IPC)

B65H

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	24 September 2024	Haaken, Willy

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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EPO FORM 1503 03.82 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 24 17 2928

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24-09-2024

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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- EP 3725691 A1 **[0005]**
- EP 1457444 A2 **[0007]**
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