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(71) Applicants:
- **CS Automazione S.r.l.**
  20146 Milano (IT)
- **SRS S.p.A.**
  41042 Fiorano Modenese (MO) (IT)

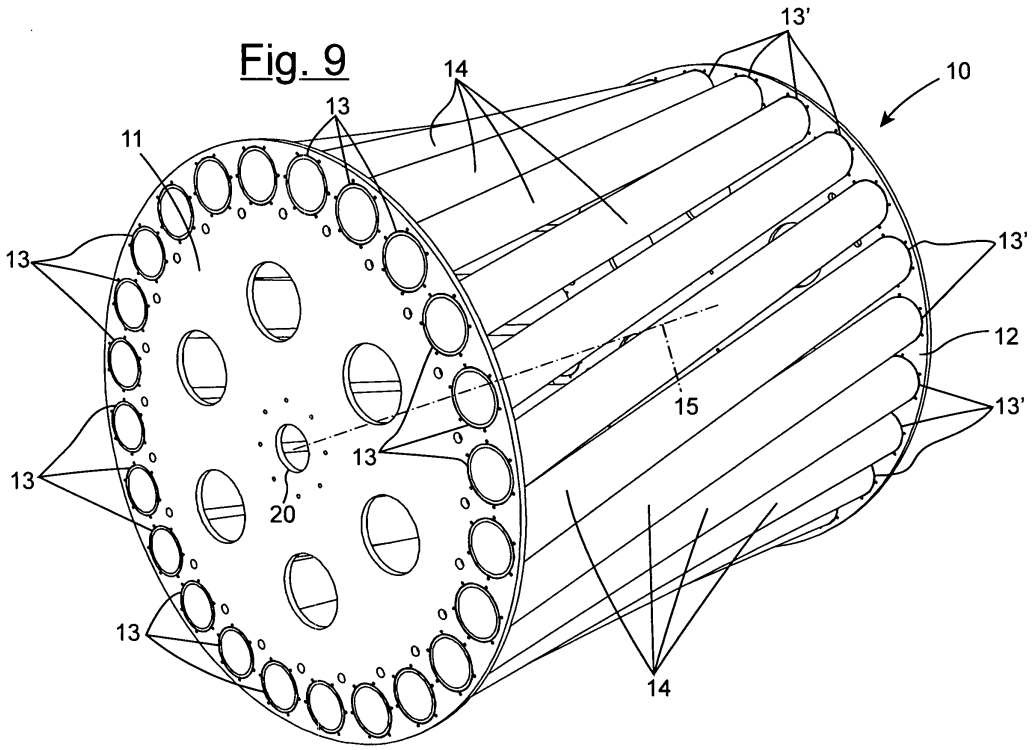
(72) Inventors:
- **Fasoli, Gianpaolo**
  20152 Milano, MI (IT)
- **Carraro, Mauro**
  21012 Cassano Magnago, VA (IT)
- **Monti, Girdano**
  42014 Castellarano, RE (IT)
- **Ricco, Maurizio**
  41049 Sassuolo, MO (IT)

(74) Representative: **Zanardo, Giovanni et al**
Barzanò & Zanardo Milano S.p.A.
Via Borgonuovo 10
20121 Milano (IT)

(54) **Storage, mixing, homogenising and dosing group**

(57) An improved storage, mixing, homogenising and dosing group (10) comprising a plurality of containment elements (114, 14, 114') associated with a rotary support (111, 111', 11, 12) around a rotation axis (115, 15), said containment elements (114, 14, 114') being arranged radially with respect to said rotation axis (115, 15) of said support (111, 111', 11, 12) and being provided with a first end associated with a dosing valve (16) and a second end associated with a filling nozzle (17).

Fig. 9



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Description

[0001] The present invention refers to an improved storage, mixing, homogenising and dosing group, in particular for liquid and/or pasty substances, but also solids, which may precipitate or aggregate, like for example dye substances or dyes in liquid or solid dispersion.

[0002] In particular, the improved storage, mixing, homogenising and dosing group object of the present invention can be used both for the preparation of small amounts of product, in such a case one often speaks of "sampling", and for dosing large amounts in the production process, using respective containers of variable capacity from 10, sampling version, up to 600 litres, industrial production version.

[0003] During use, the aforementioned dye substances or dyes are generally dosed individually in suitable proportions in order to contribute to the preparation of final dyes that can then be used in many fields of application like for example plastics, textiles, tanning and/or ceramics.

[0004] Such dyes indicated above comprise organic or inorganic pigments and they can be used directly in solid form or else they can be dispersed in water, or in other solvents, before use.

[0005] Currently in the case of dyes used in liquid form, they are stored in advance in tanks that, through a hydraulic circuit, feed a system for dosing them.

[0006] The end colour result is greatly influenced by the concentration of raw materials used.

[0007] Therefore the precision of the weight or volume measurements and the correct dosing of the dyes are of utmost importance, but it is also equally important to keep the dyes themselves as perfectly homogeneous as possible during the storage step.

[0008] Indeed, in the case of dyes mixed with one or more solvents, due to the phenomena of stratification and sedimentation, the solid particles, being heavier than the vehicle in which they are suspended, are forced by the force of gravity to sediment towards the lowest point of the unit, i.e. typically towards the bottom of the tank and along the vertical portions of the pipes for feeding the product to the dosing system, up to the inside of the dosing valves.

[0009] Therefore, disadvantageously, the lowest parts of the unit tend to build up a greater concentration of raw material with respect to the upper areas generating, in the best case scenario, an alteration over time of the homogeneity of the dyes stored in the tank.

[0010] Indeed, currently at the start of the process a sufficiently homogeneous dye is taken whereas, with the passing of time and as sedimentation starts to occur, firstly a dye richer in pigment will be taken, which will have built up in the lower areas, and then a dye with less pigment will be taken.

[0011] The consequence is that for the same amount of dye dosed the dying power, and therefore the tonalities resulting from their mixtures, are subject to variations beyond all control.

[0012] Furthermore, in a worse case, the extent of the phenomenon and the nature of the sedimented dye can cause the system to clog up as well as serious and irreversible damage to the unit.

[0013] Currently, a solution to such problems consists of introducing into the dye substances solvents and/or suitable chemical products, known as "surfanctants", "dispersants" or "suspension agent", which have a more or less pronounced effect of stabilising the suspensions.

[0014] Alternatively the viscosity of the dyes is increased, up to permitted limits for the subsequent use and dosing steps.

[0015] However, in both of the solutions outlined above the problem is not solved in a radical and lasting way and, above all, they run the risk of altering the substance to be treated lowering its dying properties in a way difficult to control or standardise and/or reproduce industrially.

[0016] In order to solve the aforementioned problems it is common to use homogenisation machines based on the use of agitators, to avoid the phenomenon of sedimentation inside the storage tanks, recirculation pumps and circuits that are as long as possible, to avoid the phenomenon that occurs inside the pipes and the valves, as well as powerful motors, to avoid the load losses generated by the increased viscosity of the raw materials and by the length of the hydraulic circuits for delivering to the dosager and returning to the storage tank.

[0017] Some of these machines are equiped with slow agitators, set in motion through a geared motor, which allow the movement of the suspension inside the storage tank for the material.

[0018] A drawback of such machines is that their use, only possible in the case of almost continuous movement of the internal agitators, consequently involves substantial energy costs in view of the high resistance that the substance usually has to the rotation of the aforementioned agitators.

[0019] Moreover, these systems cannot be used in the case of very long feeding circuits.

[0020] Other currently known systems are equipped with turbo-mixers for highly viscous products that allow a substantial mass of highly viscous product to be used.

[0021] However, a drawback of these systems is that some particularly delicate dispersions can be irrweversibly damaged by excessive mechanical action and, moreover, such systems cannot be applied in the case of very long feeding circuits and in the case of non-continuous use. Other common systems are equipped with hydraulic circuits with outgoing and incoming lines and timed recirculation pumps of the substances to be treated.

[0022] These systems, which allow good homogenisation within the pipes and within the storage tanks and the dosing valves, do nevertheless have the drawback that they require greater costs, both in terms of energy needs, and in terms of time for the maintenance of the elements that make up the hydraulic circuit.

[0023] Moreover, a drawback of the described sys-

tems is that they involve a substantial worsening of costs represented for example by a greater investment cost in the unit for double hydraulic circuits and/or for the assembly of the agitators given the increased number of dynamic components, like pumps, agitators and integral recycling valves.

[0024] Of course, such dynamic components, since they are subject to wear, require periodic maintenance that represents a great burden both in terms of time and costs.

[0025] Also in the case of dyes or in any case reactants used directly in solid form there may be problems of blockage of the system and damage to the unit caused by accumulation of the solid particles into aggregates, both inside the tanks and in other parts of the unit.

[0026] For this reason, the tanks foresee kinematisms inside the tanks themselves capable of breaking the aggregates to keep the material finely dispersed.

[0027] The purpose of the present invention is to make a device capable of solving the aforementioned drawbacks of the prior art in an extremely simple, cost-effective and particularly functional way.

[0028] Further purposes are to make an improved storage, mixing, homogenising and dosing group

- that is compact;
- that involves low investment/maintenance costs; and
- that can be used both for dyes dispersed in a solvent and for solid dyes.

[0029] These purposes according to the present invention are accomplished by making an improved storage, mixing, homogenising and dosing group as outlined in claim 1.

[0030] Further characteristics of the invention are highlighted by the subsequent claims.

[0031] The characteristics and advantages of an improved storage, mixing, homogenising and dosing group according to the present invention shall become clearer from the following description, given as a non-limiting example, referring to the attached schematic drawings in which:

figure 1 is a perspective view of an example embodiment of the improved storage, mixing, homogenising and
dosing group according to the present invention;
figure 2 is a perspective view of another example embodiment of the improved storage, mixing, homogenising and dosing group according to the present invention;
figure 3 is an enlarged view of an element of the improved storage, mixing, homogenising and dosing groups of figures 1 and 2;
figures 4 and 5 are perspective views of another two example embodiments of improved storage, mixing, homogenising and dosing groups according to the present invention equipped with elements of figure 3 or similar elements having an identical function;
figure 6 is a perspective view of another example embodiment of the improved storage, mixing, homogenising and dosing group according to the present invention;
figure 7 is an enlarged view of an element of the improved storage, mixing, homogenising and dosing groups of figure 6; and
figure 7b is an enlarged view of an element of the improved storage, mixing, homogenising and dosing groups of figure 5 installed and ready for use.
figure 8 is a perspective view of another example embodiment of the improved storage, mixing, homogenising and dosing group according to the present invention in one possible use;
figure 9 is a perspective view of an improved storage, mixing, homogenising and dosing group according to the present invention in another use;
figure 10 is a perspective front view of another improved storage, mixing, homogenising and dosing group according to the present invention; and
figure 11 is a perspective rear view of another improved storage, mixing, homogenising and dosing group according to the present invention.

[0032] With reference to the figures, an improved storage, mixing, homogenising and dosing group according to the present invention is shown with 10.

[0033] Such an improved storage, mixing, homogenising and dosing group 10 comprises a plurality of containment elements 114, 14, 114' associated with a support 111, 111', 11, 12, rotating around a rotation axis 15, 115, generally but not necessarily horizontal and centred with respect to the support 111, 111', 11, 12, said containment elements 114, 14, 114' being arranged radially with respect to the rotation axis 115, 15 of said support 111, 111', 11, 12 and being provided with a first end equipped with a dosing valve 16 and a second end equipped with a filling nozzle 17.

[0034] According to the embodiments shown in figures 1-7, the containment elements 114, 114' are associated with the rotary support 111, 111' on at least one side, i.e. they can be associated without distinction on a single side or on both sides, with the rotary support 111, 111' in a selectively removable manner, and one lined up behind the other along a circular crown C, which generally but not necessarily lies in a vertical plane and is substantially centred in the rotation axis 115.

[0035] In this way, in these embodiments the containment elements 114, 114' can be easily replaced by moving them away from the rotary support withy a single operation together with the relative dosing valves 16 and filling nozzles 17, the latter generally being removable separately from the containment elements 114, 114'.

[0036] In particular, so as to move the containment elements 114, 14, 114' in order to mix and homogenise the substances stored inside them, it is foreseen for the

rotary support 111, 111', 11, 12 to be connected to a suitable motion transmission system in turn connected with a control unit.

[0037] According to a preferred embodiment shown in figure 3 the containment elements 114, 14, 114' comprise a tank 114, 114', preferably cylindrical, equipped with substantially longitudinal extension along an axis 120. Alternatively, the containment elements 114, 114' can be of any shape, rigid or flexible, made from the material considered most suitable.

[0038] In particular, in such an embodiment the dosing valve 16 and the filling nozzle 17 are arranged on opposite sides with respect to the axis 120.

[0039] According to the embodiments shown in figures 1 and 2 the rotary support 111, 111', 11, 12 can comprise a polygonal frame 111 centred in the rotation axis 115, 15 or else, alternatively as can be seen in figures 4, 5 and 7b, a circular crown frame 111' around the rotation axis 115, 15.

[0040] With reference to the two types of support described above, the containment elements 114, 14, 114' can take up an extension substantially parallel to the rotation axis 115, 15, for example shown in figure 1, 8 and 9, or else a substantially radial extension with respect to the same rotation axis 115, 15.

[0041] In particular, in this last embodiment, shown in figures 2, 4, 5 and 7b, the dosing valve 16 can be arranged as desired facing towards the outside of the group 10 or aimed towards the rotation axis 115, 15.

[0042] In this last case, figures 5 and 7b a tank for collecting the dosed substance will be foreseen, arranged at the rotation axis 115, 15.

[0043] Alternatively, in the case in which the dosing valve 16 faces towards the outside of the group 10 as shown in figure 4, on the other hand, the tank for collecting the dosed substance shall be arranged outside of the support.

[0044] In another embodiment shown in figures 6 and 7 the containment elements 114, 14, 114' can comprise a tank 114, 114' with trapezium shaped section with the smaller base arranged near to the rotation axis 115, 15.

[0045] In this way the available volume around the rotation axis 115, 15 is optimised and used almost entirely as storage volume.

[0046] With reference to figures 8-11, another example embodiment of an improved storage, mixing, homogenising and dosing group according to the present invention is shown with 10.

[0047] As can be seen in figure 8, such an improved storage, mixing, homogenising and dosing group comprises a first and a second plate element 11, 12, generally made from metal or plastic, arranged facing one another separately and able to rotate as a unit around a common axis 15.

[0048] According to a preferred embodiment, such first and second plate elements 11, 12 are parallel to one another and the common rotation axis 15 is a perpendicular axis passing through the centres of the plate elements 11, 12 themselves.

[0049] In particular, therefore, in order to mechanically set the aforementioned first and second plate elements 11, 12 in rotation, it is foreseen for there to be two holes 20, 21, on the first and on the second plate element 11, 12, respectively, inside which a drive shaft is positioned.

[0050] Of course, the embodiment just described is purely a preferred and not limiting one since the present invention also comprises embodiments in which the first and the second plate elements 11, 12 are not necessarily parallel to one another, nor is it necessary to have a rotation around a centred and perpendicular axis.

[0051] As can be seen in figure 8, each of the plate elements 11, 12 comprises a plurality of housings 13, 13', like for example circular through holes or shaped recesses suitably arranged on the circumference/perimeter of the plate elements 11, 12.

[0052] The improved storage, mixing, homogenising and dosing group according to the invention also comprises at least one containment or storage element 14, like for example a hollow cylinder of rigid or flexible material, which extends from the first plate element 11 up to the second plate element 12.

[0053] In particular, such at least one containment element 14 comprises a first and a second open end that can be selectively closed, associated with a first and a second housing 13, 13', which however are formed in positions out of alignment, respectively, of the first and second plate element 11, 12 with respect to the rotation axis 15.

[0054] In other words the containment element 14 has two ends that are not aligned according to the direction described by the rotation axis 15.

[0055] Indeed, as can be seen in figure 8, the second end of the containment element 14 is associated with the second plate element 12 at a different point to that which would be defined by the rotation axis 15 suitably translated in the centre of the first end of the containment element 14 associated with the first plate element 11.

[0056] Such a characteristic is clearer in figure 9 where, since the two plate elements 11 and 12 are parallel one in front of the other with perpendicular and central rotation axis 15, all of the containment elements 14 have an extension not perpendicular to the two plate elements 11 and 12 but "oblique" as if the second plate 12 had undergone a rotation with the first plate 11 standing still.

[0057] In this configuration the group, during the rotation of the two plate elements 11 and 12 provides an optimal mixing and homogenisation of the possible substance stored in said containment elements 14. It should be noted that in the case just described the bulk deriving from such a rotation is minimal and does not exceed the dimensions of the plates 11 and 12.

[0058] There is thus clearly an advantageous saving in terms of bulk compared to known machines where to achieve the same level of mixing and homogenisation of the substance contained in the containment elements 14

large spaces are needed.

[0059] Alternatively, according to the present invention it is foreseen for the at least one containment element 14 that extends from a first housing 13 of the first plate 11 to the second housing 13' of the second plate element 12 to be able to have an extension at least with curvilinear portions.

[0060] In this case the spatial extension of the containment element 14 will diverge even further with respect to the rotation axis 15 increasing the advantages described above.

[0061] According to the above all of the containment elements 14 supported by the two plate elements 11 and 12 have an extension in space that cannot be aligned, and/or that matches up completely, with the rotation axis 15 around which the group 10 is made to rotate.

[0062] Of course, in order to set the first and second plate elements 11, 12 of the group 10 in rotation it is foreseen for there to be a dedicated motion transmission system, which could nevertheless also control the simultaneous movement of other groups 10 according to the invention.

[0063] Moreover, preferably the group 10 can comprise a control unit of the aforementioned motion transmission system, which can possibly be preset with stored rotation cycles and associated with different types of substance to be mixed and homogenised.

[0064] As shown in figures 8-11 the at least one containment element 14 is preferably a cylindrical element but alternatively it can be any shape.

[0065] Moreover, the at least one containment element 14 can be rigid or flexible and made from the material considered most suitable, which may for example be steel, aluminium, polyethylene, polyurethane.

[0066] The group 10 preferably also comprises at least one dosing valve 16, shown in figure 10, associated with each first housing 13 of the first plate element 11 on the opposite side of the at least one containment element 14 and through which the precise dosing of the mixed and homogenised substance stored can take place.

[0067] In order to avoid any spillage of material in the dosing step it is foreseen for there to be a suitable sleeve that, at the first housing 13, on an "inner" side of the first plate element 11, is coupled with the relative containment element 14 and, on the other "outer" side, is coupled with the dosing valve 16.

[0068] On the opposite side with respect to the dosing valve 16, in order to avoid any spillage of material even in the storage step of the substance inside the containment element 14, the group preferably comprises at least one filling nozzle 17, shown in figure 11.

[0069] As can be seen in figure 11, such at least one filling nozzle 17 on an "inner" side of the second plate element 12 is coupled with the relative containment element 14 whereas on the other "outer" side it can be selectively closed or coupled with an outer tank of the substance to be stored.

[0070] As auxiliary elements, the group 10 according to the present invention also comprises a mobile trolley associated with the first plate element 11 comprising a motorised roller, a balance and a hoister.

[0071] According to another embodiment of the present invention, visible in figures 10 and 11, the group according to claim 1 also comprises at least one third plate element 18 arranged interfacing separatley between the first and second plate element 11, 12, in which such at least one third plate element 18 comprises a plurality of housings 19 for supporting the at least one containment element 14 totally similar to the housings 13, 13' of the plate elements 11, 12.

[0072] In such an embodiment, therefore, a containment element 14, which extends from the first plate element 11 to the second plate element 12 in the way described earlier, is supported by at least one housing 19 of the at least one third plate element 18, which 19 is not necessarily aligned with respect to the ends of the containment element 14 itself.

[0073] In such an embodiment the aforementioned containment element 14 is preferably of the flexible type and follows a trajectory that is not necessarily rectilinear.

[0074] Finally, with the purpose of ensuring firm assembly of the group 10, in one particular embodiment it is also possible to foresee the presence of connection elements 20 between the at least one third plate element 18 and the first and second plate element 11, 12.

[0075] It is absolutely easy to understand how the device object of the invention operates.

[0076] The improved storage, mixing, homogenising and dosing group comprises a plurality of containment elements 114, 14, 114' associated with a rotary support 111, 111', 11, 12, in which such containment elements 114, 14, 114' are arranged radially with respect to the rotation axis 115, 15 of the support 111, 111', 11, 12 and provided with a first end equipped with a dosing valve 16 and a second end equiped with a filling nozzle 17.

[0077] In such a configuration, by setting the support in rotation, that which is stored in the containment elements will automatically be mixed and homogenised, reducing the required bulk even for large quantities of mixtures to the minimum, as can be seen in figure 7b.

[0078] Similarly, also in the embodiments shown in figures 1-7 the group 10 during the rotation performs an optimal mixing and homogenisation of the possible substance stored in the containment elements 14 reducing the bulk to a minimum.

[0079] It has thus been seen that an improved storage, mixing, homogenising and dosing group according to the present invention achieves the purposes highlighted earlier.

[0080] In particular, the present invention makes an improved storage, mixing, homogenising and dosing group that is simple, reliable, subject to minimal wear of the mechanical components, requiring minimal maintenance and minimal energy needs and that offers the maximum versatility and flexibility as well as perfect homogenisation of the stored products.

[0081] The improved storage, mixing, homogenising and dosing group of the present invention thus conceived can undergo numerous modifications and variants, all of which are covered by the same inventive concept; moreover, all of the details can be replaced by technically equivalent elements. In practice, the materials used, as well as their shapes and sizes, can be whatever according to the technical requirements.

Claims

1. Improved storage, mixing, homogenising and dosing group (10) comprising a plurality of containment elements (114, 14, 114') associated with a rotary support (111, 111', 11, 12) around a rotation axis (115, 15), said containment elements (114, 14, 114') being arranged radially with respect to said rotation axis (115, 15) of said support (111, 111', 11, 12) and being provided with a first end associated with a dosing valve (16) and a second end associated with a filling nozzle (17).

2. Group according to claim 1 **characterised in that** said containment elements (114, 114') are associated with said rotary support (111, 111') on at least one side lined up with one another along a circular crown (C) substantially centred in said rotation axis (115) and in a selectively removable way.

3. Group according to claim 1 **characterised in that** said containment elements (114, 14, 114') comprise a substantially cylindrical tank (114, 14, 114').

4. Group according to claim 1 **characterised in that** said rotary support (111, 111', 11, 12) comprises a polygonal frame (111) centred in said rotation axis (115, 15).

5. Group according to claim 1 **characterised in that** said rotary support (111, 111', 11, 12) comprises a circular crown frame (111') around said rotation axis (115, 15).

6. Group according to claim 4 or 5 **characterised in that** said containment elements (114, 14, 114') extend parallel to said rotation axis (115, 15).

7. Group according to claim 4 or 5 **characterised in that** said containment elements (114, 14, 114') extend radially with respect to said rotation axis (115, 15).

8. Group according to claim 1 **characterised in that** said containment elements (114, 14, 114') comprise a cylindrical tank (114, 114') shaped like a trapezium with the larger base arranged near to said rotation axis (115, 15).

9. Group according to claim 1 **characterised in that** said rotary support (111, 111', 11, 12) comprising a first and a second plate element (11, 12) arranged facing one another separated apart and mobile in rotation around a common axis (15), each of said plate elements (11, 12) comprising a plurality of housings (13, 13'), said containment elements (14) extending from said first plate element (11) to said second plate element (12), said first and said second end of said containment elements (14) being associated with a first and a second housing (13, 13') formed in non-aligned positions of said first and second plate element (11, 12), respectively, with respect to said rotation axis (15).

10. Group according to claim 9 **characterised in that** said containment elements (14) have a curvilinear extension at least partially out of alignment with respect to said rotation axis (15).

11. Group according to claim 9 or 10 **characterised in that** said at least one containment element (14) is a tubular element.

12. Group according to claim 9 or 10 **characterised in that** said at least one containment element (14) is a flexible tubular element.

13. Group according to claim 9 or 10 **characterised in that** it comprises a mobile trolley associated with said second plate element comprising a motorised roller, a balance and a hoister.

14. Group according to claim 9 or 10 **characterised in that** it comprises at least one third plate element (18) arranged facing and separated between said first and second plate element (11, 12), said at least one third plate element (18) comprising a plurality of support housings (19) of said at least one containment element (14).

15. Group according to claim 14 **characterised in that** it comprises connection elements (20) between said at least one third plate element (18) and said first and second plate element (11, 12).

Fig. 2

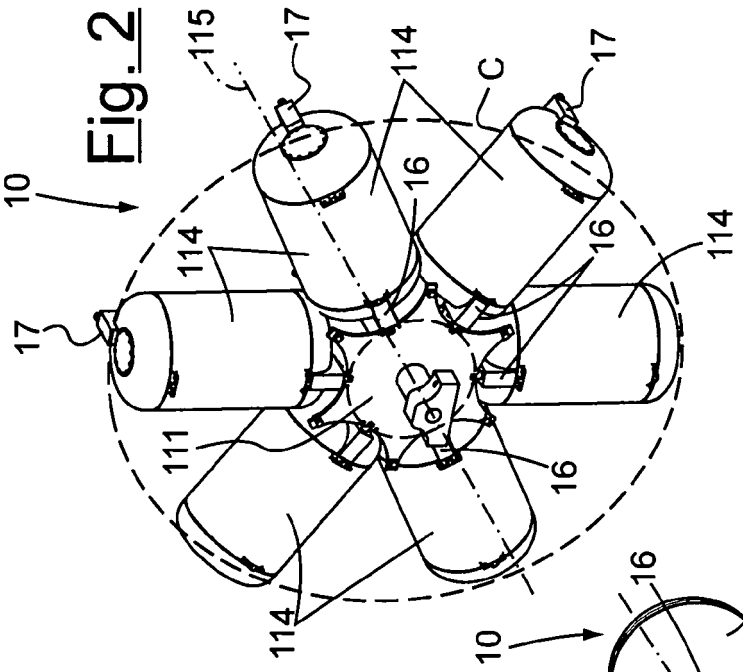


Fig. 1

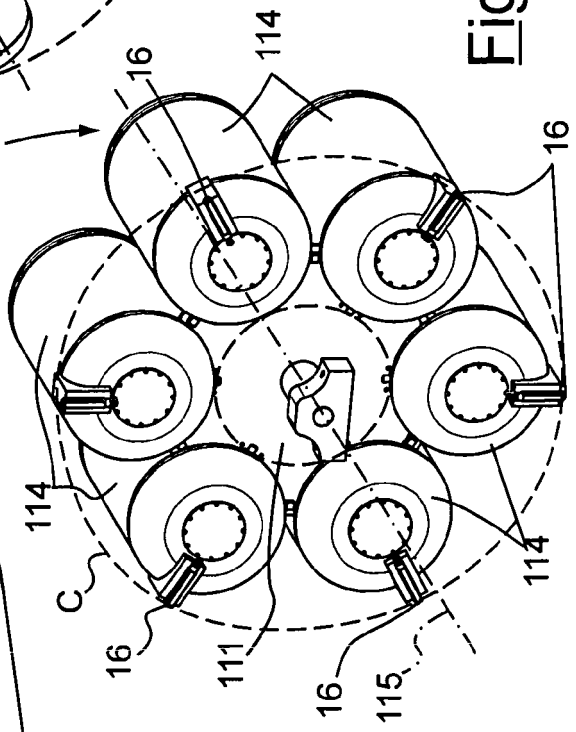


Fig. 3

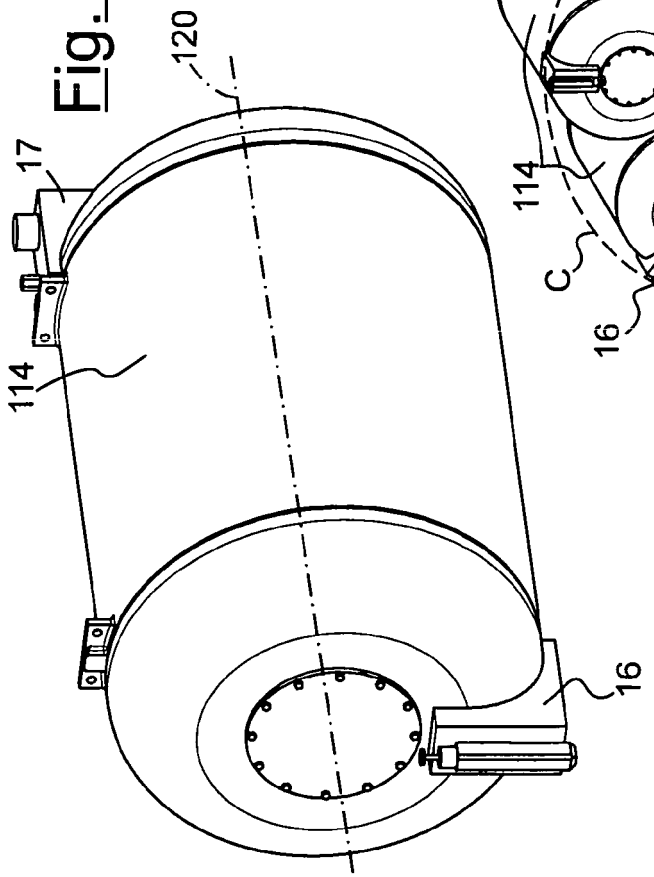


Fig. 4

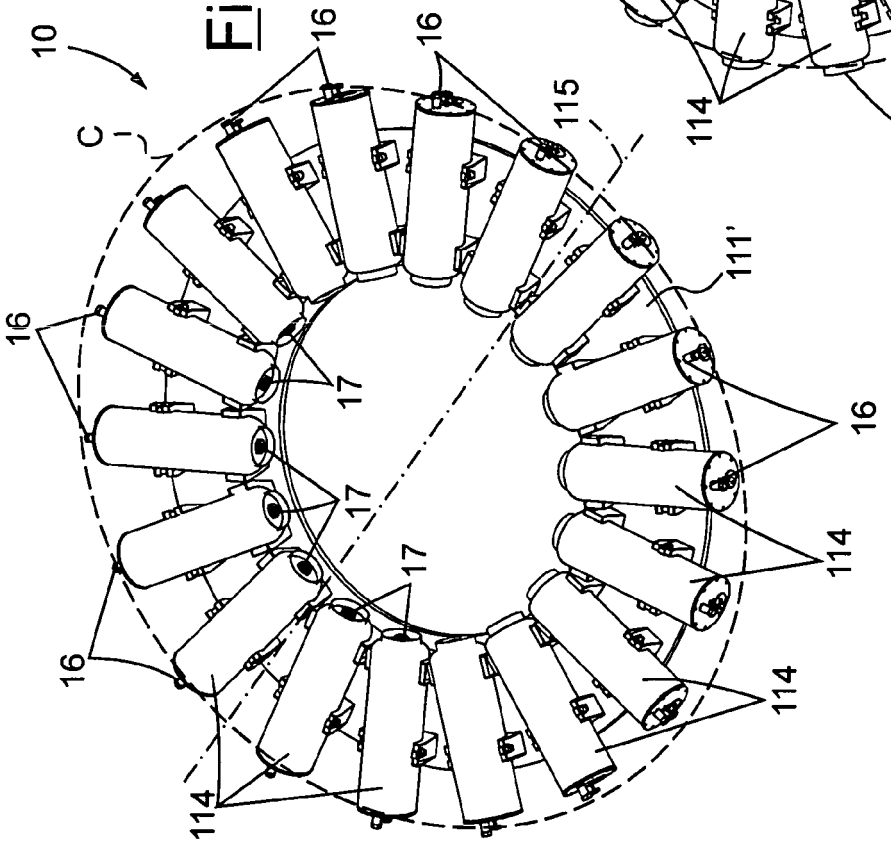

10
C
16
16
115
111'
16
17
17
17
16
114
114

Fig. 5

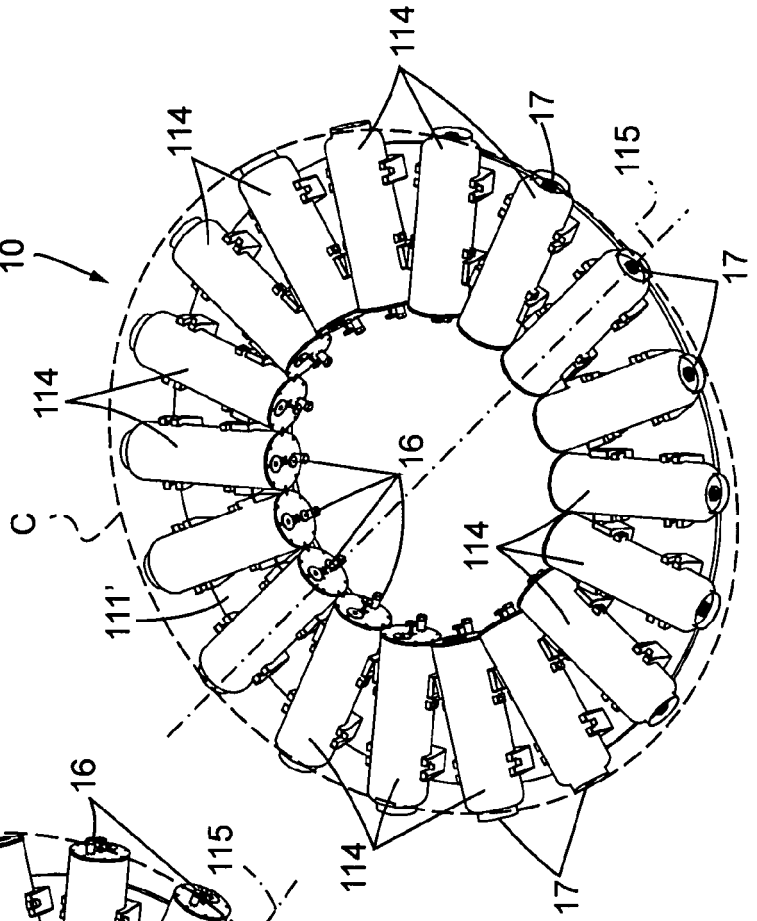

10
114
114
17
115
17
C
16
114
111'
114
114
17

Fig. 6

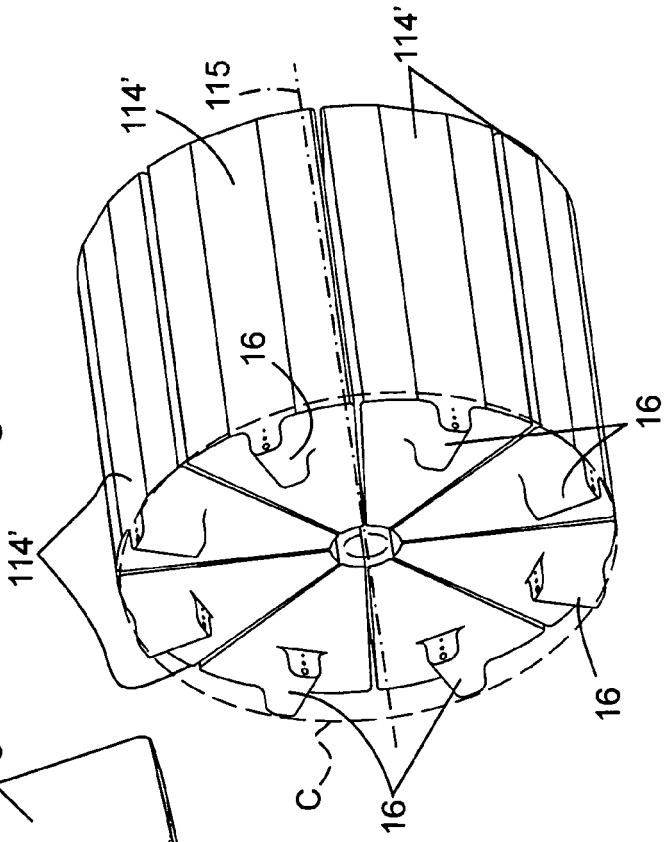


Fig. 7

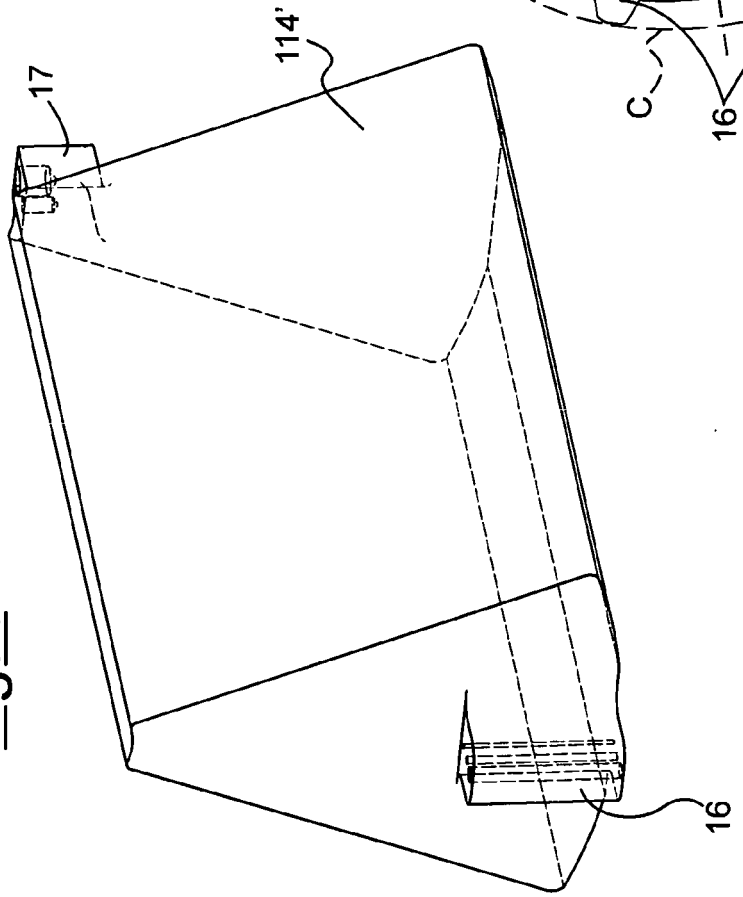


Fig. 7b

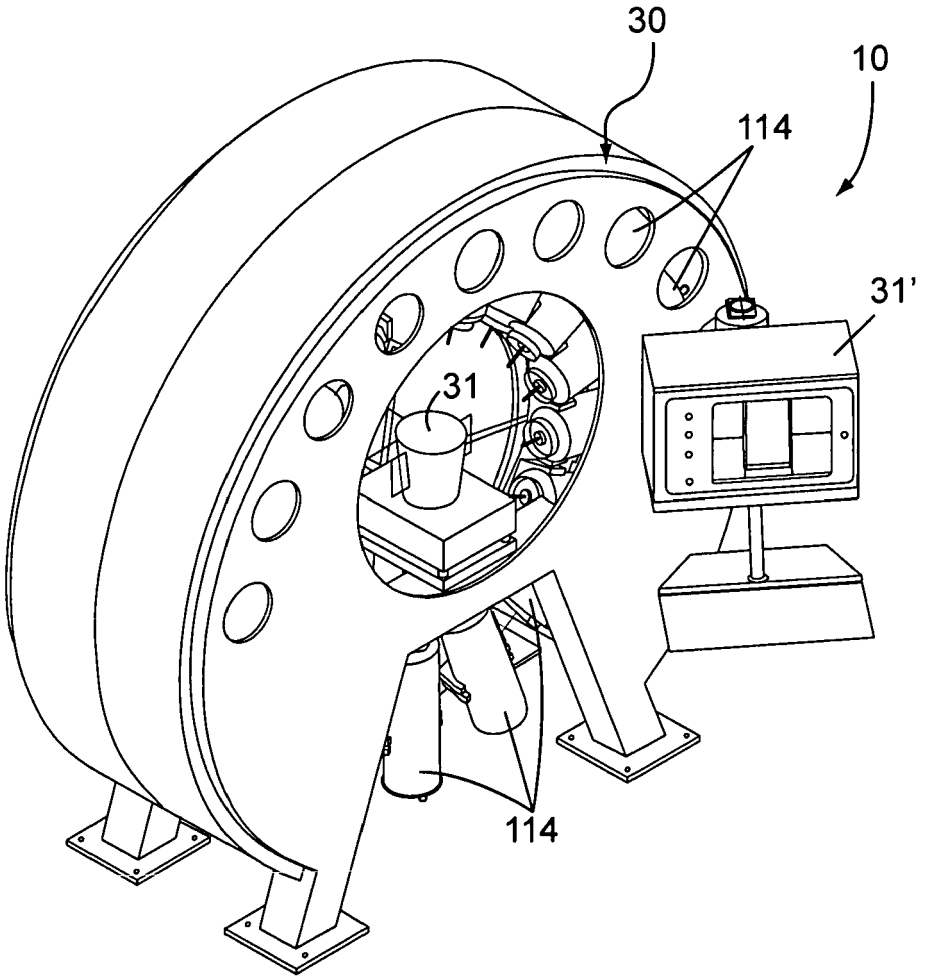
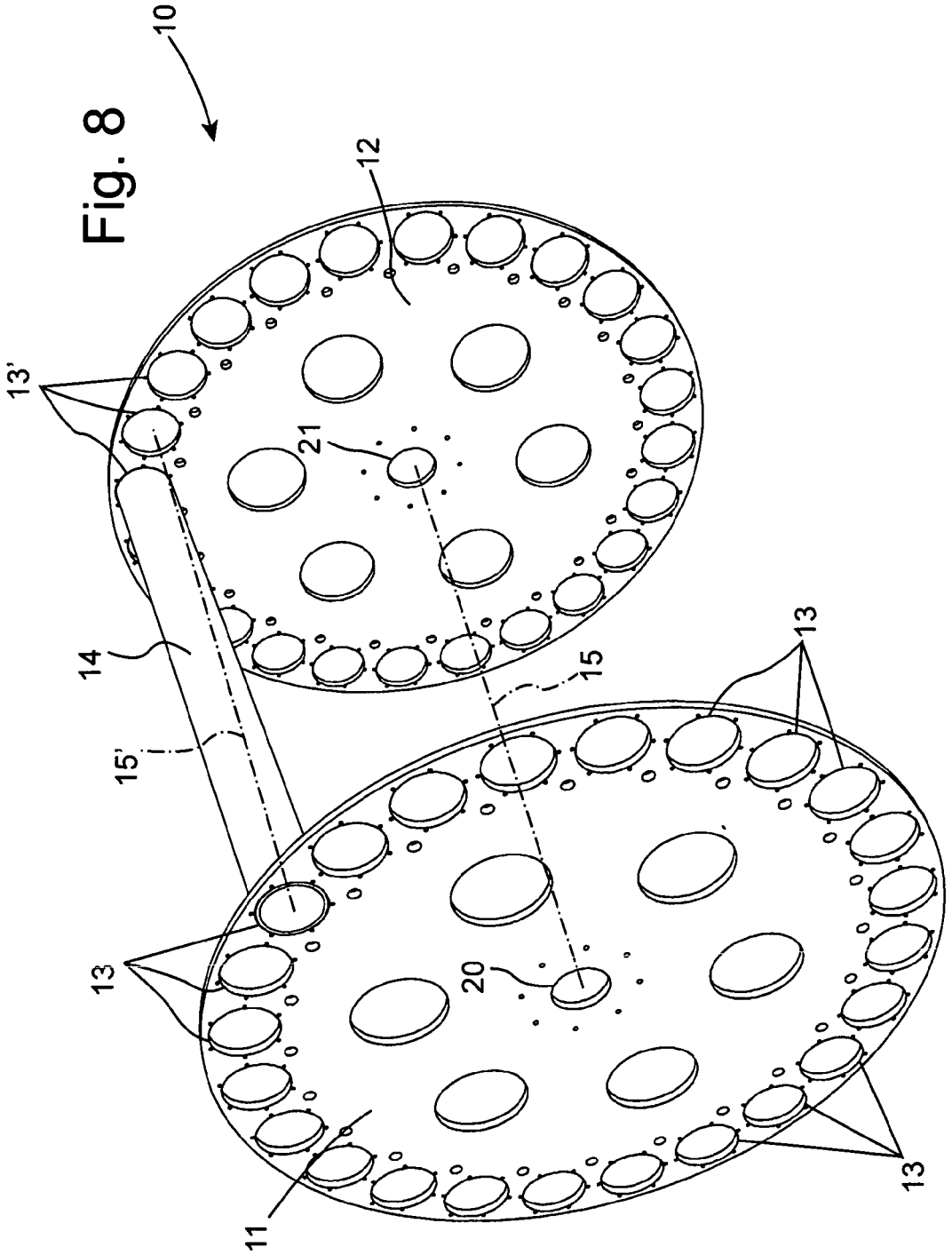


Fig. 8



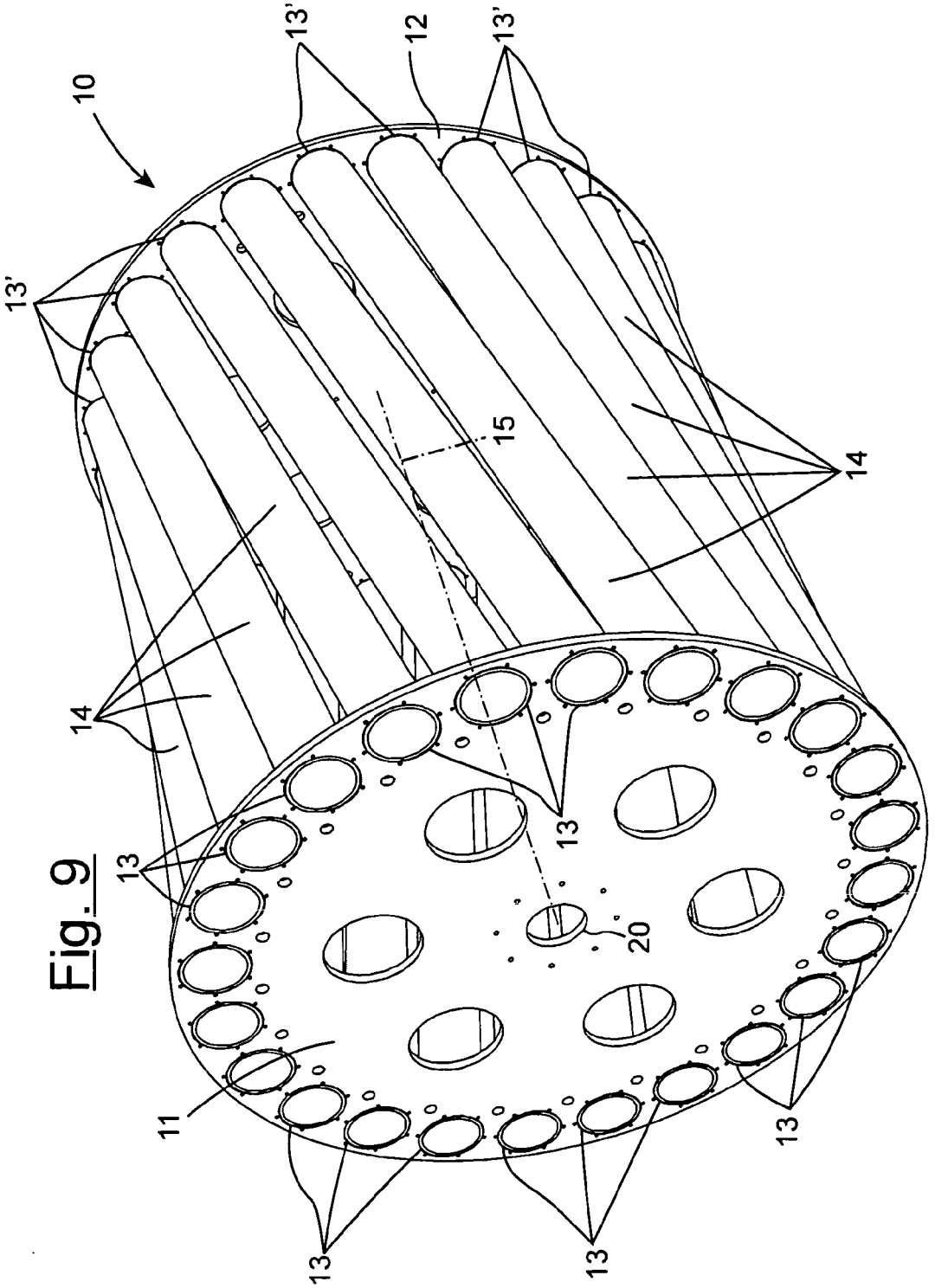


Fig. 9

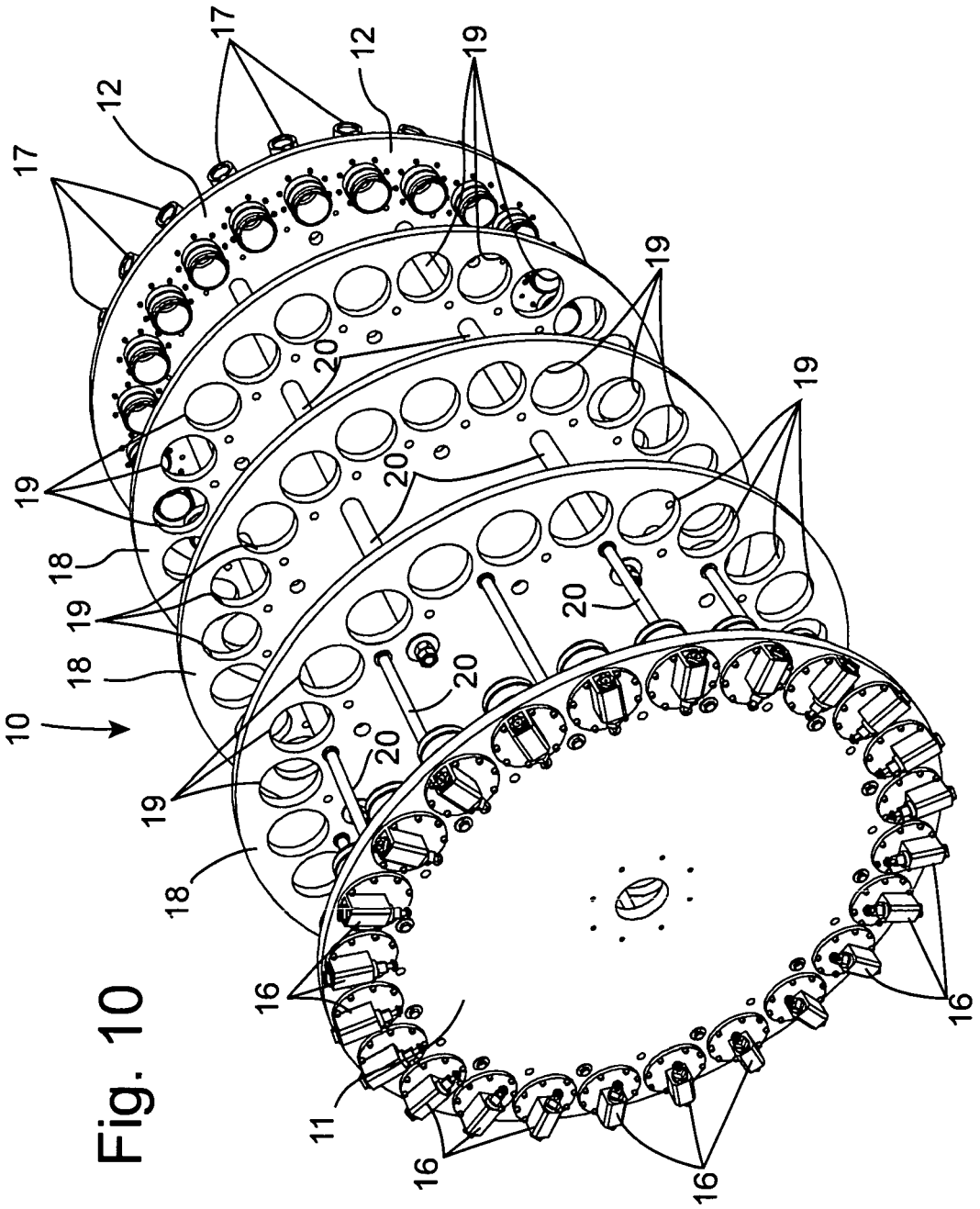


Fig. 10

Fig. 11