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the filling fluid, in the swirl body (2) a second passage (5) being obtained for a gas to be evacuated, the second passage (5) being coaxial with the first passage (3) and having an at least partially helical extension.

Description

[0001] The present invention relates to a flow deflector and a filling device for filling a receptacle comprising such a flow deflector.

[0002] Among the known filling devices, a distinction must first be made according to the type of product:

- filling devices for so-called "flat" products, i.e., products without carbon dioxide;
- filling devices for carbonated products, i.e., products containing carbon dioxide.

[0003] The filling of flat products in aseptic or ultraclean productions occurs by keeping the filling valve spaced with respect to the inlet of the receptacle so as to avoid any contamination of the receptacle due to contact with the valve itself, and by flowing the product into the centre of the receptacle (filling "from the centre").

[0004] Conversely, the filling of carbonated products occurs by contacting the filling valve with the receptacle. In fact, the filling method of carbonated products includes a pressurisation step of the receptacle achieved by hermetically closing the inlet by means of the filling valve.

[0005] In this context, attention is focused on filling carbonated products.

[0006] A constraint in filling carbonated products is reducing or avoiding the formation of foam. To this end, some known solutions employ so-called flow "deflection" techniques. For example, the deflection can be obtained by means of deflectors - i.e., protrusions - which force the flow to open in an "umbrella" shape, so that the product is conveyed on the inner walls of the receptacle, while the air is evacuated from the centre of the receptacle itself. The use of deflectors reduces the turbulence of the fluid during the filling, thus limiting the production of foam.

[0007] The main disadvantage of deflectors is related to the format change: to obtain a good deflection, the protrusions or teeth must be positioned at the connection area between the body of the bottle and the neck. The placement of the deflectors is thus variable as a function of the shape of the receptacle/bottle.

[0008] Alternatively, the deflection can be obtained by means of a helical element which usually envisages the return of air in a duct coaxial with the axis of the tap. With some types of taps, however, it is not possible to create a duct which crosses the shutter stem.

[0009] An example of a helical deflector, integral with the lower end of the shutter, is proposed in document EP3473590. The helices, lapped by the product, determine the rotation thereof, thus creating a vortex flow which is conveyed on the inner walls of the receptacle. The air is evacuated by means of a duct extending with an initial section centrally at the inlet of the receptacle, then deviating transversely with respect to the valve body and moving away with another section parallel to the valve body.

[0010] The transverse section of the duct has a dis-

turbing effect on the vortex motion of the filling fluid.

[0011] A deflector element with a central helical section is known from EP3670433. The deflector element is provided with protrusions or fins, in one of which an air evacuation duct extends.

[0012] In this context, the technical task underlying the present invention is to propose a flow deflector and a filling device for filling a receptacle comprising such a flow deflector, which overcome the problems of the prior art cited above.

[0013] In particular, it is an object of the present invention to provide a flow deflector which allows the evacuation of the gas, avoiding or limiting interference with the vortex flow of the filling fluid.

[0014] Another object of the present invention is to provide a flow deflector which is compact and structurally simple.

[0015] The specified technical task and the specified objects are substantially achieved by a flow deflector for use in a filling device of a receptacle, comprising a swirl body defining a first passage having a helical extension for a filling fluid. The first passage consists of coils which impose a vortex motion on the filling fluid.

[0016] A second passage for a gas to be evacuated is also obtained in the swirl body. The second passage is coaxial with the first passage and has an at least partially helical extension.

[0017] In accordance with an aspect of the invention, the second passage comprises a helically extending section defined by the outer walls of the coils.

[0018] In accordance with a preferred embodiment, the helically extending section of the second passage and the first passage are complementarily shaped to each other.

[0019] In accordance with an aspect of the invention, the second passage comprises a further cylindrical section which widens at one of the ends.

[0020] In accordance with an embodiment, the coils are equally spaced by a predefined pitch.

[0021] In accordance with another embodiment, the distance between the coils is variable.

[0022] In accordance with an aspect of the invention, the swirl body is made of stainless steel or titanium or of a polymer material.

[0023] The stated technical task and specified aims are substantially achieved by a filling device for filling a receptacle comprising:

- a valve body;
- a passage channel for the filling fluid, obtained inside the valve body;
- a dispensing nozzle for dispensing the filling fluid;
- a shutter slidably inserted into the passage channel to establish the selective communication thereof with the dispensing nozzle;
- the flow deflector in accordance with the present invention, which is arranged at the dispensing nozzle.

[0024] In accordance with an aspect of the invention, the flow deflector is removably inserted inside the valve body.

[0025] In accordance with an embodiment, the flow deflector is housed in a lower zone of the valve body.

[0026] Additional features and advantages of the present invention will become more apparent from the illustrative and thus non-limiting description of a preferred but not exclusive embodiment of a flow deflector and a device for filling a receptacle comprising such a flow deflector, as illustrated in the appended drawings, in which:

- figures 1A and 1B illustrate a flow deflector for use in a filling device, in accordance with the present invention, in two different perspective views;
- figure 2 illustrates the flow deflector of figure 1 in a sectioned perspective view;
- figure 3 illustrates a filling device, in accordance with the present invention, in a sectioned side view.

[0027] With reference to the figures, the number 1 indicates a flow deflector for use in a filling device 10 for filling a receptacle (not illustrated). The flow deflector 1 comprises a swirl body 2 inside which a first passage 3 is obtained for a filling fluid, in particular a carbonated beverage.

[0028] The first passage 3 has a helical extension, i.e., it is formed by a plurality of coils 4 inside which the filling fluid flows. The coils 4 impose a vortex motion on the fluid.

[0029] A second passage 5 for a gas to be evacuated is also obtained in the swirl body 2.

[0030] Advantageously, the second passage 5 is coaxial with the first passage 3. In accordance with the embodiment described and illustrated herein, the second passage 5 also has an at least partially helical extension. Preferably, the second passage 5 comprises a helically extending section 5a defined by the outer walls of the coils 4.

[0031] Preferably, the first passage 3 and the helically extending section 5a of the second passage 5 are complementarily shaped.

[0032] In other words, while the filling fluid can flow inside the coils 4 of the first passage 3, the gas to be evacuated laps the outside of such coils 4.

[0033] In particular, the first passage 3 is characterised by a predefined pitch, i.e., by a predefined distance between the coils 4.

[0034] The pitch can be constant or variable.

[0035] Precisely the distance between the coils 4 allows to give rise to the section 5a of the second passage 5 which extends as a helical path in the opposite direction with respect to the first passage 3.

[0036] In accordance with an embodiment of the invention, the coils 4 of the first passage 3 all have the same diameter.

[0037] As visible in the figures, the second passage 5 comprises a further cylindrical section 5b which widens at one of the ends.

[0038] The swirl body 2 can be made of stainless steel or titanium or of a polymer material.

[0039] In accordance with another embodiment, one or more coils 4 can have a greater diameter with respect to that of the other coils 4. Both the number of coils 4, and the pitch and the diameter of each coil 4 are parameters which are defined during the design phase, as a function of the filling fluid and the geometry of the receptacle.

[0040] As mentioned above, the flow deflector 1 can be used inside a filling device 10 for filling a receptacle. See for example figure 3.

[0041] In particular, the receptacle is a bottle having a tubular body and an externally threaded neck 100b.

[0042] For example, the receptacle is made of thermoplastic material, such as PET.

[0043] The filling device 10 comprises:

- a valve body 11;
- a passage channel 12 for the filling fluid, obtained inside the valve body 11;
- a dispensing nozzle 13 for dispensing the filling fluid;
- a shutter 14 slidably inserted into the passage channel 12 to establish the selective communication thereof with the dispensing nozzle 13;
- the flow deflector 1 arranged at the dispensing nozzle 13.

[0044] In particular, the shutter 14 can be configured at least in:

- an opening configuration, in which it enables the flow of the filling fluid through the passage channel 12 to the dispensing nozzle 13;
- a closing configuration, in which the flow to the dispensing nozzle 13 is blocked.

[0045] In accordance with an embodiment, the flow deflector 1 is housed in a lower zone of the valve body 11.

[0046] In particular, the flow deflector 1 is mounted integrally to the valve body 11.

[0047] The operation of the filling device for filling a receptacle, according to the present invention, is described below.

[0048] In order to be filled with a carbonated beverage, the receptacle is placed with the inlet 100c thereof in contact with the lower part of the filling device 10, in particular in contact with a sealing gasket.

[0049] The receptacle is then pressurised with carbon dioxide through the second passage 5 of the flow deflector 1. At the end of the pressurisation, the gas inside the receptacle is at the same pressure as the gas in the carbonated beverage.

[0050] The shutter 14, initially placed in the closing configuration, moves into the opening configuration for which it enables the flow through the passage channel 12 to the dispensing nozzle 13.

[0051] At the dispensing nozzle, the filling fluid is inter-

cepted by the flow deflector 1.

[0052] The filling fluid is channelled into the first helically extending passage 3, which creates a vortex flow which is conveyed on the inner walls of the receptacle. In fact, the helix geometry imposes a vortex motion on the fluid so that the velocity of the fluid has a tangential component which allows it to adhere to the inner walls of the receptacle.

[0053] During the filling, the gas is evacuated through the second passage 5. In particular, the gas travels through the first passage 5, crosses a plurality of openings 15 and reaches an annular chamber 16 obtained between the flow deflector 1 and the inner walls of the valve body 11. An evacuation duct 17 obtained in the valve body 11 starts from the annular chamber 16. Since the first passage 3 and the second passage 5 are completely separate, the gas does not interfere with the beverage being dispensed, thus it does not disturb the vortex motion thereof.

[0054] At the end of the filling, the shutter 14 returns to the closing configuration which blocks the flow of the beverage to the dispensing nozzle 13.

[0055] At this point, the receptacle is depressurised, i.e., brought back to atmospheric pressure. The receptacle is then lowered with respect to the filling device 10 and is ready to be closed by means of a capsule. Advantageously, the flow deflector 1 is removably inserted inside the filling device 10 so that it can be replaced according to needs.

[0056] For example, for carbonated productions the appropriate flow deflector 1 is selected as a function of the filling fluid and the geometry of the receptacle.

[0057] Furthermore, the possibility of removing the flow deflector 1 allows to make the filling device 10 also suitable for filling flat drinks. In this case, the flow deflector 1 is replaced by an element suitable for "flat" production. From the description given, the features of the filling device of a flow deflector and a filling device for filling a receptacle comprising such a flow deflector according to the present invention appear clear, as do the advantages thereof.

[0058] In particular, the proposed deflector is compact in that the gas return path extends inside the swirl body, preferably in a complementarily shaped manner with respect to the dispensing path of the filling fluid. This therefore avoids providing further ducts for the exit of the gas, as is the case in some known solutions.

[0059] The return path of the gas in the swirl body is completely separated from that of the filling fluid, so the formation of foam is limited.

[0060] The flow deflector proposed herein is also used in aseptic packaging lines. In particular, in some lines there is the need to fill both carbonated products and flat products. While carbonated products are less sensitive to bacteriological contamination, for "sensitive" flat products such as isotonic drinks, juices, nectars, soft drinks, tea, milk-based drinks, coffee-based drinks, etc., it is essential to avoid any microbiological contamination.

Claims

1. A flow deflector (1) for use in a filling device (10) for filling a receptacle, comprising:
 - 5 a swirl body (2) defining a first passage (3) having a helical extension for a filling fluid, said first passage (3) consisting of coils (4) that impose a vortex movement on the filling fluid,
 - characterized in that** in said swirl body (2) a second passage (5) is obtained for a gas to be evacuated,
 - 10 said second passage (5) being coaxial with the first passage (3) and having an at least partially helical extension.
2. The flow deflector (1) according to claim 1, wherein
 - 15 said second passage (5) comprises a section (5a) with a helical extension defined by outer walls of said coils (4).
3. The flow deflector (1) according to claim 2, wherein
 - 20 said section (5a) with a helical extension of the second passage (5) and said first passage (3) are complementarily shaped.
4. The flow deflector (1) according to claim 2 or 3,
 - 25 wherein said second passage (5) comprises a further cylindrical section (5b) that widens at one of the ends.
5. The flow deflector (1) according to any one of the
 - 30 preceding claims, wherein said coils (4) are equally spaced by a predefined pitch.
6. The flow deflector (1) according to any one of claims
 - 35 1 to 4, wherein the distance between said coils (4) is variable.
7. The flow deflector (1) according to any one of the
 - 40 preceding claims, wherein said swirl body (2) is made of stainless steel or titanium or of a polymeric material.
8. A filling device (10) for filling a receptacle, comprising:
 - 45 - a valve body (11);
 - a passage channel (12) for the filling fluid, obtained inside the valve body (11);
 - a dispensing nozzle (13) for dispensing the filling liquid;
 - a shutter (14) slidably inserted into said passage channel (12) to establish the selective communication thereof with said dispensing nozzle (13);
 - 50 - a flow deflector (1) according to any one of claims 1 to 7, said flow deflector (1) being arranged at the dispensing nozzle (13).
9. The filling device (10) according to claim 8, wherein

said flow deflector (1) is inserted removably inside
said valve body (11).

10. The filling device (10) according to claim 9, wherein
said flow deflector (1) is housed in a lower zone of 5
the valve body (11).
11. A filling machine for filling receptacles comprising a
plurality of filling devices (10) according to any one
of claims 8 to 10. 10

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FIG. 1A

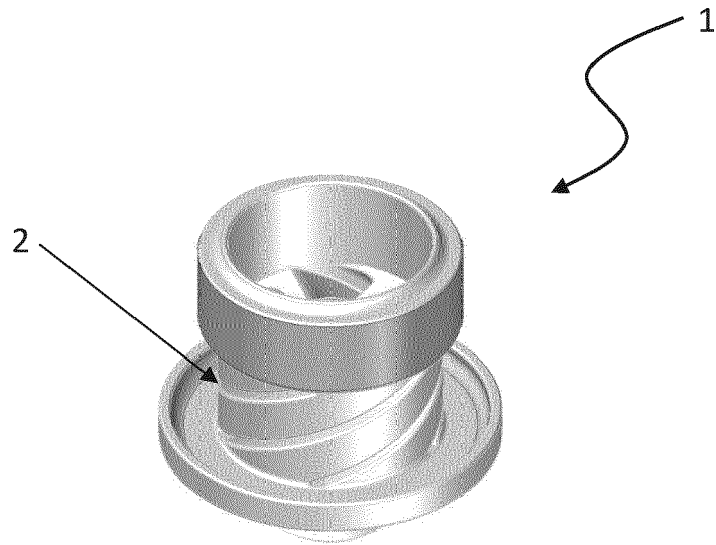


FIG. 1B

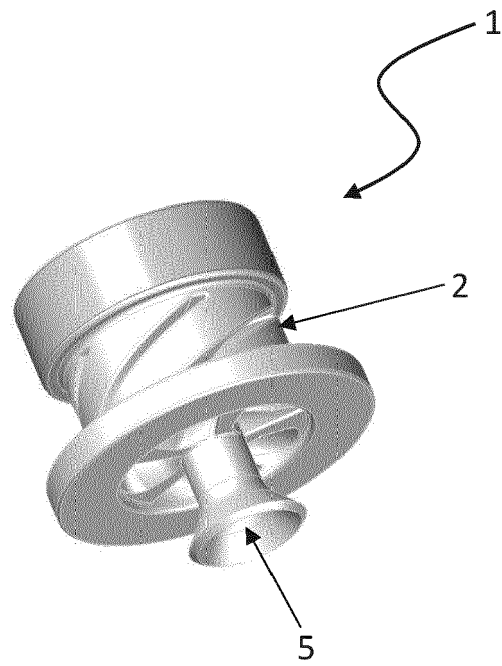


FIG. 2

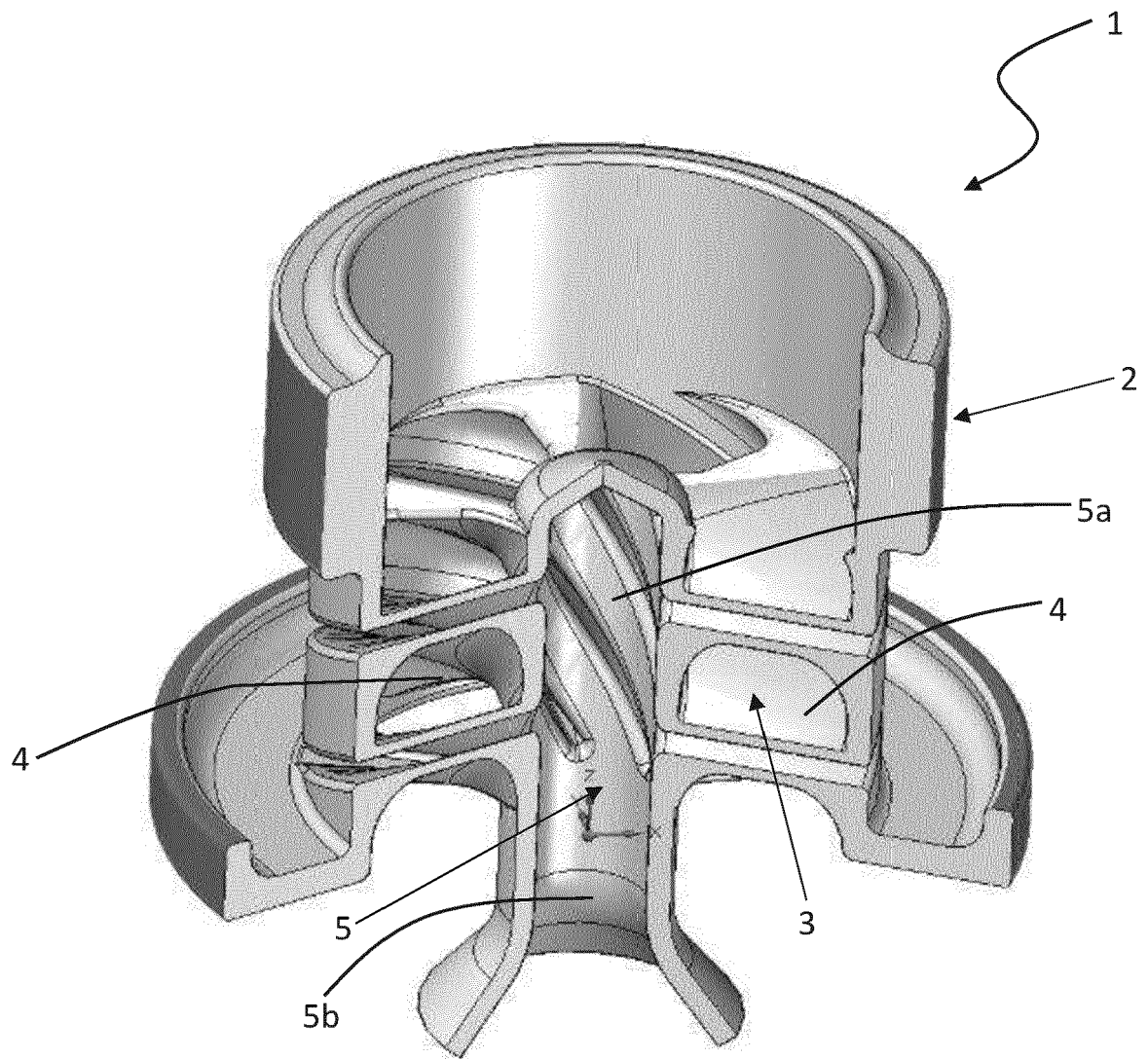
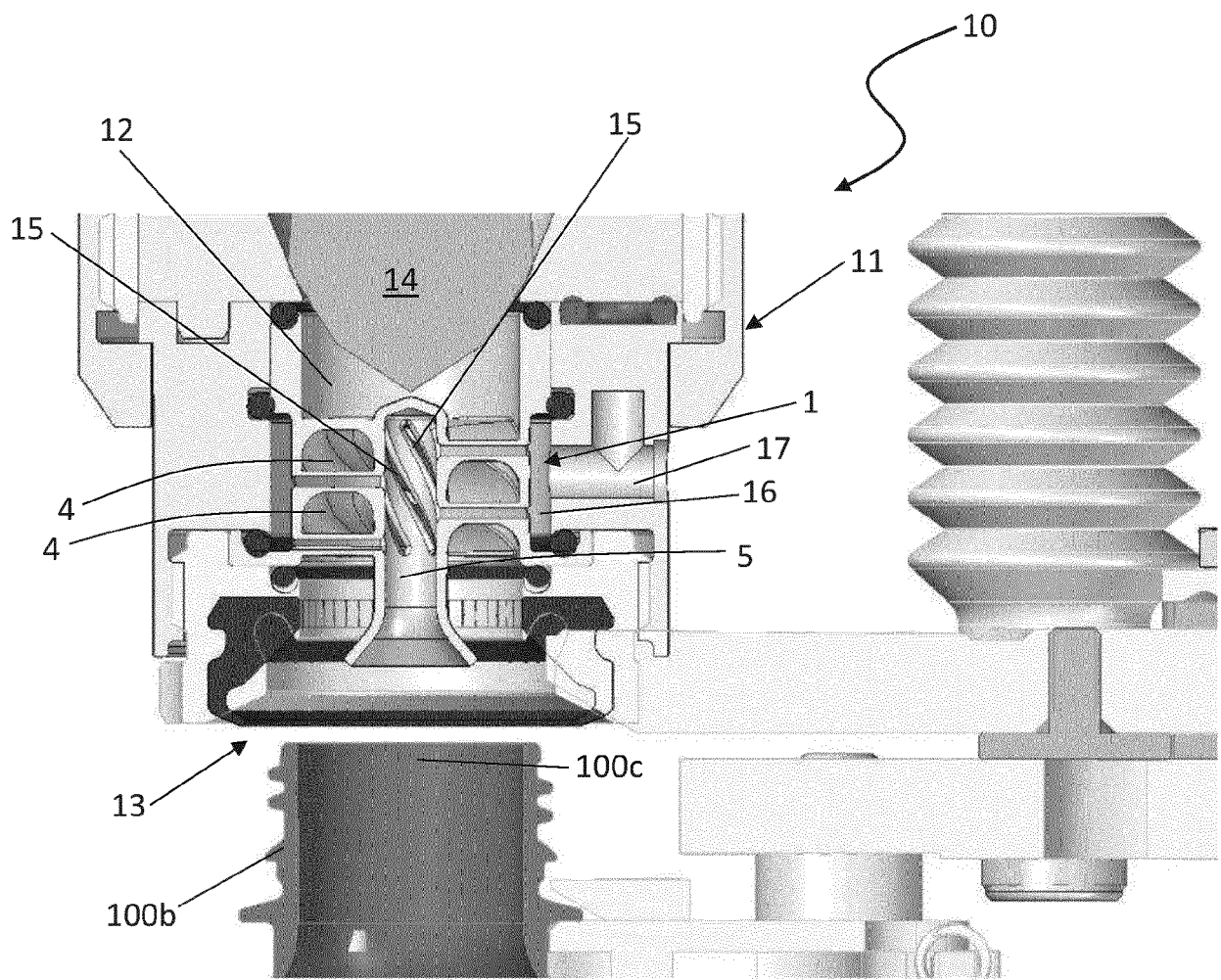


FIG. 3





EUROPEAN SEARCH REPORT

Application Number

EP 22 16 5449

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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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The present search report has been drawn up for all claims			

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Place of search	Date of completion of the search	Examiner
The Hague	19 September 2022	Wartenhorst, Frank
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		

**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 22 16 5449

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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19-09-2022

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