(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property Organization
International Bureau

(43) International Publication Date
16 January 2025 (16.01.2025)

WIPO | PCT

(10) International Publication Number
WO 2025/012006 A1

(51) International Patent Classification:
B01F 31/40 (2022.01) *B01F 35/75* (2022.01)
B01F 31/441 (2022.01) *B01F 101/20* (2022.01)
B01F 35/32 (2022.01)

(21) International Application Number:
PCT/EP2024/068484

(22) International Filing Date:
01 July 2024 (01.07.2024)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
23184529.8 10 July 2023 (10.07.2023) EP

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(81) Designated States *(unless otherwise indicated, for every kind of national protection available)*: AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG, KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY, MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS, ZA, ZM, ZW.

(84) Designated States *(unless otherwise indicated, for every kind of regional protection available)*: ARIPO (BW, CV, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:
— *with international search report (Art. 21(3))*

(54) **Title:** MIXING AND DISPENSING SYSTEM FOR A TWO-COMPONENT MATERIAL AND METHOD OF MIXING AND DISPENSING A TWO-COMPONENT MATERIAL

(57) **Abstract:** The invention relates to a mixing and dispensing system (10) for separately storing and subsequently mixing the various materials (M, M') and dispensing the mixed materials from a part of the mixing and dispensing system. The invention further relates to a method of mixing and dispensing two-component material.

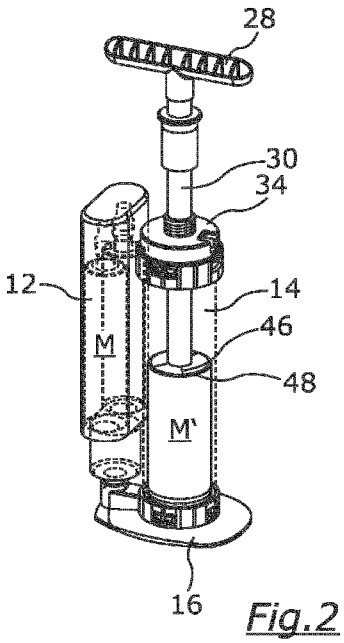


Fig.2

WO 2025/012006 A1

MIXING AND DISPENSING SYSTEM FOR A TWO-COMPONENT MATERIAL AND METHOD OF MIXING AND DISPENSING A TWO-COMPONENT MATERIAL

The invention relates to a mixing and dispensing system for separately storing and subsequently mixing the various materials and dispensing the mixed materials from a part of the mixing and dispensing system. The invention further relates to a method of mixing and dispensing two-component material.

Mixing and dispensing systems are known to mix two-component materials, such as the ones used in joint replacement surgery. On mixing two-component material, such as cement, e.g. PMMA (poly-methyl methacrylate) used e.g. in joint replacement surgery, such as hip replacement surgery, cracks in the cement mantle may facilitate a mechanical loosening of the prosthesis.

Moreover, the cement is to be used in a sterile environment and may be rather harmful to the user of the mixing and dispensing system which is why the possible contact of the user with the cement prepared in the mixing and dispensing system is not desirable.

For this reason it is an object of the invention to provide a mixing and dispensing system in which the two-component material can be sufficiently mixed, such that no fatigue cracks occur in the solidified two-component material and in which the contact a user of the mixing and dispensing system may have with the two-component material to be mixed can be minimized. Moreover, it is a further object of the invention to make available a simple mixing and dispensing system that can be used swiftly and efficiently in sterile environments during surgical processes.

This object is satisfied in accordance with the subject matter of the respective independent claim. Further embodiments and specific examples of the invention are defined in the dependent claims.

Such a mixing and dispensing system for a two-component material, such as bone cement, may comprise a first container for a first component of the two-component material, a second container for the second component of the two-component material, an interface to which each of the first and second containers are connectable to and removable from, with the interface comprising one or more passages permitting a flow of the material from the first container into the second container following activation of the mixing and dispensing system; a mixer stored in the second container for mixing the two-component material; wherein the second container is configured as a cartridge from which the mixed two-component material can be directly dispensed, and wherein the first and second containers are arranged at the same side of the interface.

By means of such a mixing and dispensing system the two-component material can be sufficiently mixed, such that no fatigue cracks occur in the solidified two-component material.

Moreover, as the components are stored separate from one another in one and the same system a possible contact of the material with a user of the mixing and dispensing system can be minimized as access thereto is restricted.

Moreover, a simple mixing and dispensing system is thereby made available that can be used swiftly and efficiently in sterile environments during surgical processes.

In this connection it should be noted that the interface can be a component used to connect the first container to the second container for conducting material stored in one into the other one, e.g. on the use of vacuum.

The interface may form a platform for the mixing and dispensing system. A simple mixing and dispensing system is thereby made available that can be used swiftly and efficiently in sterile environments during surgical processes, as a person can gold the system while carrying out the mixing.

A surface of the interface opposite to the side of the interface at which the first and second containers are arranged may be at least substantially or substantially flat. In this way a construction height can be reduced and a stability of the system can be increased making an even more simple to use mixing and dispensing system available.

One or more seals may be arranged between the first container and the interface and/or between the second container and the interface. Through the use of such seals the spilling of material can be avoided reducing a possible contact of the material with a user of the mixing and dispensing system can be minimized as access thereto is restricted.

The first and second containers may be arranged in parallel to one another when the first and second containers are connected to the interface. In this way a construction width can be reduced and a stability of the system can be increased making an even more simple to use mixing and dispensing system available.

The first and second containers may be arranged inclined with respect to one another when the first and second containers are connected to the interface. In this way a construction height can be reduced and a stability of the system can be increased making an even more simple to use mixing and dispensing system

available. Moreover, the material stored in the first container can be guided more efficiently to the second container.

An inclination of the first container relative to the second container can be selected in the range of 2 to 30° relative to an axis extending between the first and second ends of the second container.

The second container may comprise first and second ends that are oppositely disposed form one another, with the first end optionally being connectable and removable from the interface and the second end optionally comprising a vacuum port. In this way the material stored in the first container can so to say be sucked from the first container through the interface and into the second container for improved mixing results.

The second container may comprise first and second ends that are oppositely disposed form one another, with the first end being optionally connectable and removable from the interface and the second end optionally comprising an outlet. This further reduces the size and components of the mixing and dispensing system making it even more efficient and cost effective in use.

The second container may comprise first and second ends that are oppositely disposed form one another, with the first end optionally being connectable and removable from the interface and wherein the mixer is optionally actuable from the second end. This further reduces the size and components of the mixing and dispensing system making it even more efficient and cost effective in use.

In this connection it should be noted that the outlet can be formed by e.g. a cannula or a nozzle integrated into the second container, attached to the second container or attachable to the second container

The mixer may be actuable via the outlet. This further reduces the size and components of the mixing and dispensing system making it even more efficient and cost effective in use.

At least a part of the mixer may be removable from the second container via the outlet. In this way no moving of the mixed material from the second container into a further container or cartridge is required increasing the ease of use of the mixing and dispensing system.

A dispensing nozzle may be connectable to the second end of the second container. This aids in dispensing of the mixed two-component material.

A plunger may be connectable to the first end of the second container in order to move a piston arranged therein. Such a plunger can be part of a dispenser used to dispense the mixed two-component material.

The first container may be configured to receive one or more ampoules comprising the first material. Such ampoules are beneficially used to store components of adhesives such as a component of PMMA.

The first container may comprise an ampoule breaking system configured to break said one or more ampoules on activation of the mixing and dispensing system. Such systems can be integrated into the mixing and dispensing system to facilitate the operation thereof.

A cap may be connected to the second container. Such a cap may comprise a vacuum port and/or a connector to an outlet or form part of the outlet.

The cap may comprise an interface to a cannula. In this way a size of the mixing and dispensing system can be reduced improving its handling.

The mixer may be guided into the second container via a cannula, in particular wherein, following mixing, the mixer can be removed from the cannula for dispensing the mixed two-component material via the cannula. In this way a size of the mixing and dispensing system can be reduced improving its handling.

According to a further aspect of the invention this relates to a method of mixing and dispensing two-component material, preferably in a mixing and dispensing system as described herein, the method comprising the steps of:

preparing a first component stored in a first container for mixing;

applying a vaccum to a second container;

guiding a first component from the first container to a second component stored in the second component through the use of said vacuum;

mixing the first and second component in the second container with a mixer;

removing the mixer from the second container and dispensing the mixed two-component material via an outlet through which the mixer is guided into the second container.

By way of such a method the handle can be reliably removed from the mixing and dispensing system while the user does not come into contact with the mixed two-component material, such that pre-loaded and sterile mixed two-component materials can be made available in a sterile cartridge which is particularly useful in a medical environment of use.

Further embodiments of the invention are described in the following description of the Figures. The invention will be explained in the following in detail by means of embodiments and with reference to the drawing in which is shown:

Fig. 1 view of components of a mixing and dispensing system;

Fig. 2 a further view of the mixing and dispensing system with a first and a second container installed at an interface;

Fig. 3 a further view of the mixing and dispensing system with the second container arranged at the interface;

Fig. 4 a view of the mixing and dispensing system with a handle removed from a cannula arranged at the second container;

Fig. 5a to d various views of the handle of Figs. 1 to 4;

Fig. 6a to c various views of components of the mixing and dispensing system;

Fig. 7 a view of a second kind of first container;

Fig. 8a to b further views of the first container of Fig. 7;

Fig. 9a to b views of internal workings of the first container of Fig. 7.

In the following the same reference numerals will be used for parts having the same or equivalent function. Any statements made having regard to the direction of a component are made relative to the position shown in the drawing and can naturally vary in the actual position of application.

Fig. 1 shows a view of a mixing and dispensing system 10 for a two-component material M, M', such as bone cement, e.g. PMMA (Poly(methyl methacrylate)). the mixing and dispensing system 10 a first container 12 for storage of a first component respectively material M of the two-component material M, M', a second container 14 for storage of a second component respectively material M' of the two-component material M, M', an interface 16 to which each of the first and second containers 12, 14 are connectable to and removable from, with the interface 16 comprising one or more passages 22 permitting a flow of the material M from the first container 12 into the second container 14 following activation of the mixing and dispensing system 10.

The mixing and dispensing system 10 further comprises a mixer 24 arranged in the second container 14 for mixing the two-component material M, M' following activation of the mixing and dispensing system 10.

In this connection it should be noted that the second container 14 is thus not only configured for the storage of the second component M', but is also configured as a mixing space in which the mixed two-component material M, M' is mixed and from which the mixed two-component material M, M' can be directly dispensed.

In this connection it should be noted that the material of the first component M originally stored in the first container 12 is drawn into the second container 14 via the passage 22 through the application of a vacuum.

To this end a vacuum port 26 is arranged at the second container 14 via which a negative pressure can be applied at the mixing and dispensing system 10 for sucking the first component M into the second container 14 for mixing.

The mixer 24 is a manual mixer, i.e. the mixing is conducted manually.

The mixer 24 is connected to a handle 28 via a cannula 30. The mixer 24 can be axially displaced to and fro relative to the second container 14 by pushing the handle 28 towards the second container 14 respectively pulling the handle 28 away from the second container 14. In addition the mixer 24 can be rotated relative to the second container 14 by turning the handle 28 relative to the second container 14. Thereby both an axial and radial mixing of the two-component material M, M' can be effected.

The cannula 30 is guided via a cap 34 and a support 32 in order to effect the axial and rotational movement relative to the second container 14.

In this connection it should be noted that the support 32 can be a port, i.e. a connection interface to a further cannula (not shown). This connection interface can have a thread as part of a connection interface to a counter thread of the further cannula. The connection interface could also be formed as part of a bayonet type connector, of a snap fit connector and/or of connectors used in the medical field.

The handle 28 is formed as a T-shaped handle for ease of gripping and effecting the mixing of the two-component material M, M' in the mixing and dispensing system 10.

The handle 28 is connected to the mixer 24 via the cannula 30 and a hub 38 that connects to a connection interface, such as a hub connector 40 of the cannula 30.

In this connection it should be noted that the first container interface 18 and/or the second container interface 20 engage a respective counterpart 18', 20' at the first container 12 and the second container 14.

The first container interface 18 and/or the second container interface 20 can respectively be formed as one of a threaded connection, a snap-fit connection, a bayonet-type connection, a plug and rotate type connection and/or further types of connection that permit connection to and removal from the first and/or the second container 12, 14 with the interface 16.

Fig. 2 shows a further view of the mixing and dispensing system 10 with the first and the second container 12, 14 installed at the interface 16. The mixing and dispensing system 10 is in a pre-activation state of use, i.e. prior to permitting the material M stored int eh first container 12 to move into the second container 14 for mixing.

Fig. 3 shows a further view of the mixing and dispensing system 10 with only the second container 14 arranged at the interface 16. This is in a state where the first material M has been moved into the second container 14 for mixing with the second material M' prior to mixing the two-component material M, M'.

Fig. 4 shows a view of the mixing and dispensing system 10 with the handle 28 removed from the cannula 30 arranged at the second container 14.

In this connection it should be noted that the mixer 24 can comprise a plurality of vanes 46, e.g. 3 to 12 vanes that extend radially outwardly from a hub 50 connect to an end of the cannula 30 arranged at an end of the cannula 30 disposed opposite to the handle 24, i.e. at a connector end 42 of the mixing shaft 36.

The vanes 46 in turn connect to an outer ring 48 that stabilizes the vanes 46 on the one hand, and on the other hand, also allows to scrape the material M, M' from an inner sidewall 44 of the second container 14 for thorough through mixing.

In this connection it should be noted that also other kinds of mixers 28 can be used that can be disengaged from the mixing shaft 36 after mixing for removal of the mixing shaft 36 from the cannula 30.

Following mixing of the two-component material M, M' the mixing shaft 36 is removed from the cannula 30 by disengaging the hub 38 from the mixing shaft 36 via the mixer connector 42 as is indicated on the right in Fig. 4.

The handle is detachable, in particular in a non-destructive manner, from the mixer 24 and the cannula 30. In this connection it should be noted that the mixing shaft 36 supports the cannula during mixing and blocks material M, M' from entering the cannula 30 via the end 42 as this fills the hollow hub 50 of the hollow cannula 30.

Figs. 5a to d show various views of the handle 28 of Figs. 1 to 4. Fig. 5a shows the handle 28 connected to the cannula 30 in the storage state respectively the mixing state, i.e. in a state where movements of the handle 28 are transferred to movements of the mixer 24.

For this purpose the hub 38 comprises an attachment mechanism 52 configured to engage the hub connector 40. By way of example and as shown in Figs. 5b and 5c the attachment mechanism 52 can comprise arms 52' that engage the hub connector 40. In order to do so the hub connector 40 of the cannula has a hexagonal outer shape formed by projections 54 (see Fig. 5c) projecting from an outer surface 56 of the cannula 30 behind which the arms 52' can engage.

When the hub 38 is in the position shown in Fig. 5a, the arms 52' are locked in position relative to the hub connector 40 to fix the handle 28 to the cannula 30. Due to the hexagonal shape of the hub connector 40 and complementary shaped arms 52' the axial and rotational movements induced at the handle 28 can be transferred to the mixer 24.

On axially moving the hub 38 towards the handle 28 the attachment mechanism 52 is disengagable from the hub connector 40, as the arms 52' are moveable relative to the mixing shaft 36.

Further axial movement of the handle 28 and the hub 38 away from the second container 14 allows the removal of the handle and of the mixing shaft 36 from the cannula 30 as indicated in Fig. 5c.

Fig. 5d shows a section taken along the sectional line A:A of Fig. 5a. The outer shape of the mixing shaft 36 that is integrally formed with the handle 28 is shaped complementary to an inner shape of the cannula 30.

Visible is also the hexagonal shape of the hub connector 40 of the cannula 30 at the position of the hub connector 40.

In this connection it should be noted that the outer shape of the cannula between the mixer 24 and the hub connector 40 is generally cylindrical in shape, e.g. at least 90% of a length of the cannula 30 between the mixer 24 and the hub connector 40 is cylindrical, preferably at least 95%, especially at least 98% of a length of the cannula 30 between the mixer 24 and the hub connector 40 is cylindrical.

Fig. 6a to c various views of components of the mixing and dispensing system 10, with Fig. 6a show a part schematic part sectional view. an second container 14 is connected to the interface in this example by a threaded connection 58. An end 62 of the second container disposed opposite an end 64 bearing the cap 34 comprises an outer thread engaging an inner thread at the interface 16 forming the threaded connection 58 of the second container interface 20 and its counterpart 20'.

In order to close of the end 62 following removal of the second container 14 from the interface a piston 60 is arranged at the end 62.

The other end of the second container 14 is sealed off via the cap 34 that is connected to the second container via a further threaded connection 66.

Fig. 6b shows an enlarged view of circle B of Fig. 6a. The cap 34 is connected to the second container 14 the threaded connection 66.

The cap 34 comprises a sealing plug 70 to seal with respect to the second container 14 and the cannula 30. The sealing plug 70 projects into the second container 14 from an end face 74 of the cap 34 in parallel to outer walls 76 of the cap 34.

The outer walls 76 comprise an inner thread as part of the threaded connection 66 that engages an outer thread on an outer wall 78 of the second container 14 in order to fix the cap 34 to the second container.

The sealing plug 70 comprises an outer sealing surface 72 that engages and provides a seal with respect to the inner sidewall 44. The sealing plug further comprises an inner sealing surface 70 that engages and provides a seal with respect to the outer surface 56 of the cannula 30.

As indicated the cap further comprises the vacuum port 26 via which air can be removed from the second container 14 on activation of the mixing and dispensing system 10. The cap 34 comprises a hollow chamber 80 that is in engagement with an inner space 82 of the second container 14 via a filter 84. The filter prevents material of the two-component material M, M' being sucked out of the second container via the vacuum port 26.

Fig. 6c shows an enlarged view of circle A of Fig. 6a. The first and second containers 12, 14 are arranged at the same side 86 of the interface 16.

The interface 16 forms a platform 88 for the mixing and dispensing system 10. In this connection it should be noted that a surface 90 of the interface 16 opposite to the side 86 of the interface 16 at which the first and second containers 12, 14 are arranged is at least substantially flat or substantially flat. In this connection it means that the surface 90 is planar over at least 70 % of its extend with recesses potentially being present and projecting into the interface 16 or projections projecting outwardly being arranged at the surface 90 (both not shown).

The piston 60 is initially arranged at the end 62 and provides a seal with respect to the interface 16. For this purpose an outer surface 92 of the piston 60 comprises a sealing lip 94 that engages the inner sidewall 44.

In order to introduce the material from the first container 12, the interface 16 comprises a connector 96. The connector 96 comprises a membrane that can be opened when the second container 14 is connected to the interface to allow the material M to arrive in the inner space of the second container 14 and automatically closes on removal of the second container 14 from the interface 16, i.e. by removing the second container 14 via the threaded connection 58.

In order to dispense the mixed material M, M' from the second container 14, as dispenser (not shown) can be coupled to the end 62 following removal of the second container 14 from the interface 16. A plunger of the dispenser (both not shown) then comes into contact with the piston 60 for dispensing said two-component material M', M" from said second container 14.

The material can be dispensed from the second container 14 either via the cannula 30 or via a further outlet (not shown) connectable to the cap 34 via the support 32.

Fig. 7 shows a view of a second kind of first container 12. The first container 12 is configured to receive an ampoule 100 for storage of the first material M.

The ampoule 100 is configured to store a liquid component M of the PMMA. On activation of the mixing and dispensing system 10, the ampoule 100 is broken by rotating a container housing 102 relative to a container base 104 of the first container 12.

The first container interface 18 and the counterpart 18' are formed by a threaded connection 106 , 20' at the first container 12 and the second container 14.

In order to seal the first container 12 relative to the interface 16, a seal 108 is provided at a plug element 110 of the first container 12. The plug element 110 is arranged at the container base 104.

An outer ring 112 of the container base comprises an inner thread forming the counterpart 18' and the first container interface 18 is formed by an outer thread of the threaded connection 106. An alternate arrangement could also be considered where the container interface 18 is formed by an inner thread engaging an outer thread, e.g. present at the plug element 110.

In order to secure the first container 12 to the container base 104, a security ring 114 may be provided that like a circlip ensures that the container housing 102 is not moveable relative to the container base 104 in the storage state of the mixing and dispensing system 10.

A reverse lock 116 is arranged at an inner surface 118 of the container housing 102. The reverse lock 116 cooperates with the container base 104 in order to break the ampoule 100 on activation of the mixing and dispensing system 10.

Figs. 8a to b show further views of the first container 12 of Fig. 7. A seal 118 is arranged between the container housing 102 and the container base 104. On activation of the mixing and dispensing system 10, a vacuum is applied at the vacuum port 26 removing air from within the mixing and dispensing system 10.

This seal 118, e.g. an O-ring, ensures that the air can be removed from the first container 12 and that once the ampoule 100 is broken the liquid M stored therein can be transferred via the passage 22 to the second container where it is mixed

with the second component M', e.g. powder if the two-component material is PMMA.

Following application of the vacuum, the security ring 114 is removed and a user of the mixing and dispensing system 10 can then rotate the container housing 102 further towards the container base 104 via a threaded connection 120 this causes a pressure to be exerted on the ampoule 100, like in a vice or clamp which breaks the ampoule 100 to release the component M therefrom.

The reverse lock 116 is provided to ensure that the container housing 102 can only be rotated in one direction of rotation only relative to the container base 104, namely such that the two components are drawn to one another.

Fig. 8b shows a perspective view of the first container 12 storing an ampoule 100. Also further kinds of first containers 12 can be presented provided these can have a negative pressure, i.e. vacuum applied and ensure a breaking of the ampoule 100 stored therein.

Fig. 9a to b show views of internal workings of the reverse lock 116 of the first container 12 of Fig. 7 and 8.

The reverse lock comprises a ratchet 122 formed by a non-uniform saw tooth arrangement and a ratchet arm 124. The ratchet arm prevents rotation of the container housing 102 in one direction of rotation due to blocking walls 126 of the ratchet and can move in the other rotational direction due to the inclined walls 128 of the ratchet 122 as indicated e.g. in Fig. 9b.

List of reference numerals:

10	mixing and dispensing system
12	first container
14	second container

16	interface
18	first container interface at 16
18'	counter part of 18 at 12
20	second container interface at 16
20'	counter part of 20 at 14
22	passage
24	mixer
26	vacuum port
28	handle
30	cannula
32	support
34	cap
36	mixing shaft
38	hub
40	hub connector
42	end of 36
44	inner sidewall of 14
46	vane
48	outer ring
50	hub
52	attachment mechanism
54	projection
56	outer surface of 30
58	threaded connection
60	piston
62	end
64	end
66	threaded connection
68	inner sealing surface
70	sealing plug
72	outer sealing surface
74	end face of 34
76	outer wall of 34
78	outer wall of 14
80	hollow chamber
82	inner space of 14
84	filter
86	side
88	platform
90	surface
92	outer surface of 60
94	sealing lip
96	connector
98	membrane
100	ampoule

102	container housing
104	container base
106	threaded connection
108	seal
110	plug element
112	outer ring
114	security ring
116	reverse lock
118	seal
120	threaded connection
122	ratchet
124	ratchet arm

Claims

1. A mixing and dispensing system (10) for a two-component material (M, M'), such as bone cement, the mixing and dispensing system (10) comprising:
a first container (12) for a first component of the two-component material (M, M'),
a second container (14) for the second component of the two-component material (M, M'),
an interface to which each of the first and second containers (12, 14) are connectable to and removable from, with the interface (16) comprising one or more passages permitting a flow of the material from the first container (12) into the second container (14) following activation of the mixing and dispensing system (10);
a mixer stored in the second container (14) for mixing the two-component material (M, M');
wherein the second container (14) is configured as a cartridge from which the mixed two-component material (M, M') can be directly dispensed, and wherein the first and second containers (12, 14) are arranged at the same side of the interface (16).

2. The mixing and dispensing system (10) of claim 1,
wherein the interface (16) forms a platform for the mixing and dispensing system (10); and/or wherein a surface of the interface (16) opposite to the side of the interface (16) at which the first and second containers (12, 14) are arranged is at least substantially or substantially flat.

3. The mixing and dispensing system (10) of claim 1 or 2,

wherein one or more seals are arranged between the first container (12) and the interface (16) and/or between the second container (14) and the interface (16).

4. The mixing and dispensing system (10) of one of claims 1 to 3, wherein the first and second containers (12, 14) are arranged in parallel to one another when the first and second containers (12, 14) are connected to the interface (16); or wherein the first and second containers (12, 14) are arranged inclined with respect to one another when the first and second containers (12, 14) are connected to the interface (16).

5. The mixing and dispensing system (10) of one of claims 1 to 4, wherein the second container (14) comprises first and second ends (62, 64) that are oppositely disposed form one another, with the first end being connectable and removable from the interface (16) and the second end comprising a vacuum port (26).

6. The mixing and dispensing system (10) of one of claims 1 to 5, wherein the second container (14) comprises first and second ends that are oppositely disposed form one another, with the first end being connectable and removable from the interface (16) and the second end comprising an outlet (30, 32).

7. The mixing and dispensing system (10) of one of claims 1 to 6, wherein the second container (14) comprises first and second ends that are oppositely disposed form one another, with the first end being connectable and removable from the interface and wherein the mixer (24) is actuable from the second end.

8. The mixing and dispensing system (10) of claim 6 and 7,

wherein the mixer (24) is actuable via the outlet (30, 32).

9. The mixing and dispensing system (10) of claim 6 and 7 or claim 8, wherein at least a part of the mixer (24) is removable from the second container (14) via the outlet (30, 32).

10. The mixing and dispensing system (10) of one of claims 5 to 9, wherein a dispensing nozzle is connectable to the second end of the second container (14); and/or wherein a plunger is connectable to the first end of the second container (14).

11. The mixing and dispensing system (10) of one of claims 1 to 10, wherein the first container (12) is configured to receive one or more ampoules (100) comprising the first material.

12. The mixing and dispensing system (10) of claim 11, wherein the first container (12) comprises an ampoule breaking system (102, 104) configured to break said one or more ampoules (100) on activation of the mixing and dispensing system (10).

13. The mixing and dispensing system (10) of one of claims 1 to 12, wherein a cap (34) is connected to the second container.

14. The mixing and dispensing system (10) of claim 13, wherein the cap (34) comprises an interface to a cannula (32).

15. The mixing and dispensing system (10) of one of claims 1 to 14, wherein the mixer (24) is guided into the second container via a cannula (30), in particular wherein, following mixing, the mixer (24) can be removed from the

cannula for dispensing the mixed two-component material (M, M') via the cannula.

16. A method of mixing and dispensing two-component material (M, M'), preferably in a mixing and dispensing system (10) according to one of claims 1 to 15, the method comprising the steps of:
preparing a first component stored in a first container (12) for mixing;
applying a vaccum to a second container (14);
guiding a first component from the first container (12) to a second component stored in the second component through the use of said vacuum;
mixing the first and second component in the second container (14) with a mixer (24);
removing the mixer from the second container (14) and dispensing the mixed two-component material (M, M') via an outlet through which the mixer (24) is guided into the second container (14).

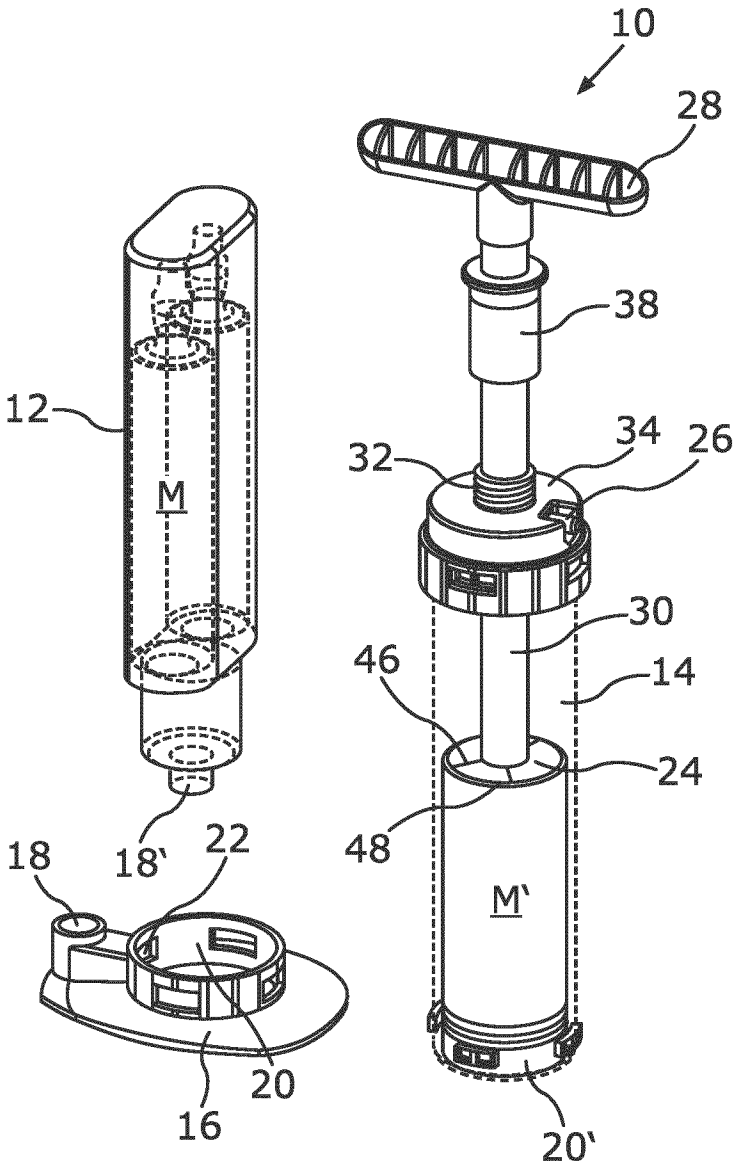


Fig.1

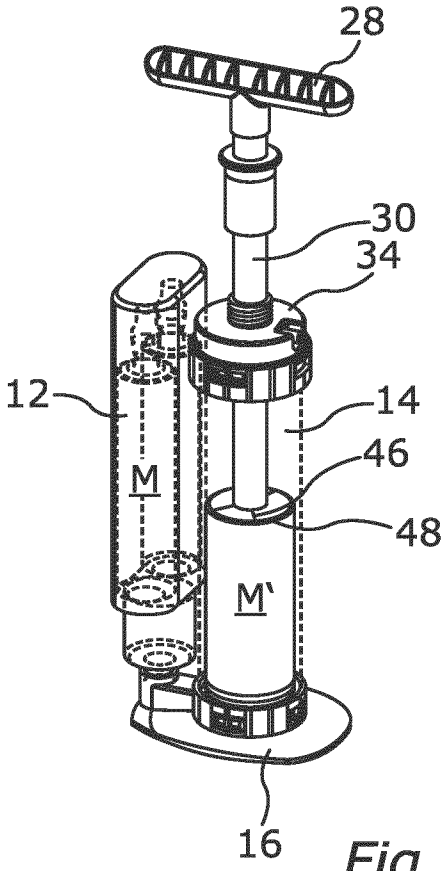


Fig.2

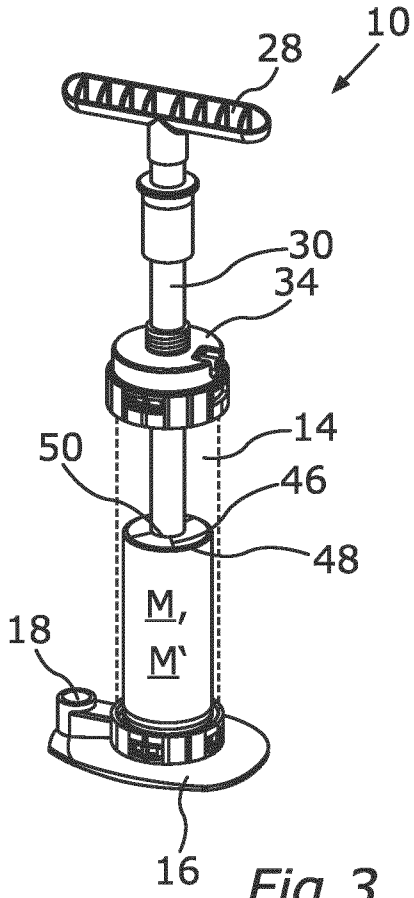


Fig.3

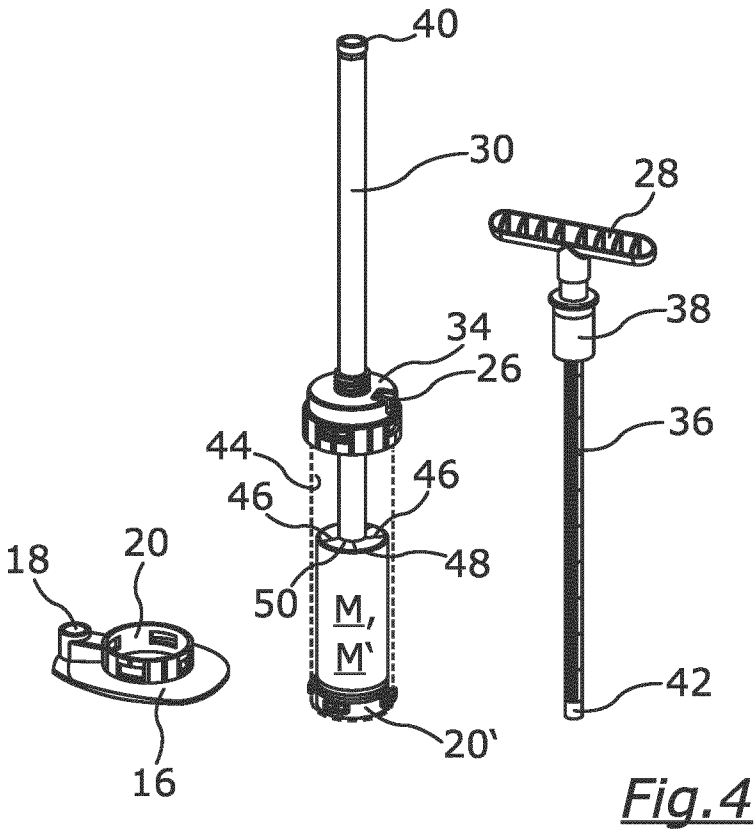


Fig.4

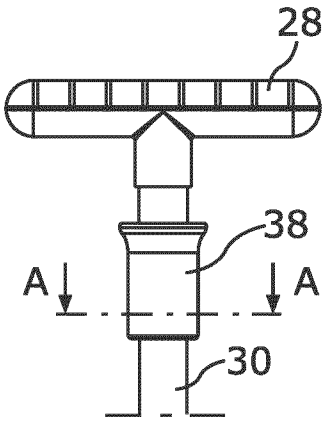


Fig.5a

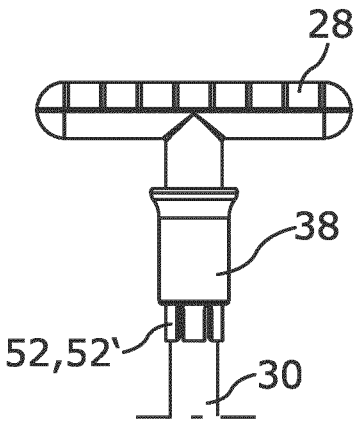


Fig.5b

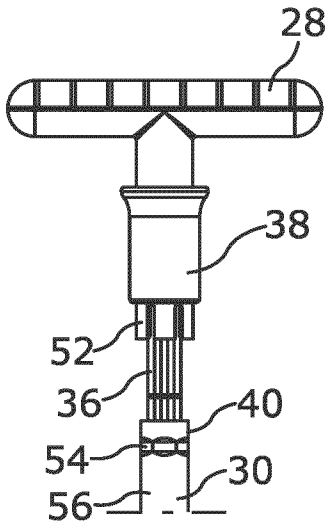


Fig.5c

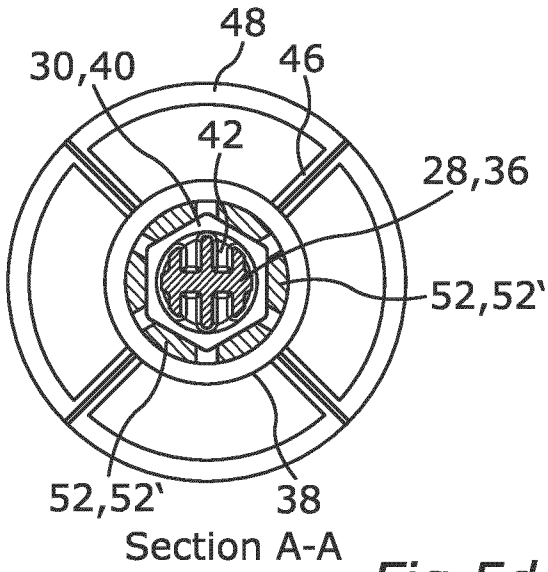
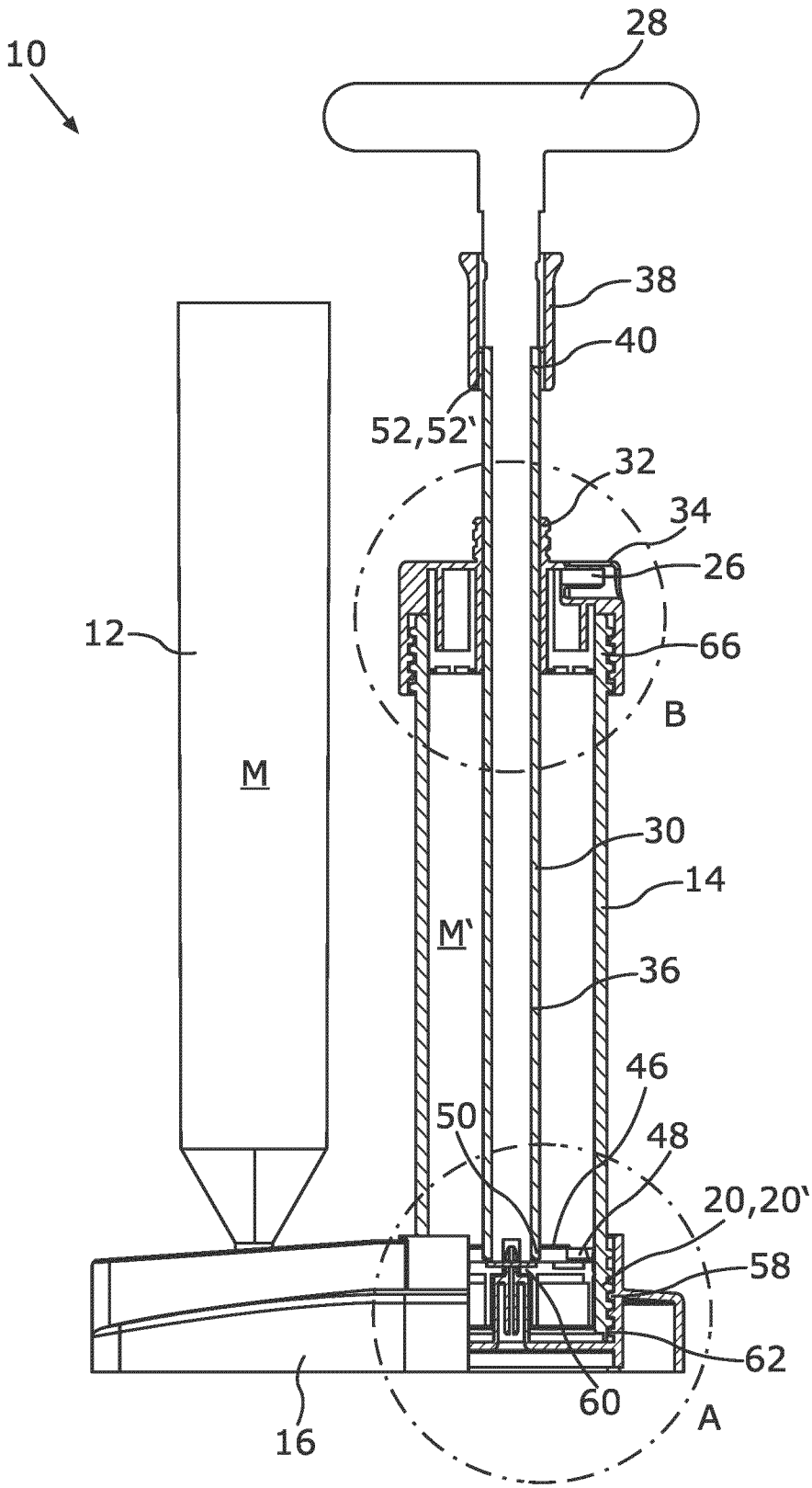


Fig.5d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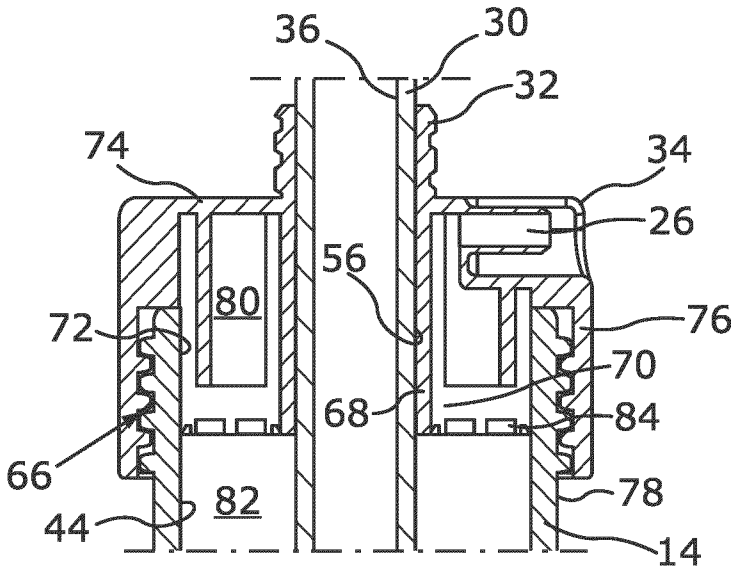
28
38
40
52,52'
32
34
26
66
12
B
M
30
14
M'
36
46
50
48
20,20'
58
62
60
A
16

Fig.6a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74
34
26
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80
72
76
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68
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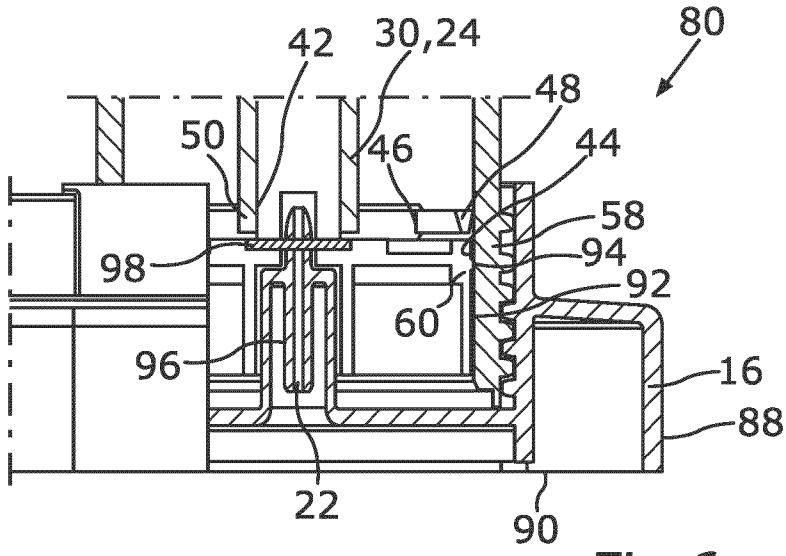
78
44
14

Fig.6b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96
16
88
22
90

Fig.6c

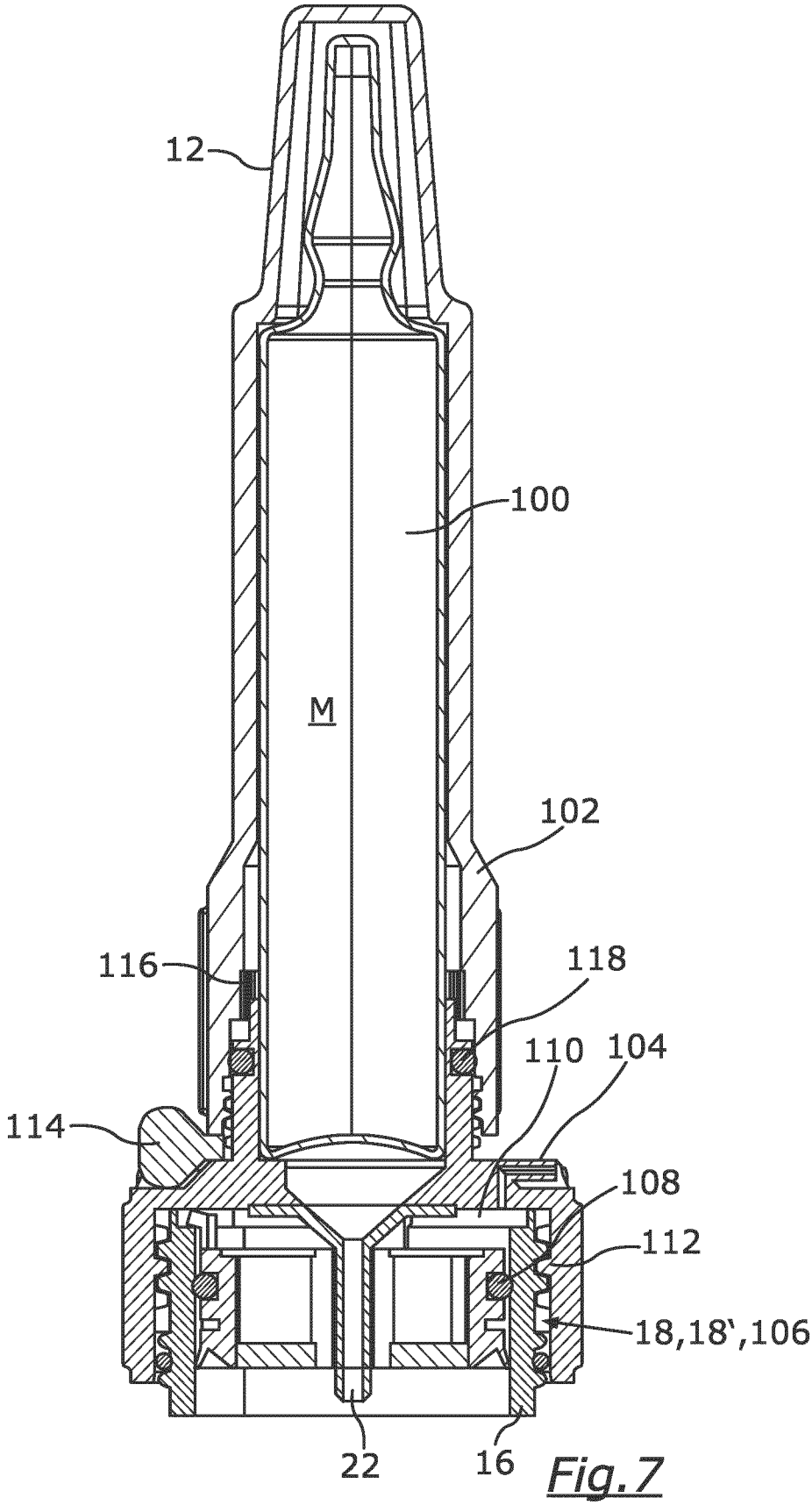
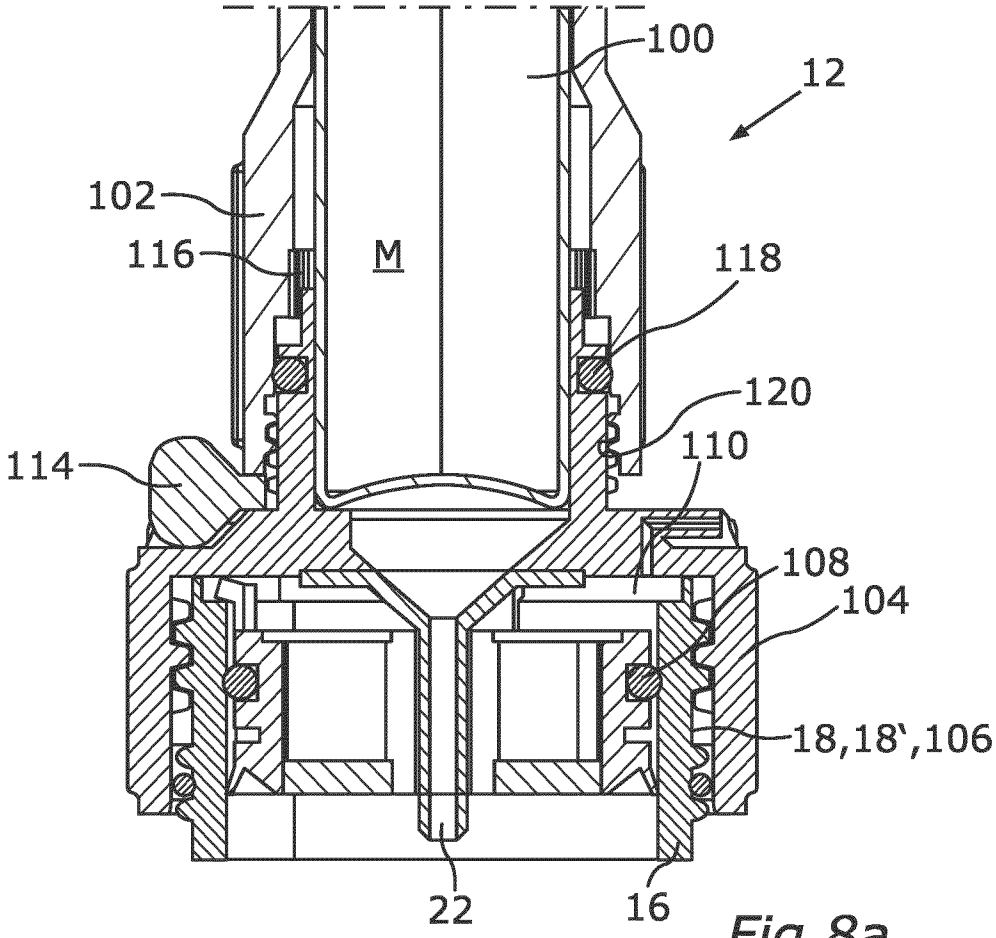


Fig.7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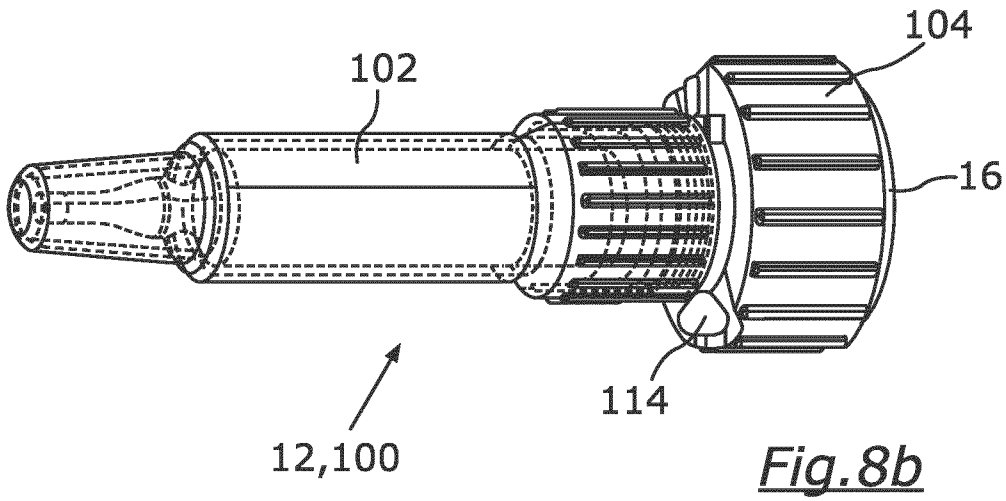
102
116
M
118
120
114
110
108
104
18,18‘,106
22
16

Fig.8a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114
12,100

Fig.8b

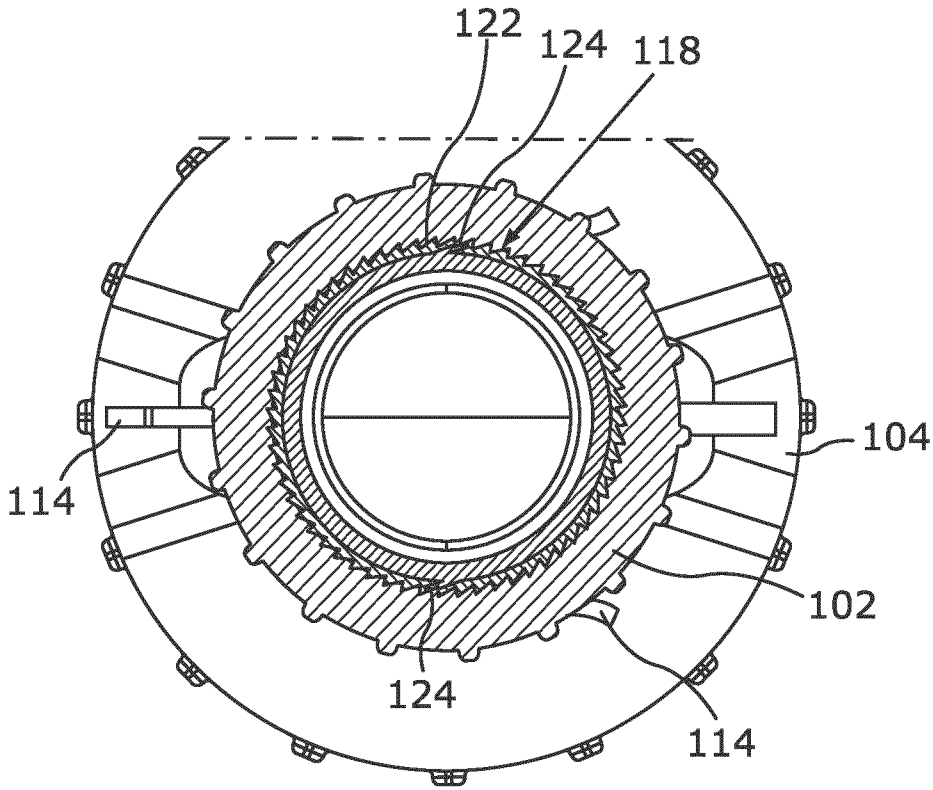

Fig.9a

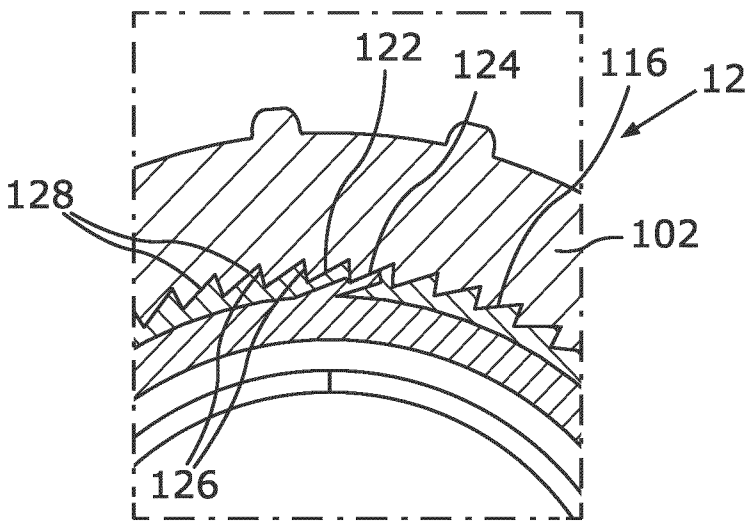

Fig.9B

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/068484

A. CLASSIFICATION OF SUBJECT MATTER

INV. B01F31/40 B01F31/441 B01F35/32 B01F35/75 B01F101/20
ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

B01F A61B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 3 260 192 A1 (HERAEUS MEDICAL GMBH [DE]) 27 December 2017 (2017-12-27) paragraphs [0036], [0042], [0091] - [0107]; figures 1-8	1-16
X	EP 3 178 545 A1 (HERAEUS MEDICAL GMBH [DE]) 14 June 2017 (2017-06-14) paragraphs [0070], [0071], [0104] - [0136]; figures 1-8	1-16
X	EP 3 117 895 A1 (HERAEUS MEDICAL GMBH [DE]) 18 January 2017 (2017-01-18) paragraphs [0070] - [0082]; figures 1-7	1-5,7, 13,14

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
19 September 2024	01/10/2024

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Léandre, Arnaud

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

Information on patent family members

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PCT/EP2024/068484

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