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(54) Dispenser for anaerobic curing compositions

(57) Anaerobic compositions cure when out of contact with oxygen or air and often when in contact with metal. Thus the dispenser for such anaerobic compositions has a casing (2) adapted to withstand internal pressure with an internal flexible container (3) having walls permeable to air or oxygen which gas is filled under pressure into the casing (2) to surround the container (3). A dispensing valve (5) is connected to the flexible container (3) and is selectively operable to release the composition. In order to allow dispensing even when the container (3) is becoming exhausted, an elongate channel-defining rod (4) extends across an interior of the flexible container (3) from adjacent the valve (5) to a remote end. The channel-defining rod (4) comprises solid wall elements extending generally radially outwardly from its longitudinal axis and twisting to define at least one helical channel extending generally longitudinally of the rod (4) and connected along substantially its entire extent directly to an interior of the flexible container (3).

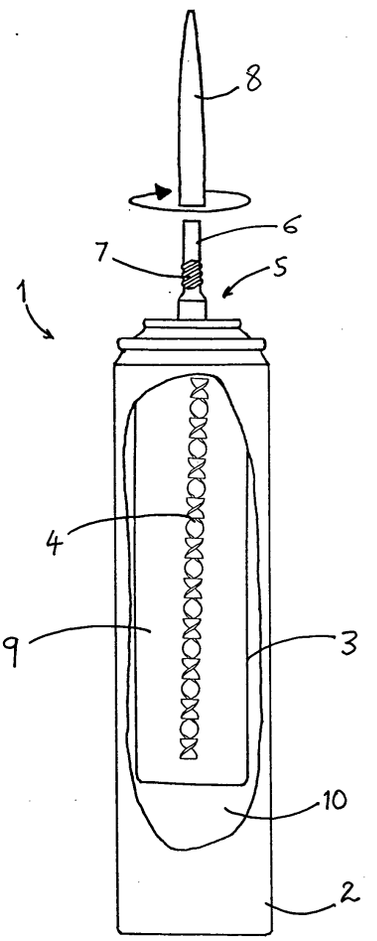


Fig 1

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Description

[0001] The present invention relates to a container for the storage and dispensing of curable compositions that cure in the absence of oxygen. More particularly but not exclusively, it relates to a dispenser for such compositions from which an improved proportion of its contents may be dispensed.

[0002] Anaerobic curing compositions are those which remain as liquids in the presence of oxygen, but which polymerise to solids or gels in the absence of oxygen. Such compositions also polymerise in the presence of metal, even a solid metal surface. They are therefore widely used in engineering instead of expensive or elaborate mechanical fixings or components, especially where metal components are to be fixed and/or sealed together. Common applications include thread-locking nuts, retaining, sealing and gasketing.

[0003] To prevent premature polymerisation and ensure long shelf lives, such anaerobic adhesives and sealants are generally stored in plastics containers with a substantial free air volume above the liquid composition. However, these products are generally highly viscous liquids or even pastes. Thus, a conventional manually-squeezable plastics bottle or the like, having a restricted nozzle for accurate application, is not particularly convenient as a dispenser for such compositions. It is also very difficult to squeeze out as high a proportion of the contents of such containers as one might wish, and the anaerobic compositions are generally far too viscous to flow out unaided.

[0004] While these compositions are highly effective when used correctly, they are also expensive to produce, compared to most other forms of adhesive or sealant. It is hence a disincentive to using such products, if there is a significant wastage that cannot be dispensed from the container. The recovery or disposal of undispensed product may also constitute an environmental, health and/or safety problem.

[0005] Alternative forms of container/dispenser have been considered which are adapted to deliver a high proportion of a liquid contained therein, driven by pressurised gas (frequently, but strictly incorrectly, known as aerosols). A conventional pressurised dispenser of this type has metal walls and would lead to polymerisation of its contents. A plastics equivalent would not be able to retain a gas pressure sufficient to deliver viscous anaerobic compositions. In any case, the composition should be delivered as a liquid not as a spray or a foam, so direct composition/gas contact is undesirable.

[0006] It is known to dispense a liquid material from an "aerosol" container comprising a flexible, collapsible bag disposed within a conventional pressurisable metal outer casing (widely referred to as a "barrier pack system"). The flexible bag holds the liquid and is connected to the dispensing valve of the container, while a gas under pressure is held within the outer casing and outside the bag, which is substantially impermeable. When the valve is operated, the pressurised gas compresses the flexible bag, expelling the liquid therein through the valve. Since the valve can be made entirely of plastics materials, the liquid is never in contact with metal.

[0007] Nevertheless, such containers are generally unsuitable for anaerobic compositions, as there is no free air volume in the bag to keep the liquid therein oxygenated.

[0008] An attempt has been made to address this problem in International Patent Application No. WO 00/18661, in which the flexible bag comprises a polymer permeable to oxygen, and the pressurised gas outside the bag contains a significant level of oxygen. Thus, an anaerobic composition within the bag can be stored without curing for substantial periods.

[0009] Unfortunately, it has been found that such a container still does not reliably dispense its entire contents. The bag often collapses unevenly, for example delivering material from adjacent the valve and then becoming locally constricted, preventing delivery of material from a side of the constriction remote from the valve.

[0010] A similar problem is known in conventional barrier pack systems having impermeable bags, and it has been addressed for such systems in US Patent No. 4148416. In this, a tubular body is placed within the flexible bag, leading from an end thereof adjacent the valve to adjacent a far end. Thus, even if the bag becomes locally constricted, a passage is maintained past the constriction allowing material from the remote end of the bag to reach the valve.

[0011] Such an arrangement has unfortunately proved an inadequate solution to the problem for anaerobic compositions. To avoid collapsing inwardly under pressure, the tubular body has relatively thick walls and hence a relatively narrow bore. This is especially true when the tubular body is of plastics material, as needs to be the case for most anaerobic compositions. Such a narrow bore does not allow free passage for liquids or pastes as viscous as the majority of anaerobic compositions. The narrow openings at each end of the tubular body are prone to blockage. Furthermore, even when combined with the oxygen-permeable bag of WO 00/18661, the interior of the tubular body is relatively inaccessible to oxygen permeating through the bulk of the composition, and so any of the composition retained therein for any length of time will begin to polymerise and can easily block the bore. This is found to be the case even with versions of the tubular body having perforated walls, also shown in US 4148416.

[0012] US4148416 also discloses, as an alternative, an elongate solid body provided with longitudinal surface ribs, but the passages defined between the ribs, the body and a constricted bag can often become too narrow to allow sufficiently free passage of a viscous liquid or paste. Nevertheless, the concept of maintaining a passage from end to end of a compressed bag appears sound.

[0013] It is hence an object of the present invention

to provide a container in which an anaerobic composition may be stored and from which it may be substantially completely dispensed, providing the benefits of the containers described above while obviating the problems described.

[0014] According to the present invention, there is provided a dispenser for anaerobic compositions comprising casing means adapted to withstand internal pressure, flexible container means disposed within the casing means and having walls permeable to oxygen and dispensing valve means connected to the flexible container means and selectively operable to release material held therewithin, wherein the dispenser is provided with elongate channel-defining means extending across an interior of the flexible container means from adjacent the valve means to a remote end, the channel-defining means comprising solid wall elements extending generally radially outwardly from its longitudinal axis and twisting to define at least one helical channel means extending generally longitudinally of the channel-defining means and connected along substantially its entire extent directly to an interior of the flexible container means.

[0015] The channel-defining element may comprise a plastics material.

[0016] Preferably, said channel means comprises at least half of the area of a transverse cross-section of the channel-defining means at any point thereof.

[0017] Advantageously, there is a plurality of said channel means, each extending generally longitudinally of the channel-defining means, and optionally interconnected, one with another.

[0018] Preferably, the channel-defining means comprises a plurality of substantially identical first sections arranged substantially along its longitudinal axis.

[0019] Advantageously, the channel-defining means also comprises a plurality of second sections, each substantially identical one to the others, and also arranged substantially along the longitudinal axis of the channel-defining means.

[0020] Said first and second sections may be arranged alternately along said longitudinal axis.

[0021] Preferably, each said first or second section defines at least one generally helical channel means extending generally longitudinally of the channel-defining means, optionally two generally helical channel means.

[0022] Advantageously, each said first section defines at least one channel means extending helically in an opposite sense to the at least one channel means defined by each said second section.

[0023] Each said first section may thus define a clockwise helical path while each said second section defines an anticlockwise helical path, or vice versa.

[0024] Advantageously, said wall of each section is discontinuous with the corresponding wall of each adjoining section.

[0025] Each of the two helical channel means defined by each section will then be connected to each of the two helical channel means defined by each said adjoining section.

[0026] Optionally, adjoining sections may be so disposed, one relative to the other, that their respective walls extend substantially at right angles one to the other where they meet.

[0027] Preferably, each said first or second section defines helical channel means having a pitch of between one quarter and four times a diameter of the section.

[0028] Advantageously, each said first or second section defines helical channel means having a pitch of between one half and two times said diameter, optionally having a pitch substantially equal to said diameter.

[0029] The flexible container means preferably contains an anaerobic composition, such as an anaerobic curing adhesive or sealant material.

[0030] The dispenser advantageously contains a pressurised gas, held between the casing means and the flexible container means.

[0031] Said pressurised gas may comprise oxygen, and optionally may comprise compressed air.

[0032] An embodiment of the present invention will now be more particularly described by way of example and with reference to the accompanying drawings, in which:

Figure 1 is a side elevation of a dispensing container embodying the invention, shown partially cut away;

Figure 2 is a side elevation of a channelling element of the container of Figure 1, isolated therefrom;

Figure 3 is an axial cross-sectional view of the element of Figure 2, taken along the line III - III;

Figure 4 is an axial cross-sectional view of the element of Figure 2, taken along the line IV - IV;

Figure 5A is a scrap view, in partial cross-section, of a valve of the container of Figure 1;

Figure 5B is a scrap view, in partial cross-section, of the valve shown in Figure 5A in operation;

Figure 6A is a scrap view in cross-section of a gas-filling arrangement of the container of Figure 1;

Figure 6B is a scrap view, in cross-section, of the gas-filling arrangement shown in Figure 6A in operation; and

Figure 7 is a side elevation of the dispensing container of Figure 1 in use, shown partially cut away.

[0033] Referring now to the Figures, and to Figure 1 in particular , a dispensing container 1 for anaerobic curing compositions comprises an elongate cylindrical outer casing 2, within which is disposed an elongate flexible bag 3. The outer casing 2 may be of metal such as tinplate or aluminium. The flexible bag 3 comprises a plastics material, such as low density polyethylene, which is permeable to gases, and in particular oxygen containing gases. An elongate channelling element 4 of plastics material is disposed generally longitudinally within the flexible bag 3, and is shown in more detail in Figures, 2,

3 and 4.

[0034] The container 1 is provided at a first end with a dispensing valve 5 of generally conventional form, shown in more detail in Figures 5A and 5B. The valve 5 is connected to an interior of the flexible bag 3. The valve 5 has a nozzle 6 extending outwardly therefrom, coaxially of the container 1, which is provided with a thread 7. A tapering extension nozzle 8, provided with a corresponding thread on an interior surface, may thus be screwed on to the nozzle 6.

[0035] The flexible bag 3 containing the element 4 is filled with an anaerobic curing composition 9 to be dispensed from the container 1, in the form of a viscous liquid or a flowable paste. A propellant gas 10 is held under pressure within the outer casing 2 and outside the flexible bag 3. (Arrangements for injecting this gas 10 into the container 1 are shown in Figures 6A and 6B). The propellant gas 10 has a significant oxygen content - compressed air is a convenient example. Because the flexible bag 3 is significantly permeable to oxygen, some oxygen from the propellant gas 10 will pass through the flexible bag 3 to contact the anaerobic composition 9. An oxygen concentration within the anaerobic composition 9 is thus established and maintained, which is sufficient to prevent or at least significantly retard premature curing within the container 1.

[0036] The channelling element 4, as shown in Figure 2, comprises a plurality of helical sections 11, 12, each formed of a wall extending radially on both sides of the longitudal axis of the element 4. Helical sections 11 having a twist in one sense, say clockwise, alternate along the element 4 with helical sections 12 having a twist in the opposite sense, say anti-clockwise. Each of the helical sections 11, 12 twists in a respective sense through half a revolution about the longitudinal axis of the elongate element 4. The wall at a first end 13 of each section 11, 12 extends at right angles to the wall at an adjoining second end 14 of a neighbouring section 12, 11.

[0037] Thus, in Figure 3, a second end 14 of a clockwise helical section 11 is visible, with each surface of the section 11 spiralling away in a clockwise sense, as shown. The first end 13 of the section 11 is just obscured, as is the adjoining anticlockwise section 12.

[0038] In Figure 4, further along the same helical section 11, a small portion of each surface of the section 11 is visible, spiralling away in a clockwise sense as far as the first end 13 of the section 11. The second end 14 of the adjoining anticlockwise helical section 12 extends at right angles to the first end 13 of the clockwise section 11, and each surface of the adjoining helical section 12 can be seen spiralling away in an anticlockwise sense.

[0039] The radially outer edges of the walls of the helical sections 11, 12 thus effectively define a cylindrical volume filled by the element 4. Continuous but indirect passages extend longitudinally from one end to the other end of the element 4, and said passages are also accessible throughout to material entering them from laterally of the element 4. Similarly, oxygen permeating through the composition 9 can easily reach any part of these passages, preventing the formation of anoxic zones in which the composition 9 may start to cure. However, the passages are sufficiently restricted, unlike in some known elements, that a flexible wall of the bag 3 cannot be compressed significantly into the cylindrical volume defined by the element 4.

[0040] A further benefit of the shape of element 4 shown is that (as Figure 3 makes particularly clear), the volume of the solid structure of each section 11, 12 is only a small proportion of the volume defined by the element 4 (here, about a quarter thereof). Thus, the longitudinal channels have a relatively high transport capacity for material flowing therealong. The manner in which the channels meet and split again at the ends 13, 14 of each section 11, 12 ensures that any blockage that may still form can easily be by-passed.

[0041] The net surface area of the element 4 shown is also minimised. This is important for viscous liquids and pastes, as surface drag can significantly hamper their flow. If flow were restricted unduly, higher compressed air pressures would be required within the outer casing 2 to drive the composition 9 out of the container 1, and there are limits to the pressures that commercially viable outer casings 2 can withstand.

[0042] Although the shape of element 4 shown might appear complex, it has no awkward undercuts, and is therefore relatively easy to injection-mould from a polymer of choice. The shape of the element 4 is also particularly conductive to good flow of the composition.

[0043] The dispensing valve 5 of the container 1 is relatively conventional, as Figure 5A and 5B show. The flexible bag 3 is mounted to the outer casing 2 and the valve 5 by means of a peened annular seam 15, such that the valve 5 is connected only to an interior of the bag 3 containing the composition 9, and not to the compressed gas 10 between the casing 2 and the bag 3.

[0044] The nozzle 6 is provided with a bore 16, which is open at an end distal to the container 1, but is closed by a plate 17 at a proximal end, disposed within the bag 3. A plurality of ports 18 extend through the walls of the nozzle 6 adjacent the plate 17. The nozzle 6 is seated within a resilient bush 19 of elastomeric material. Normally, as shown in Figure 5A, the plate 17 is held securely against a proximal end of the bush 19 by the pressure of the contents of the bag 3. The ports 18 are blocked by an interior surface of the bush 19, such that nothing from within the bag 3 can pass into and out of the nozzle 6.

[0045] To operate the valve 5, the nozzle 6 is displaced laterally (for example with a fingertip). The nozzle 6 cants over, as shown in Figure 5B, opening a passage between the plate 17 and the bush 19 leading to the ports 18. The pressure of gas 10 in the outer casing 2 compresses the bag 3, urging the liquid/paste composition 9 through the ports 18 and into the bore 16 of the nozzle 6, from which it is dispensed. Once the nozzle 6 is released, the resilient bush 19 returns the valve 5 to

its original configuration, re-sealing the valve.

[0046] The outer casing 2 is filled with pressurised gas 10 before use, as shown in Figures 6A and 6B. An end 20 of the casing 2 remote from the valve 5 is slightly dished, to help it withstand internal pressure. An elastomeric self-sealing grommet 21 is implanted in the dished end 20, and a gas injection needle 22 is passed therethrough. Gas 10, such as compressed air, is injected through the needle 22 into an interior of the casing 2, and the needle 22 is then withdrawn, the grommet 21 sealing itself automatically.

[0047] Figure 7 shows the container 1 in use. The valve 5 has been opened by displacing the nozzle 6 and attached extension nozzle 8 from their rest position. The compressed gas 10 in the outer casing 2 has partially crushed the flexible bag 3 and thus expelled much of the composition 9 held therewithin through the valve 5. As will frequently occur, the bag 3 has not collapsed evenly, and a localised constriction 23 has formed. However, this constriction 23 cannot tighten any further once it has contacted the channelling element 4. Thus, composition 9 held in a portion of the bag 3 remote from the valve 5 can still flow into the passages extending longitudinally of the element 4, past the constriction 23 and into a portion of the bag 3 from which it may flow to the valve 5. Even should one helical passage become blocked or filled by the bag 3, the opposite passage of that section should be available for flow of composition from the two passages of the section below to the two passages of the section above.

[0048] Almost all of the composition 9 may hence be dispensed from the container 1; the only wastage will be the small amount of composition 9 still present within the passages of the element 4 when the bag 3 has collapsed completely.

Claims

1. A dispenser for anaerobic compositions comprising casing means (2) adapted to withstand internal pressure, flexible container means (3) disposed within the casing means (2) and having walls permeable to oxygen, dispensing valve means (5) connected to the flexible container means (3) and selectively operable to release material held therewithin and elongate channel-defining means (4) extending across an interior of the flexible container means from adjacent the valve means (5) to a remote end, **characterised in that** the elongate channel-defining means (4) comprises solid wall elements extending generally radially outwardly from its longitudinal axis and twisting to define at least one helical channel means extending generally longitudinally of the channel-defining means and connected along substantially its entire extent directly to an interior of the flexible container means.

2. A dispenser as claimed in claim 1, **characterised in that** the channel-defining element comprises a plastics material.

3. A dispenser as claimed in either claim 1 or 2, **characterised in that** said channel means comprises at least half of the area of a transverse cross-section of the channel-defining means at any point thereof.

4. A dispenser as claimed in any one of the preceding claims, **characterised in that** the channel-defining means comprises a plurality of substantially identical first sections (11) arranged substantially along its longitudinal axis.

5. A dispenser as claimed in claim 4, **characterised in that** the channel-defining means further comprises a plurality of second sections (12), each substantially identical one to the others, and also arranged substantially along the longitudinal axis of the channel-defining means, preferably alternately between said first sections (11).

6. A dispenser as claimed in claim 5, **characterised in that** each said first or second section (11, 12) defines at least one, preferably two, generally helical channel means extending generally longitudinally of the channel-defining means.

7. A dispenser as claimed in either claim 5 or claim 6, **characterised in that** the channel means of each said first section (11) define a clockwise helical path while the channel means of each said second section (12) define an anticlockwise helical path, or vice versa.

8. A dispenser as claimed in claim 7, **characterised in that** said wall of each section is discontinuous with the corresponding wall of each adjoining section, so that each of the two helical channel means defined by each section will then be connected to each of the two helical channel means defined by each said adjoining section.

9. A dispenser as claimed in claim 8, **characterised in that** adjoining sections are so disposed, one relative to the other, that their respective walls extend substantially at right angles one to the other where they meet.

10. A dispenser as claimed in any one of claims 5 to 9, **characterised in that** each said first or second section (11, 12) defines helical channel means having a pitch of between one quarter and four times a diameter of the section, preferably between one half and two times said diameter, optionally having a pitch substantially equal to said diameter.

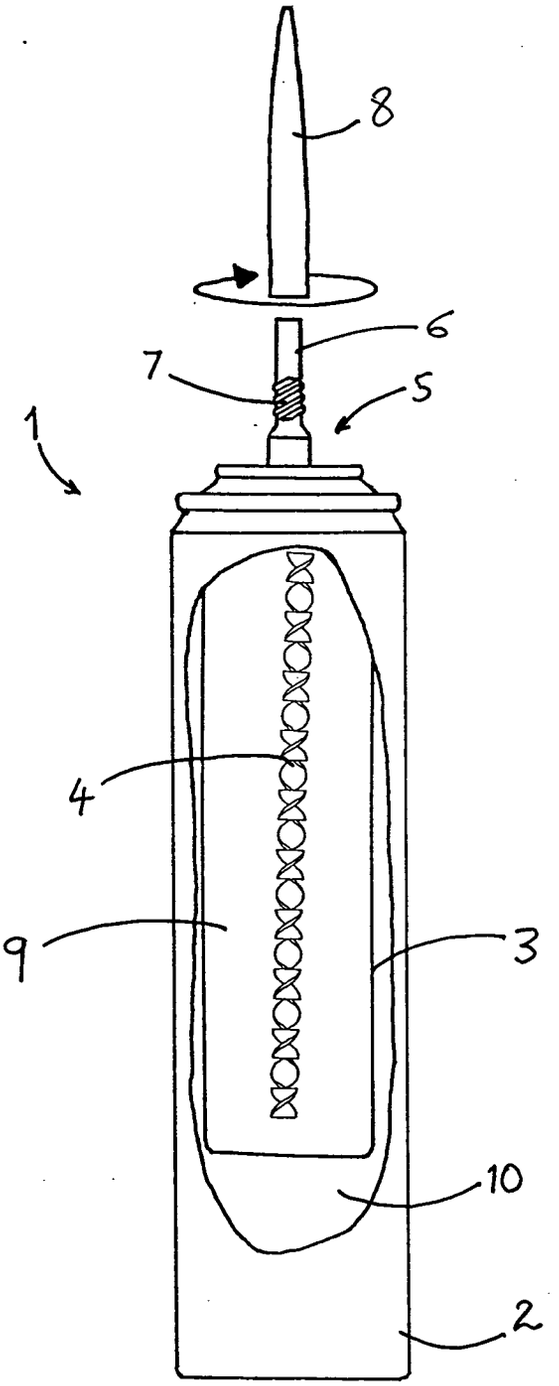


Fig 1

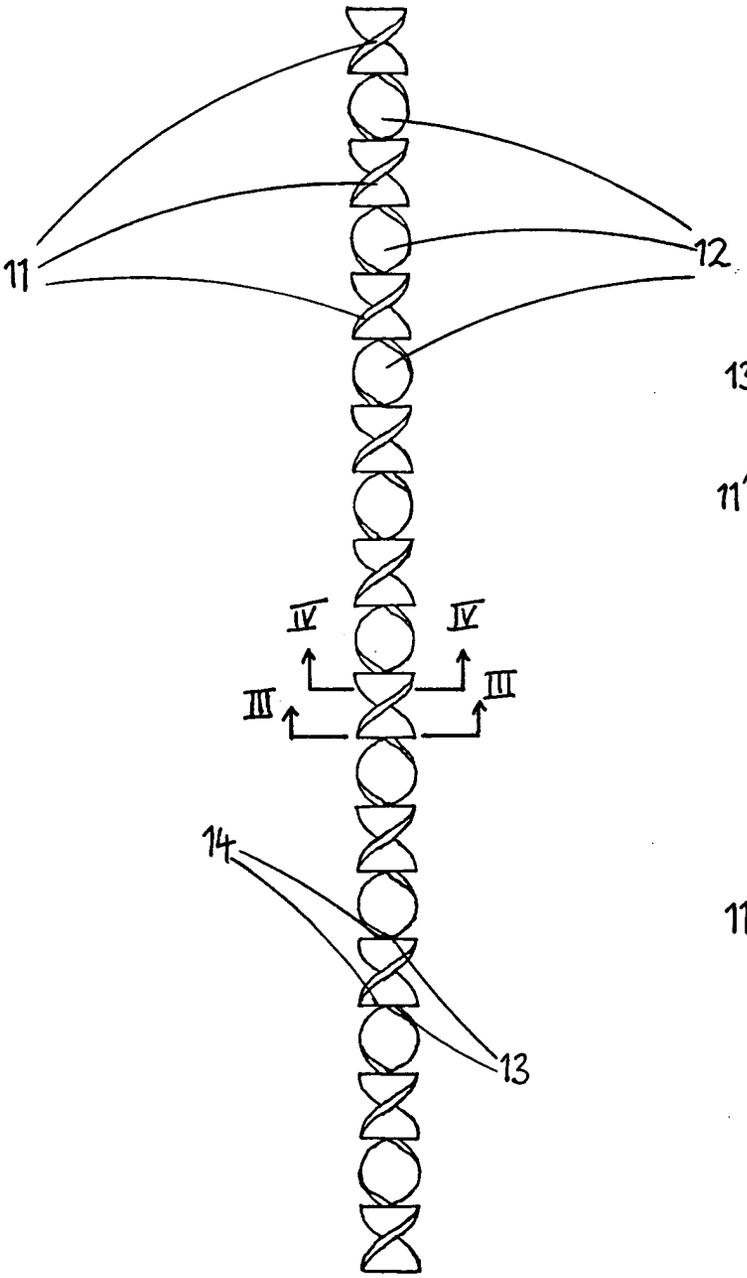


Fig2

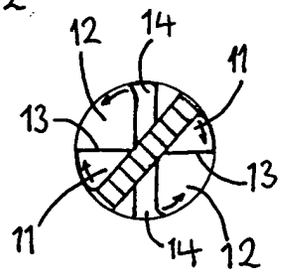


Fig4

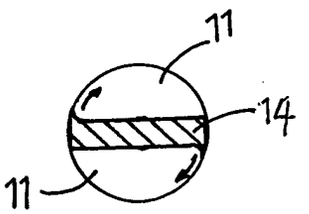


Fig3.

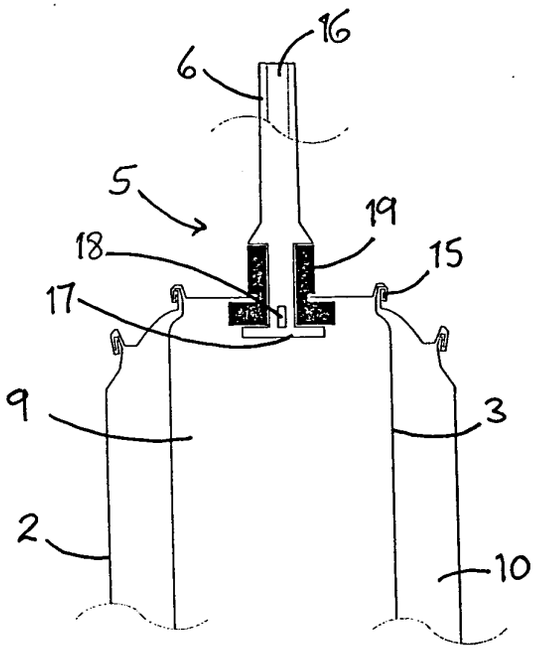


Fig 5A

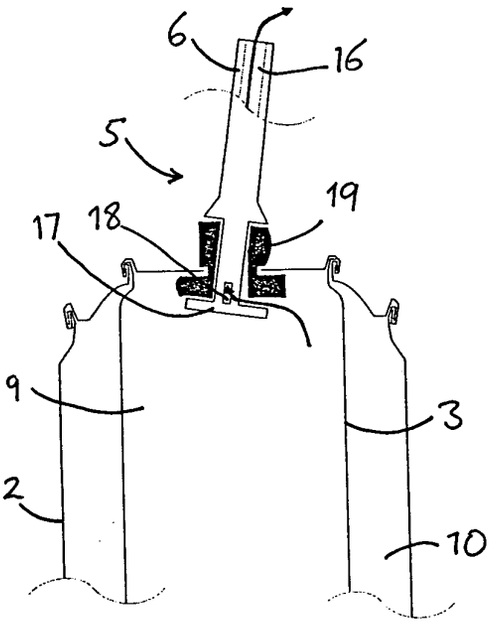


Fig 5B

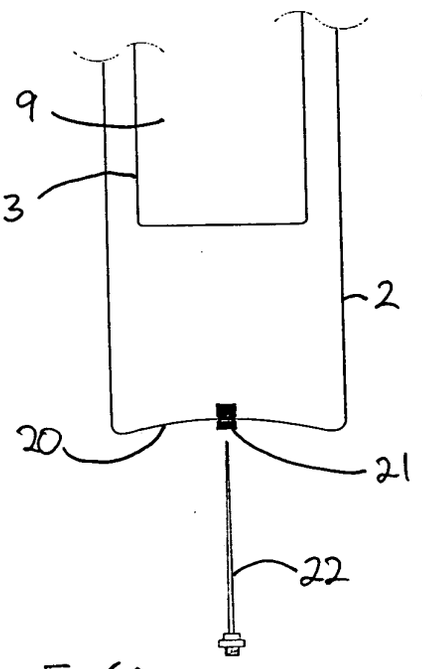


Fig 6A

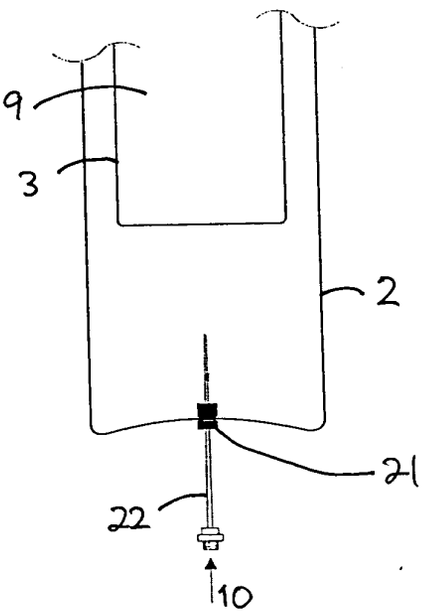


Fig 6B

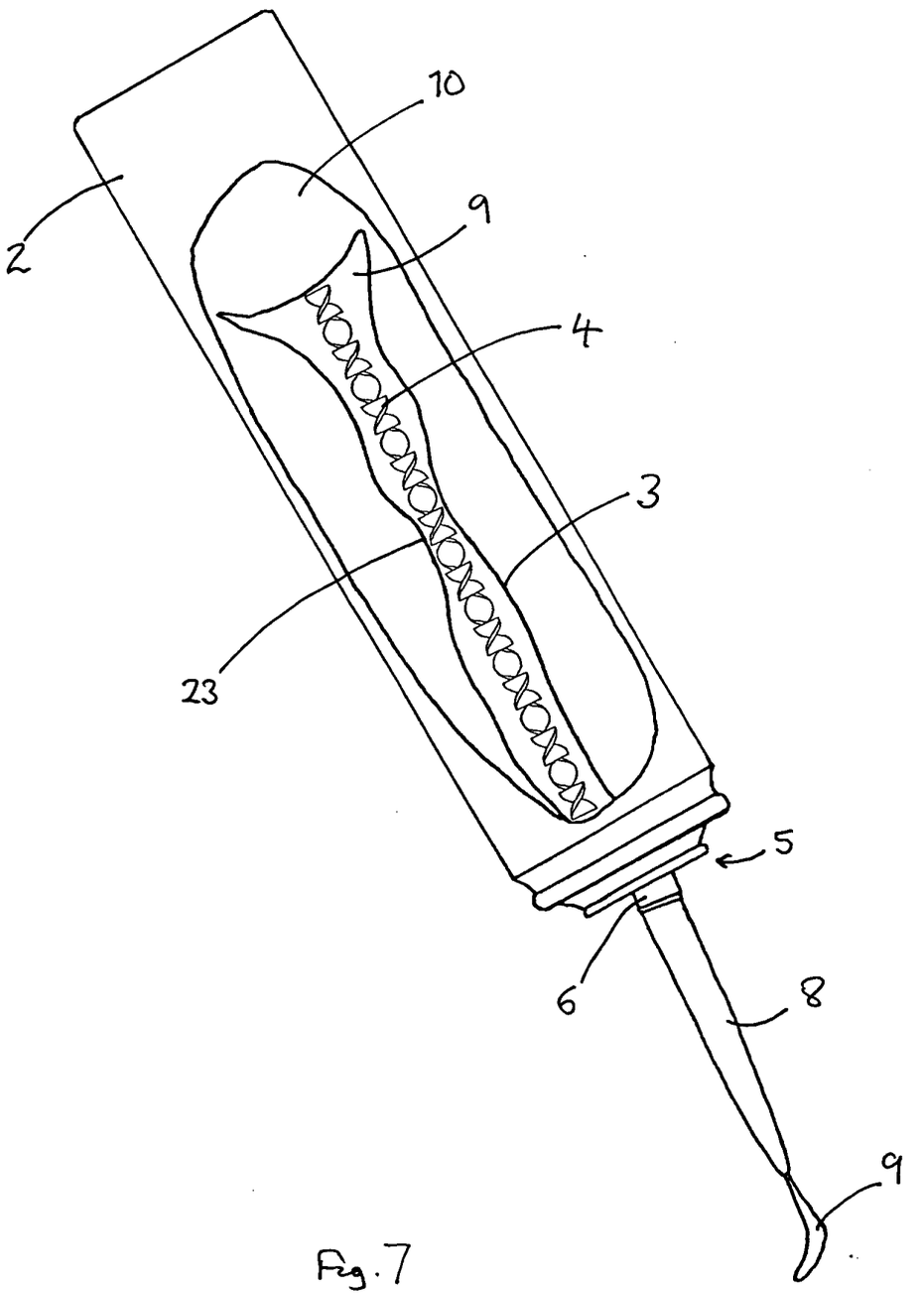


Fig. 7

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 03 25 5760

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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	19 November 2003	Berrington, N

CATEGORY OF CITED DOCUMENTS

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