

(19)



(11)

EP 4 741 175 A1

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:
13.05.2026 Bulletin 2026/20

(51) International Patent Classification (IPC):
B43K 8/08 (2006.01) **B43K 8/12** (2006.01)

(21) Application number: **24216293.1**

(52) Cooperative Patent Classification (CPC):
B43K 8/12; B43K 8/08

(22) Date of filing: **28.11.2024**

(84) Designated Contracting States:
**AL AT BE BG CH CY CZ DE DK EE ES FI FR GB
GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL
NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
BA
Designated Validation States:
GE KH MA MD TN

(72) Inventor: **Loh, Wen Cheun**
46100 Selangor (MY)

(74) Representative: **Meissner Bolte Nürnberg**
Patentanwälte Rechtsanwälte
Partnerschaft mbB
Bankgasse 3
90402 Nürnberg (DE)

(30) Priority: **06.11.2024 MY PI2024006355**

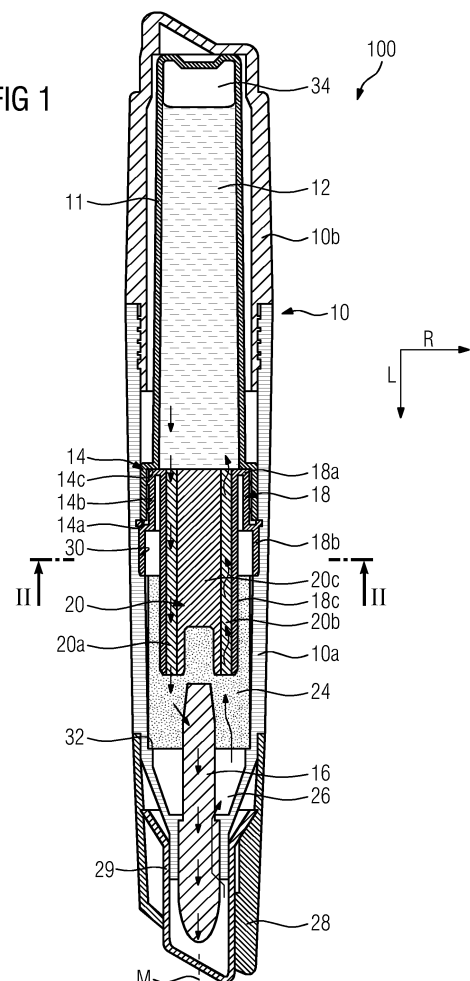
Remarks:
Amended claims in accordance with Rule 137(2)
EPC.

(71) Applicant: **Faber- Castell AG**
90546 Stein (DE)

(54) WRITING INSTRUMENT, IN PARTICULAR REFILLABLE WRITING INSTRUMENT

(57) The invention relates to a writing instrument (100), in particular refillable writing instrument, comprising

- a shaft (10) extending in a longitudinal direction (L),
- a cartridge (11) configured to provide a reservoir (12) for application liquid, wherein the cartridge (11) is arranged within the shaft (10) in a rear section, wherein a receiving section (14) is provided at a front end of the cartridge (11),
- a capillary application element (16) being arranged at a front end of the shaft (10),
- an adapter (18) configured to be arranged within the receiving section (14) of the cartridge (11), wherein the adapter (18, 18') is configured to fluidly connect the application element (16) with the reservoir (12) via a through-channel (20, 20') extending in the longitudinal direction (L), and wherein the through-channel (20, 20') comprises an inner section (20c, 20c') and at least two outer sections (20a, 20a', 20b, 20b'), wherein the at least two outer sections (20a, 20a', 20b, 20b') are fluidly connected via the inner section (20c, 20c') in the longitudinal direction (L) at least in sections and wherein the inner section (20c, 20c') forms a narrower passage than the outer sections (20a, 20a', 20b, 20b') so that a flow rate between the reservoir (12) and the application element (16) through an outer section (20a, 20a', 20b, 20b') is larger than a flow rate between the reservoir (12) and the application element (16) through the inner section (20c, 20c').

FIG 1**EP 4 741 175 A1**

Description

[0001] The present invention relates to a writing instrument, in particular a refillable writing instrument.

[0002] Known writing instruments, in particular refillable writing instruments, such as cartridge markers have cartridges providing a reservoir for an application liquid (or: ink) and an application element, in particular a capillary application element. The application element is fluidly connected to said reservoir and configured to transfer application liquid onto a writing medium when the writing instrument is used.

[0003] Refillable cartridge markers (RCM) work on the principle of ink surface tension, air displacement, suffocation of airflow by saturated ink in a filter element and pressure equalization between chambers that are present within the marker. Known cartridge markers have the disadvantage that the application liquid, which is flowing free in the reservoir, will continue flowing when the writing instrument is held in a vertical position, thus when the tip of the application element is directed downwardly in a vertical direction. A filter element may be arranged between the reservoir and the application element for regulating the flow of application liquid, in particular to reduce flow towards the application element and prevent leakage of the application liquid. Nevertheless, such a system needs to have good hermetic sealing to prevent tip bleeding during external or internal pressure change. The ink flow control is critical to the ink lay down, ink intensity and writing length, while the hermetic sealing is crucial to prevent ink bleeding through the tip of the application element and leaking of ink at joining parts of the components of the writing instrument.

[0004] It is therefore an object of the present invention to provide a writing instrument, in particular a refillable writing instrument such as a refillable cartridge marker that is improved with regard to control of the flow of an application liquid and hermetic sealing.

[0005] This object is solved by a writing instrument, in particular a refillable writing instrument, more particularly a refillable cartridge marker, according to claim 1.

[0006] The writing instrument comprises a shaft extending in a longitudinal direction and a cartridge configured to provide a reservoir for application liquid (or: ink), wherein the cartridge is at least partially, preferably completely arranged within the shaft. In other words: The cartridge contains an application liquid (or: ink) and/or is configured to receive and/or store an application liquid. A receiving section is provided at a front end of the cartridge, configured to receive a further component of the writing instrument in a sealing manner. The writing instrument further comprises a capillary application element (or: nib) for transferring application liquid onto a writing medium such as paper. The application element is arranged at a front end of the shaft and is fluidly connected to said reservoir for receiving application liquid therefrom. An adapter (or: connecting piece) is configured to be arranged within the receiving section of the

cartridge provided at the front end of the cartridge. The adapter comprises a through-channel that extends in the longitudinal direction and is configured to fluidly connect the application element - directly or indirectly - with the reservoir. The through-channel comprises - relative to a radial direction - an inner section and at least two outer sections, each of them extending in the longitudinal direction, wherein the at least two outer sections are fluidly connected via the inner section in the longitudinal direction at least in sections and wherein the outer sections and the inner section are designed such that a flow rate of application liquid and/or air between the reservoir and the application element through an outer section is larger than a flow rate of application liquid and/or air between the reservoir and the application element through the inner section. In other words: The inner section forms a narrower passage than the outer sections so that a flow rate of application liquid and/or air between the reservoir and the application element through an outer section is larger than a flow rate of application liquid and/or air between the reservoir and the application element through the inner section.

[0007] More particularly, the through-channel is a single channel, but comprises an inner section extending in the longitudinal direction and at least two outer sections extending in the longitudinal direction, wherein these sections have such a cross-section or shape that application liquid and/or air merely flow through the outer sections, but only very minimal through the inner section. In other words, the inner section and the outer sections each extend at least essentially parallel to each other in the longitudinal direction and are fluidly connected to form one single channel through which the application liquid and/or air can flow through. As the inner and outer sections are fluidly connected ("single channel"), the inner section helps to regulate the flow between the outer sections to prevent excessive or uncontrolled flow of the application liquid without stop. When the writing instrument is held in a vertical position so that the tip of the application element points downward, the inner section equalizes the pressure between the outer sections and stops the application liquid from flowing out the through channel. At slanting angle or when the writing instrument is held in a horizontal position, the application liquid flows through one of the outer sections of the through-channel again and air enters through the other outer section in the opposite direction to equalize pressure within the reservoir.

[0008] In summary, the ink flow control is regulated by the size and shape of the single channel, in particular due to certain areas are made thin passage while others are bigger passage and therefore ink with surface tension will flow through less restricted. On the one hand, such writing instruments show a continuous good flow of application liquid during usage and recovery of good ink flow after the writing instrument has been refilled. On the other hand, with a singular channel, the ink flow is better regulated and the ink will stop flowing when the tip of

the application element is vertically down, but will flow again when the writing instrument is tilted or in a horizontal position.

[0009] The shaft of the writing instrument has - relative to the longitudinal direction - a front end and a rear end and encloses an interior space, wherein the cartridge including the reservoir, the adapter and at least a rear end of the application element, and if applicable further components of the writing elements, are arranged. The cartridge also has - relative to the longitudinal direction - a front end and a rear end, wherein the receiving section is formed at a front end of the cartridge.

[0010] In the following, a "front end" of the individual components is to be understood as the end or section facing towards the tip of the application element. A "rear end" is to be understood as the end or section facing away from the tip of the application element.

[0011] The shaft, the adapter and the cartridge are preferably made of plastic materials, in particular different plastic materials to achieve hermetic sealing between the components. In particular, various grades of polypropylene, HDPE (High Density Polyethylene) and/or LDPE (Low Density Polyethylene) for various parts are used.

[0012] The application element is preferably made of fibres, for example polyester, acrylic or polyolefin fibres, or made of sintered material.

[0013] In particular, the inner section and the outer sections have different dimensions in the longitudinal direction, in particular a different average length. More particularly, the inner section may have at least partially a first inner section length in the longitudinal direction and the two outer sections may have an outer section length in the longitudinal direction, wherein the first inner section length is less than the outer section length. The inner section may also have at least partially a second inner section length having the same length as the outer section length of the outer section. This part or these parts or subsection(s) of the inner section is or are in particular arranged next to the outer section(s). In the alternative or additionally, the inner section and the outer sections in particular have different dimensions in a plane perpendicular to said longitudinal direction, thus in a radial direction or radial plane, in particular different cross-sections and/or shape. In other words: The inner section provides a narrower passage than each of the outer sections.

[0014] In one exemplary embodiment, the inner section has a first inner section length of about 20 to 25 mm and a second inner section length of about 27 to 32 mm and the outer section has an outer section length of about 27 to 32 mm. In a plane perpendicular to the longitudinal direction, the inner section may have a cross-section of about 4 to 8 mm times 0,2 to 0,6, in particular 5 to 7 mm times 0,3 to 0,5 mm. Each of the outer sections may have a cross-section of about 1 to 3 mm times 1 to 3 mm or a diameter between 1 and 3 mm - depending on the shape of the outer section.

[0015] In a preferred embodiment, the at least two

outer sections have the same dimensions in the longitudinal direction, in particular a same length, and/or the same dimensions in a plane perpendicular to said longitudinal direction, thus in a radial direction or radial plane, in particular the same cross-sections and/or shape. In other words: A first and a second outer section are mirror images, in particular arranged on opposite end sections or sides of the inner section.

[0016] Preferably, the inner section has a rectangular cross-section in a plane perpendicular to said longitudinal direction with a length being many times greater than a width and/or the outer sections preferably have a round, semicircular, circular or elliptical cross-section in a plane perpendicular to said longitudinal direction. A rectangular, round, semicircular, circular or elliptical cross-section within the meaning of this application shall also include such shapes, which are approximately or largely rectangular, round, semicircular, circular or elliptical.

[0017] According to a preferred embodiment, a central longitudinal axis of the shaft passes through the inner section, in particular in alignment with a central longitudinal axis of the inner section. A first and a second outer section are in particular arranged at opposite end sections or sides of the inner section.

[0018] According to a preferred embodiment, the adapter comprises a rear wall or a rear section, an outer wall and an inner wall, wherein the outer wall and the inner wall extend from the rear wall or the rear section in the longitudinal direction towards a front end of the writing instrument and spaced apart from each other in a direction perpendicular to said longitudinal direction, i.e. a radial direction, thereby forming a space between the inner wall and the outer wall.

[0019] According to a preferred embodiment, the through-channel, in particular the inner section and the outer sections, is formed by the inner wall of the adapter. Particularly, the inner wall extends further from the rear wall or the rear section in the longitudinal direction than the outer wall. In other words: The inner wall surrounding the through-channel has an inner wall length (or: first length) in the longitudinal direction and the outer wall has an outer wall length (or: second length) in the longitudinal direction, wherein the inner wall length is larger than the outer wall length.

[0020] In one exemplary embodiment, the inner wall length is about 27 to 32 mm and the outer wall length is about 12 to 18 mm.

[0021] According to a preferred embodiment, the outer sections extend beyond the inner section in the longitudinal direction, wherein the outer sections have a tubular shape and are surrounded completely by the inner wall, said inner wall forming a circumferential wall at least in the section extending beyond the inner section. Said circumferential wall reduces the capillary effect and avoids or at least further significantly reduces bleeding of the application liquid.

[0022] According to a further preferred embodiment, the rear wall or rear section and/or the outer wall abuts on

an inner surface of the receiving section in a sealing manner and/or the outer wall overlaps a front end of the receiving section at least partially in a radial direction and abuts on the front end of the receiving section in a sealing manner. The adapter and the reservoir are in particular made of different plastic materials to achieve good hermetic sealing. Further, the hermetic sealing is achieved by such overlapping of the components. In an embodiment, the outer wall comprises projections, in particular annular projections protruding from the outer wall in a radial direction and abutting on the inner surface of the receiving section in a sealing manner. The inner surface of the receiving section further provides an impact surface for the rear wall of the adapter configured to form a positive fit effective in the longitudinal direction.

[0023] According to another preferred embodiment, the outer wall at least partially abuts on an inner surface of the shaft in a sealing manner and/or by forming a positive fit effective in the longitudinal direction. The adapter and the shaft are in particular also made of different plastic materials to achieve good hermetic sealing.

[0024] In a preferred embodiment, the writing instrument further comprises a filter element being arranged within the shaft and between the adapter, in particular the through-channel of the adapter, and the application element, wherein the filter element is configured to fluidly connect the application element, in particular a rear end of the application element, with the through-channel and the reservoir, to further improve the regulation of the flow of the application liquid. More preferably, the filter element is arranged in such a way between the adapter and the application element, that the filter element at least partially surrounds the inner wall of the adapter and/or the through-channel, in particular the outer sections, and/or a rear end of the application element, so that application liquid and/or air flows through the through-channel and the filter element between the reservoir and the application element. Thereby, leakage of application liquid flowing from the reservoir through the through-channel is prevented by the filter element.

[0025] Preferably, a recess (or: deepening) is provided at a front surface of the inner wall in the area of the inner section configured to receive the filter element.

[0026] In a preferred embodiment, the filter element at least partially abuts on an inner surface of the shaft, in particular forming a positive fit effective in the longitudinal direction to hold the filter element in place.

[0027] The filter element is preferably made of polyester fibres or any other fibre materials such as acrylic or polyolefin fibres, said fibres extending in the longitudinal direction, when assembled. The filter element comprises a front section and a rear section and the fibres are compressed in the front section so that the fibres are arranged in a more dense state in the front section than in the rear section. This may be achieved by structures, such as ribs provided on an inner surface of the shaft in a region of the front section of the filter element that press

on the filter element in an assembled state. This has the advantage that the capillary effect is slowed down in the filter element, i.e. a flow rate in the front section, wherein the fibres are compressed, is slower than in the rear section, wherein the fibres are not or less compressed.

[0028] According to a preferred embodiment, a first air space (or: first air chamber) is provided between the application element, the filter element and the shaft for receiving air passing past the application element from outside during use of the writing instrument to equalize pressure inside the writing instrument. Further, a second air space (or: second air chamber) is preferably provided within the cartridge to receive air from the first air space through the through-channel, in particular one of the outer sections, during the use of the writing instrument to equalize pressure inside the writing instrument.

[0029] According to a preferred embodiment, a volume in the first air space is smaller than a volume in the second air space and/or a pressure in the first air space is larger than a pressure in the second air space. Thereby, the air flow and flow of the application liquid during use is improved whilst bleeding of the ink is avoided.

[0030] Preferably, the shaft comprises a barrel and a rear cover, in particular a removable (or: detachable) rear cover, provided at a rear end of the barrel, wherein the barrel and the rear cover abut on each other in a sealing manner and/or are held together with a positive fit effective in the longitudinal direction, e.g. by a screw connection. A multi-piece shaft allows replacing the cartridge and/or refilling of the reservoir in an easy manner.

[0031] The writing instrument may further comprise a cap. In an embodiment, the cap comprises a sealer, i.e. an additional part fitted to the cap, e.g. by a snap-fit connection. The sealer is configured to be fitted tightly to the front end of the shaft in a sealing manner to form a hermetic sealing. The cap and the sealer are retained on the front end of the shaft, e.g. by clamping action.

[0032] These and other features and advantages of the present invention will be better understood by reference to the following detailed description of exemplary implementations and the accompanying drawings, wherein

FIG 1 is a sectional view of an embodiment of a writing instrument,

FIG 2 is a top view of the section plane along line II-II of Fig. 1,

FIG 3 is a sectional view of the cartridge in combination with the adapter of Fig. 1,

FIG 4 is a sectional view of a further embodiment of a writing instrument,

FIG 5 is a top view of the section plane along line IV-IV of Fig. 4,

FIG 6 is a perspective view of the adapter of Fig. 4,

FIG 7 is a sectional view of the cartridge in combination with the adapter of Fig. 4.

[0033] In the following, two possible embodiments of a sharpening device are described. Corresponding parts

are provided with the same reference signs in both embodiments.

[0034] A first embodiment of a writing instrument 100, in particular a refillable writing instrument such as a refillable cartridge marker is illustrated in Fig. 1. The writing instrument 100 comprises a shaft 10 extending in a longitudinal direction L and having a front end and a rear end. According to the embodiment shown, the shaft 10 comprises a barrel 10a and a rear cover 10b that is detachable provided at a rear end of the barrel 10a. The barrel 10a and the rear cover 10b abut on each other in a sealing manner. Further, the barrel 10a and the rear cover 10b are attached to each other forming a positive fit effective in the longitudinal direction L. In the embodiment shown, a front portion of the rear cover 10b is partially inserted into a rear portion of the barrel 10a so that the rear portion of the barrel 10a and the front portion of the rear cover 10b partially overlap in the longitudinal direction L. In this overlapping area, an outer surface of the rear cover 10b and an inner surface of the barrel 10a abut on each other in a sealing manner. Furthermore, the barrel 10a and the rear cover 10b are detachably connected to each other by means of a screw connection. Other connecting types, for example a snap-in connection or clamping mechanism are known and may be used as well instead.

[0035] A cartridge 11 providing a reservoir 12 is arranged within the shaft 10 and is filled with an application liquid. The cartridge 11 is formed by a container or housing, for example a hollow cylindrical body closed at its rear end. A receiving section 14 is formed at a front end of the cartridge 11 for receiving an adapter 18. The receiving section 14 has a larger diameter in a direction perpendicular to the longitudinal direction L, thus in a radial direction R, than a part of the cartridge 11 providing the reservoir 12, in which the application liquid is contained.

[0036] A capillary application element 16 or nib is arranged at a front end of the shaft 10. The application element 16 is elongated in shape and extends in the longitudinal direction L. In the present case, the application element 16 has essentially two longitudinal sections with different diameters. The barrel 10a comprises a front portion tapering, at least in sections, toward the front end of the writing instrument 100, in which the application element 16 is retained, for example by forming a positive fit effective in the longitudinal direction L.

[0037] The writing instrument 100 further comprises an adapter 18 that is retained within the receiving section 14. The adapter 18 comprises a through-channel 20 that extends in the longitudinal direction L and that is configured to fluidly connect the application element 16 to the reservoir 12 to transfer application liquid from the reservoir 12 into the application element 16 as well as air from outside the writing instrument 100 into the reservoir 12 to equalize pressure, when the writing instrument 100 is used. The through-channel 20 is formed as a single channel and comprises an inner section 20c and two outer sections 20a, 20b, each of the sections 20a, 20b,

20c extending in the longitudinal direction L. The two outer sections 20a, 20b are fluidly connected via the inner section 20c and are designed such that a flow rate between the reservoir 12 and the application element 16 through an outer section 20a, 20b is larger than a flow rate between the reservoir 12 and the application element 16 through the inner section 20c.

[0038] The inner section 20c and the outer sections 20a, 20b have different dimensions in the longitudinal direction L. The inner section 20c has a first subsection having a first inner section length L_2 in the longitudinal direction L and the two outer sections 20a, 20b have an outer section length L_1 in the longitudinal direction L, wherein the first inner section length L_2 is smaller than the outer section length L_1 . As can be seen, e.g. from Fig. 3, the inner section 20c further has a second subsection with a second inner section length L_1 corresponding to the outer section length L_1 . Furthermore, as can be seen in Fig. 2, the inner section 20c and the outer sections 20a, 20b have different dimensions in a plane perpendicular to the longitudinal direction L, in particular different cross-sections and/or shape. In the embodiment shown, the inner section 20c has a rectangular cross-section with a length being many times, e.g. 10 to 25 times larger than a width so that a thin (or: narrow) passage between the reservoir 12 and the application element 16 is formed by the inner section 20c. The outer sections 20a, 20b are a mirror image of each other and exemplary have a semi-circular cross-section thereby forming a bigger passage between the reservoir 12 and the application element 16. A central longitudinal axis M of the shaft 10 passes through the inner section 20c.

[0039] The adapter 18 comprises a rear wall 18a, an outer wall 18b and an inner wall 18c. The outer wall 18b and the inner wall 18c extend from the rear wall 18a in the longitudinal direction L and spaced apart from each other in a direction perpendicular to said longitudinal direction L, thus in a radial direction R. The through-channel 20, in particular the inner section 20c and the outer sections 20a, 20b, are formed by the inner wall 18c of the adapter 18. The inner wall 18c extends further from the rear wall 18a in the longitudinal direction L than the outer wall 18b. The outer wall 18b has an outer wall length L_3 , the inner wall 18c has an inner wall length L_1 corresponding to the outer section length L_1 and the second inner section length L_1 .

[0040] The rear wall 18a abuts on an inner surface 14c of the receiving section 14, thereby forming a positive fit effective in the longitudinal direction L. Further, the outer wall 18b abuts on an inner surface 14b of the receiving section 14 in a sealing manner. For this purpose, the outer wall 18b has projections 21, in particular annular projections, exemplary two annular projections, protruding from the outer wall 18b in the radial direction R and abutting on the inner surface 14b of the receiving section 14. Even further, the outer wall 18b overlaps a front end 14a of the receiving section 14 at least partially in the radial direction R and abuts on the front end 14a of the

receiving section 14 in a sealing manner. Therefore, hermetic sealing is among others achieved by overlapping of adjacent parts.

[0041] In addition, the outer wall 18b at least partially abuts on an inner surface 30 of the shaft 10, in particular an inner surface of the barrel 10a in a sealing manner and forms a positive fit effective in the longitudinal direction L so that the adapter 18 is held in place within the receiving section 14.

[0042] The shaft 10, the adapter 18 and cartridge 11 are made of different plastic materials to achieve hermetic sealing between the components.

[0043] To further improve the ink flow control, the writing instrument 100 further comprises a filter element 24 that is arranged within the shaft 10 and configured to fluidly connect the application element 16 with the through-channel 20. Thus, the ink flow is controlled and regulated by the adapter 18, i.e. the size and the shape of the through channel 20, and the filter element 24. To receive and hold the filter element 24 within the shaft 10, a recess 22 is provided at a front surface of the inner wall 18c in the area of the inner section 20c configured to receive the filter element 24. The filter element 24 is arranged between the adapter 18 and the application element 16 and has a form to at least partially surround the adapter 18, in particular the inner wall 18 and the through-channel 20. A rear end of the application element 16 is in contact with the filter element 24, i.e. surrounded by the filter element 24 so that application liquid can be drawn from the filter element 24 into the application element 16.

[0044] The filter element 24 at least partially abuts on an edge 32 provided at an inner surface 30 of the shaft 10, also forming a positive fit effective in the longitudinal direction L. The adapter 18 may further comprise two T-shaped parts 19 acting as a stopper to prevent the filter element 24 from moving further into the adapter 18.

[0045] The filter element 24 is made of fibres extending in the longitudinal direction. The filter element 24 comprises a front section 24a and a rear section 24b, wherein the fibres are compressed in the front section so that the fibres are arranged in a more dense state in the front section than in the rear section. This may be achieved by providing structures on an inner surface of the shaft or on an outer surface of the adapter in a region corresponding to the front section of the filter element, wherein the structures press onto the fibres in the front section.

[0046] To receive air from the outside for pressure equalization, a first air space 26 is provided between the application element 16, the filter element 24 and the shaft 10. A second air space 34 is provided within the cartridge 11 to receive air from the first air space 26 through the through-channel to equalize pressure. A volume in the first air space 26 is smaller than a volume in the second air space 34 and a pressure in the first air space 26 is larger than a pressure in the second air space 34.

[0047] The writing instrument 100 further comprise a

cap 28 configured to be attached to the front end of the shaft 10, when the writing instrument 100 is not in use. The cap 28 comprises a sealer 29 fitted to the cap 28 and configured to be fitted tightly to the front end of the shaft 10, in particular the barrel 10a, in a sealing manner to form a hermetic sealing.

[0048] A second embodiment of a writing instrument 100', in particular a refillable writing instrument such as a refillable cartridge marker is illustrated in Fig. 4. The writing instrument 100' also comprises a shaft 10 extending in a longitudinal direction L and having a front end and a rear end, wherein the shaft 10 comprises a barrel 10a' and a rear cover 10b that is detachable provided at a rear end of the barrel 10a'. The barrel 10a' and the rear cover 10b partially overlap in the longitudinal direction abut on each other in a sealing manner and are attached to each other forming a positive fit effective in the longitudinal direction L. The barrel 10a' and the rear cover 10b are detachably connected to each other by means of a screw connection or other known connecting types. In contrast to the first embodiment, the barrel 10a' encloses the application element 16 almost completely, even in a rear area of the application element.

[0049] A cartridge 11, e.g. a hollow cylindrical body closed at its rear end, providing a reservoir 12 is arranged within the shaft 10 and is filled with an application liquid. A receiving section 14 having a larger diameter in the radial direction than a part of the cartridge 11 providing the reservoir 12 is formed at a front end of the cartridge 11 for receiving an adapter 18.

[0050] A capillary application element 16 - having the features as described in the context of the first embodiment above - is arranged at a front end of the shaft 10 and extends in the longitudinal direction L. The capillary application element 16 is retained within the barrel 10a'.

[0051] The writing instrument 100' further comprises an adapter 18' that is retained within the receiving section 14. The adapter 18' comprises a through-channel 20' that extends in the longitudinal direction L and that is configured to fluidly connect the application element 16 to the reservoir 12 to transfer application liquid from the reservoir 12 into the application element 16 as well as air from outside the writing instrument 100' into the reservoir 12 to equalize pressure, when the writing instrument 100' is used. The through-channel 20' is formed as a single channel and comprises an inner section 20c' and two outer sections 20a', 20b', each of the sections 20a', 20b', 20c' extending in the longitudinal direction L. According to this embodiment, the two outer sections 20a', 20b' have a round (or: circular) cross-section and are fluidly connected via the inner section 20c' having a rectangular cross-section. The outer sections 20a', 20b' are a mirror image of each other.

[0052] The inner section 20c' has an inner length L_2' in the longitudinal direction L and the two outer sections 20a', 20b' have an outer length L_1' in the longitudinal direction L, wherein the inner length L_2' is smaller than the outer length L_1' .

[0053] The adapter 18' comprises a rear section 18d', an outer wall 18b' and an inner wall 18c'. The outer wall 18b' and the inner wall 18c' extend from the rear section 18d' in the longitudinal direction L and spaced apart from each other in the radial direction R. The through-channel 20', in particular the inner section 20c' and the outer sections 20a', 20b', are formed by the inner wall 18c' of the adapter 18'. The inner wall 18c' extends further from the rear section 18d' in the longitudinal direction L than the outer wall 18b'. The outer wall 18b' has an outer wall length L_3 , the inner wall 18c' has an inner wall length L_1 corresponding to the outer section length L_1 and the second inner section length L_1 .

[0054] As can be seen, e.g. from Fig. 6, the outer sections 20a', 20b' extend beyond the inner section 20c' in the longitudinal direction L and have a tubular shape, i.e. are surrounded completely by an inner wall 18c' at least in the section extending beyond the inner section 20c'.

[0055] The rear wall 18a' abuts on an inner surface 14c' of the receiving section 14, thereby forming a positive fit effective in the longitudinal direction L and the rear section 18d' abuts on an inner surface 14b' of the receiving section 14 in a sealing manner. For this purpose, the rear section 18d' may comprise projections, protruding from the rear section 18d' in the radial direction R and abutting on the inner surface 14b' of the receiving section 14. Even further, the outer wall 18b' at least partially abuts on an inner surface of the barrel 10a' in a sealing manner, wherein the outer wall 18b' may also comprise projections protruding therefrom in a radial direction.

[0056] In addition, the outer wall 18b' forms a positive fit effective in the longitudinal direction L with the inner surface of the barrel 10a' so that the adapter 18' is held in place within the receiving section 14.

[0057] Also in this embodiment, the shaft 10, the adapter 18 and the cartridge 11 may be made of different plastic materials to achieve hermetic sealing between the components.

[0058] To further improve the ink flow control, the writing instrument 100' further comprises a filter element 24 as already described with regard to first embodiment so that we explicitly refer to our explanations above. The adapter 18' may further comprise two T-shaped parts 19' acting as a stopper to prevent the filter element 24 from moving further into the adapter 18'.

[0059] The filter element 24 is made of fibres extending in the longitudinal direction. The filter element 24 comprises a front section 24a and a rear section 24b, wherein the fibres are compressed in the front section so that the fibres are arranged in a more dense state in the front section than in the rear section. This may for example be achieved by ribs 10c' (shown as dashed lines in Fig. 4), provided at an inner surface of the shaft 10a' in a region of the front section 24a of the filter element 24 and extending in the longitudinal direction L. These ribs 10c' press on the filter element 24 so that the fibres are compressed.

[0060] To receive air from the outside for pressure

equalization, a first air space 26 is provided between the application element 16, the filter element 24 and the shaft 10. A second air space 34 is provided within the cartridge 11 to receive air from the first air space 26 through the through-channel to equalize pressure. A volume in the first air space 26 is smaller than a volume in the second air space 34 and a pressure in the first air space 26 is larger than a pressure in the second air space 34.

[0061] The writing instrument 100' further comprise a cap 28 including a sealer 29' and being configured to be attached to the front end of the shaft 10, when the writing instrument 100' is not in use in a sealing manner to form a hermetic sealing.

[0062] In the following, the functionality of the writing instruments 100, 100' will be explained in more detail, whereby the direction of flow of application liquid and air is exemplary indicated by arrows in Fig. 1 for the first embodiment, wherein this applies for the second embodiment in the same way.

[0063] The application liquid stored in the cartridge 11, i.e. in the reservoir 12 enters the through-channel 20, 20', flows through the through-channel 20, 20' and fills-up the filter element 24. When the filter element 24 is saturated with the application liquid, air is suffocated and blocked from entering the through-channel 20, 20'.

[0064] During usage of the writing instrument 100, 100', application liquid is drawn from the filter element 24 to the application element 16, in particular to the tip of the application element 16 due to capillary effects, and transferred onto a writing medium such as paper. As a result, a deficit of application liquid occurs at the tip of the application element 16 so that application liquid is further drawn from the rear end of the application element 16 and the filter element 24 to the tip. Thereby the filter element 24 becomes less saturated with application liquid and air will flow from the outside around the application element 16 into the air space 26, 26' and into the through-channel 20, 20' to displace the application liquid that flows from the reservoir 12 to the application element 16. Application liquid will then flow through the through-channel 20, 20' into the filter element 24 until the filter element 24 is saturated again.

[0065] According to the present invention, the through-channel 20, 20' comprises an inner section 20c, 20c' and two outer sections 20a, 20a', 20b, 20b' wherein the inner section 20c, 20c' is a narrow channel that fluidly connects the outer sections 20a, 20a', 20b, 20b'. When application liquid flows through the first outer section 20a, 20a' when the writing instrument 100, 100' is held at slanting angle, i.e. when the writing instrument 100, 100' is used, air displaces through the second outer section 20b, 20b'. When application liquid flows through the second outer section 20b, 20b' when the writing instrument 100, 100' is held at slanting angle, air displaces through the first outer section 20a, 20a'. Application liquid as well as air will flow through the inner section 20c, 20c', but only very minimal due to the restriction of the flow. Rather, the inner section

20c, 20c' is provided to regulate the flow between the outer sections 20a, 20a', 20b, 20b' to prevent excessive and uncontrolled flow without stop.

[0066] When the writing instrument 100, 100' is held in a vertical position, thus the tip of the application element 16 is directed downwards, the inner section 20c, 20c' equalizes the pressure between the outer sections 20a, 20a', 20b, 20b' and the application liquid will stop from flowing out of the through-channel 20, 20' into the filter element 24. At slanting angle or in a horizontal position of the writing instrument 100, 100' the application liquid flows again through one of the outer sections 20a, 20a', 20b, 20b'.

[0067] Having now described embodiments of the invention in detail, those skilled in the art will recognize modifications and substitutions for the specific embodiments disclosed herein. Such modifications are within the scope of the present invention as defined in the following claims.

Reference signs list

[0068]

10 shaft
 10a, 10a' barrel
 10b rear cover
 10c' ribs
 11 cartridge
 12 reservoir
 14 receiving section
 14a front surface of the receiving section
 14b inner surface of the receiving section
 14c inner surface of the receiving section
 16 application element
 18, 18' adapter
 18a rear wall
 18b, 18b' outer wall
 18c, 18c' inner wall
 18d' rear section
 19, 19' T-shaped part
 20, 20' through channel
 20a, 20a' outer section
 20b, 20b' outer section
 20c, 20c' inner section
 21 projection
 22 recess
 24 filter element
 26, 26' air space
 28 cap
 29, 29' sealer
 30 inner surface of the shaft
 32 edge
 34 air space
 100, 100' writing instrument
 L longitudinal direction
 R radial direction

Claims

1. Writing instrument (100, 100'), in particular refillable writing instrument, comprising

- a shaft (10) extending in a longitudinal direction (L),
 - a cartridge (11) configured to provide a reservoir (12) for application liquid, wherein the cartridge (11) is arranged within the shaft (10) in a rear section, wherein a receiving section (14) is provided at a front end of the cartridge (11),
 - a capillary application element (16) being arranged at a front end of the shaft (10),
 - an adapter (18) configured to be arranged within the receiving section (14) of the cartridge (11), wherein the adapter (18, 18') is configured to fluidly connect the application element (16) with the reservoir (12) via a through-channel (20, 20') extending in the longitudinal direction (L), and wherein the through-channel (20, 20') comprises an inner section (20c, 20c') and at least two outer sections (20a, 20a', 20b, 20b'), wherein the at least two outer sections (20a, 20a', 20b, 20b') are fluidly connected via the inner section (20c, 20c') in the longitudinal direction (L) at least in sections and wherein the inner section (20c, 20c') forms a narrower passage than the outer sections (20a, 20a', 20b, 20b') so that a flow rate between the reservoir (12) and the application element (16) through an outer section (20a, 20a', 20b, 20b') is larger than a flow rate between the reservoir (12) and the application element (16) through the inner section (20c, 20c').

2. Writing instrument (100, 100') according to claim 1, **characterised in that**, the inner section (20c, 20c') and the outer sections (20a, 20a', 20b, 20b') have different dimensions in the longitudinal direction (L), in particular a different length, and/or different dimensions in a plane perpendicular to said longitudinal direction (L), in particular different cross-sections and/or shape.

3. Writing instrument (100, 100') according to any of the claims 1 or 2, **characterised in that**, the at least two outer sections (20a, 20a', 20b, 20b') have the same dimensions in the longitudinal direction (L), in particular the same length, and/or the same dimensions in a plane perpendicular to said longitudinal direction (L), in particular the same cross-sections and/or shape.

4. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that**,

the inner section (20c) has a rectangular cross-section in a plane perpendicular to said longitudinal direction (L) with a length being many times greater than a width and/or the outer sections (20a, 20a', 20b, 20b') have a round, semicircular, circular or elliptical cross-section in a plane perpendicular to said longitudinal direction (L).

5. Writing instrument (100, 100') according to any of the preceding claims,
characterised in that,
the adapter (18, 18') comprises a rear wall (18a) or a rear section (18d'), an outer wall (18b, 18b') and an inner wall (18c, 18c'), wherein the outer wall (18b, 18b') and the inner wall (18c, 18c') extend from the rear wall (18a) or the rear section (18a') in the longitudinal direction (L) and are spaced apart from each other in a radial direction (R).
6. Writing instrument (100, 100') according to claim 5,
characterised in that,
the through-channel (20, 20'), in particular the inner section (20c, 20c') and the outer sections (20a, 20a', 20b, 20b'), is formed by the inner wall (18c, 18c') of the adapter (18, 18'), the inner wall (18c, 18c') extending further from the rear wall (18a) or the rear section (18d') in the longitudinal direction (L) than the outer wall (18b, 18b').
7. Writing instrument (100, 100') according to any of the preceding claims,
characterised in that,
the outer sections (20a, 20a', 20b, 20b') extend beyond the inner section (20c, 20c') in the longitudinal direction (L), wherein the outer sections (20a', 20b') have a tubular shape and are surrounded completely by the inner wall (18c') at least in the section extending beyond the inner section (20c').
8. Writing instrument (100, 100') according to any of the claim 6 to 7,
characterised in that,
the rear wall (18a) and/or rear section (18a') and/or outer wall (18b, 18b') abut on an inner surface (14b) of the receiving section (14) in a sealing manner and/or the outer wall (18b, 18b') overlaps a front end (14a) of the receiving section (14) at least partially in a radial direction (R) and abuts on the front end (14a) of the receiving section (14) in a sealing manner.
9. Writing instrument (100, 100') according to any of the claims 6 to 8,
characterised in that,
the outer wall (18b, 18b') at least partially abuts on an inner surface (30) of the shaft (10) in a sealing manner and/or by forming a positive fit effective in the longitudinal direction (L).

10. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that,**
the writing instrument (100) further comprises a filter element (24) being arranged within the shaft (10) and between the adapter (18, 18'), in particular the trough-channel (20, 20') of the adapter (18, 18'), and the application element (16), wherein the filter element (24) is configured to fluidly connect the application element (16) with the through-channel (20, 20') and the reservoir (12).
11. Writing instrument (100, 100') according to claim 10,
characterised in that,
a recess (22) is provided at a front surface of the inner wall (18a, 18a') in the area of the inner section (20c, 20c') configured to receive the filter element (24).
12. Writing instrument (100, 100') according to any of the claims 10 to 11, **characterised in that,**
the filter element (24) at least partially abuts on an inner surface of the shaft (10), in particular forming a positive fit effective in the longitudinal direction (L).
13. Writing instrument (100, 100') according any of claims 10 to 12, **characterised in that,**
the filter element (24) is made of fibres extending in the longitudinal direction (L), wherein the filter element (24) comprises a front section and a rear section and wherein the fibres are compressed in the front section so that the fibres are arranged in a more dense state in the front section than in the rear section.
14. Writing instrument (100, 100') according to any of the claims 10 to 13, **characterised in that,**
a first air space (26, 26') is provided between the application element (16), the filter element (24) and the shaft (10) said air space (26, 26') being configured to receive air passing past the application element (16) from outside during the use of the writing instrument (100, 100') to equalize pressure inside the writing instrument (100, 100') and a second air space (34) is provided within the cartridge (11) to receive air from the first air space (26, 26') through the through-channel (20, 20') during the use of the writing instrument (100, 100') to equalize pressure inside the writing instrument (100, 100').
15. Writing instrument (100, 100') according to any of the claims 10 to 14, **characterised in that,**
a volume in the first air space (26, 26') is smaller than a volume in the second air space (34) and/or a pressure in the first air space (26, 26') is larger than a pressure in the second air space (34).

Amended claims in accordance with Rule 137(2) EPC.

1. Writing instrument (100, 100'), in particular refillable writing instrument, comprising

- a shaft (10) extending in a longitudinal direction (L),
 - a cartridge (11) configured to provide a reservoir (12) for application liquid, wherein the cartridge (11) is arranged within the shaft (10) in a rear section, wherein a receiving section (14) is provided at a front end of the cartridge (11),
 - a capillary application element (16) being arranged at a front end of the shaft (10),
 - an adapter (18) configured to be arranged within the receiving section (14) of the cartridge (11), wherein the adapter (18, 18') is configured to fluidly connect the application element (16) with the reservoir (12) via a through-channel (20, 20') extending in the longitudinal direction (L), and wherein the through-channel (20, 20') comprises an inner section (20c, 20c') and at least two outer sections (20a, 20a', 20b, 20b'), wherein the at least two outer sections (20a, 20a', 20b, 20b') are fluidly connected via the inner section (20c, 20c') in the longitudinal direction (L) at least in sections and wherein the inner section (20c, 20c') forms a narrower passage than the outer sections (20a, 20a', 20b, 20b') so that a flow rate between the reservoir (12) and the application element (16) through an outer section (20a, 20a', 20b, 20b') is larger than a flow rate between the reservoir (12) and the application element (16) through the inner section (20c, 20c'),

characterised in that,

the adapter (18, 18') comprises a rear wall (18a) or a rear section (18d'), an outer wall (18b, 18b') and an inner wall (18c, 18c'), wherein the outer wall (18b, 18b') and the inner wall (18c, 18c') extend from the rear wall (18a) or the rear section (18a') in the longitudinal direction (L) and are spaced apart from each other in a radial direction (R),
 the through-channel (20, 20') is formed by the inner wall (18c, 18c') of the adapter (18, 18'), the inner wall (18c, 18c') extending further from the rear wall (18a) or the rear section (18d') in the longitudinal direction (L) than the outer wall (18b, 18b'), and
 the outer sections (20a, 20a', 20b, 20b') extend beyond the inner section (20c, 20c') in the longitudinal direction (L), wherein the outer sections (20a', 20b') have a tubular shape and are surrounded completely by the inner wall (18c') at

least in the section extending beyond the inner section (20c').

2. Writing instrument (100, 100') according to claim 1, **characterised in that,** the dimension of the inner section (20c, 20c') in the longitudinal direction (L) and/or in a plane perpendicular to said longitudinal direction (L) differs from the dimension of at least one of the outer sections (20a, 20a', 20b, 20b') in the longitudinal direction (L) and/or in a plane perpendicular to said longitudinal direction (L), in particular the inner section (20c, 20c') has a different length than at least one of the outer sections (20a, 20a', 20b, 20b') and/or the inner section (20c, 20c') has a different cross-section and/or shape than at least one of the outer sections (20a, 20a', 20b, 20b').
3. Writing instrument (100, 100') according to any of the claims 1 or 2, **characterised in that,** the at least two outer sections (20a, 20a', 20b, 20b') have the same dimensions in the longitudinal direction (L), in particular the same length, and/or the same dimensions in a plane perpendicular to said longitudinal direction (L), in particular the same cross-sections and/or shape.
4. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that,** the inner section (20c) has a rectangular cross-section in a plane perpendicular to said longitudinal direction (L) with a length being many times greater than a width and/or the outer sections (20a, 20a', 20b, 20b') have a round, semicircular, circular or elliptical cross-section in a plane perpendicular to said longitudinal direction (L).
5. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that,** the inner section (20c, 20c') and the outer sections (20a, 20a', 20b, 20b') are formed by the inner wall (18c, 18c') of the adapter (18, 18').
6. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that,** the rear wall (18a) and/or rear section (18a') and/or outer wall (18b, 18b') abut on an inner surface (14b) of the receiving section (14) in a sealing manner and/or the outer wall (18b, 18b') overlaps a front end (14a) of the receiving section (14) at least partially in a radial direction (R) and abuts on the front end (14a) of the receiving section (14) in a sealing manner.
7. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that,** the outer wall (18b, 18b') at least partially abuts on an inner surface (30) of the shaft (10) in a sealing

manner and/or by forming a positive fit effective in the longitudinal direction (L).

8. Writing instrument (100, 100') according to any of the preceding claims, **characterised in that,** 5
the writing instrument (100) further comprises a filter element (24) being arranged within the shaft (10) and between the adapter (18, 18'), in particular the trough-channel (20, 20') of the adapter (18, 18'), and the application element (16), wherein the filter 10
element (24) is configured to fluidly connect the application element (16) with the through-channel (20, 20') and the reservoir (12).

9. Writing instrument (100, 100') according to claim 8, 15
characterised in that,
a recess (22) is provided at a front surface of the inner wall (18a, 18a') in the area of the inner section (20c, 20c') configured to receive the filter element (24). 20

10. Writing instrument (100, 100') according to any of the claims 10 to 11, **characterised in that,**
the filter element (24) at least partially abuts on an inner surface of the shaft (10), in particular forming a positive fit effective in the longitudinal direction (L). 25

11. Writing instrument (100, 100') according any of claims 10 to 12, **characterised in that,**
the filter element (24) is made of fibres extending in the longitudinal direction (L), wherein the filter ele- 30
ment (24) comprises a front section and a rear section and wherein the fibres are compressed in the front section so that the fibres are arranged in a more dense state in the front section than in the rear section. 35

12. Writing instrument (100, 100') according to any of the claims 10 to 13, **characterised in that,**
a first air space (26, 26') is provided between the application element (16), the filter element (24) and 40
the shaft (10) said air space (26, 26') being configured to receive air passing past the application element (16) from outside during the use of the writing instrument (100, 100') to equalize pressure inside the writing instrument (100, 100') and a second air 45
space (34) is provided within the cartridge (11) to receive air from the first air space (26, 26') through the through-channel (20, 20') during the use of the writing instrument (100, 100') to equalize pressure inside the writing instrument (100, 100'). 50

13. Writing instrument (100, 100') according to any of the claims 10 to 14, **characterised in that,**
a volume in the first air space (26, 26') is smaller than 55
a volume in the second air space (34) and/or a pressure in the first air space (26, 26') is larger than a pressure in the second air space (34).

FIG 1

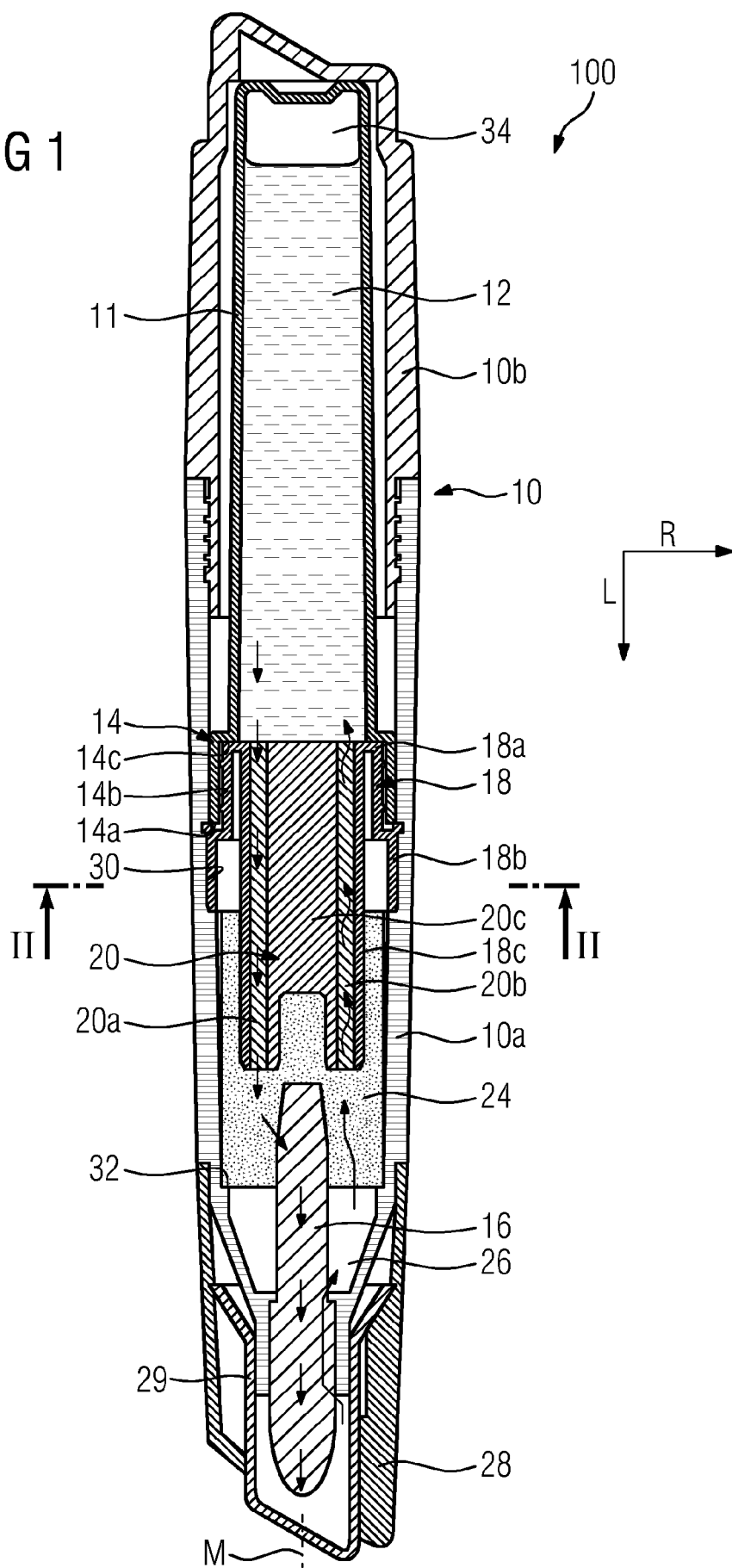


FIG 2

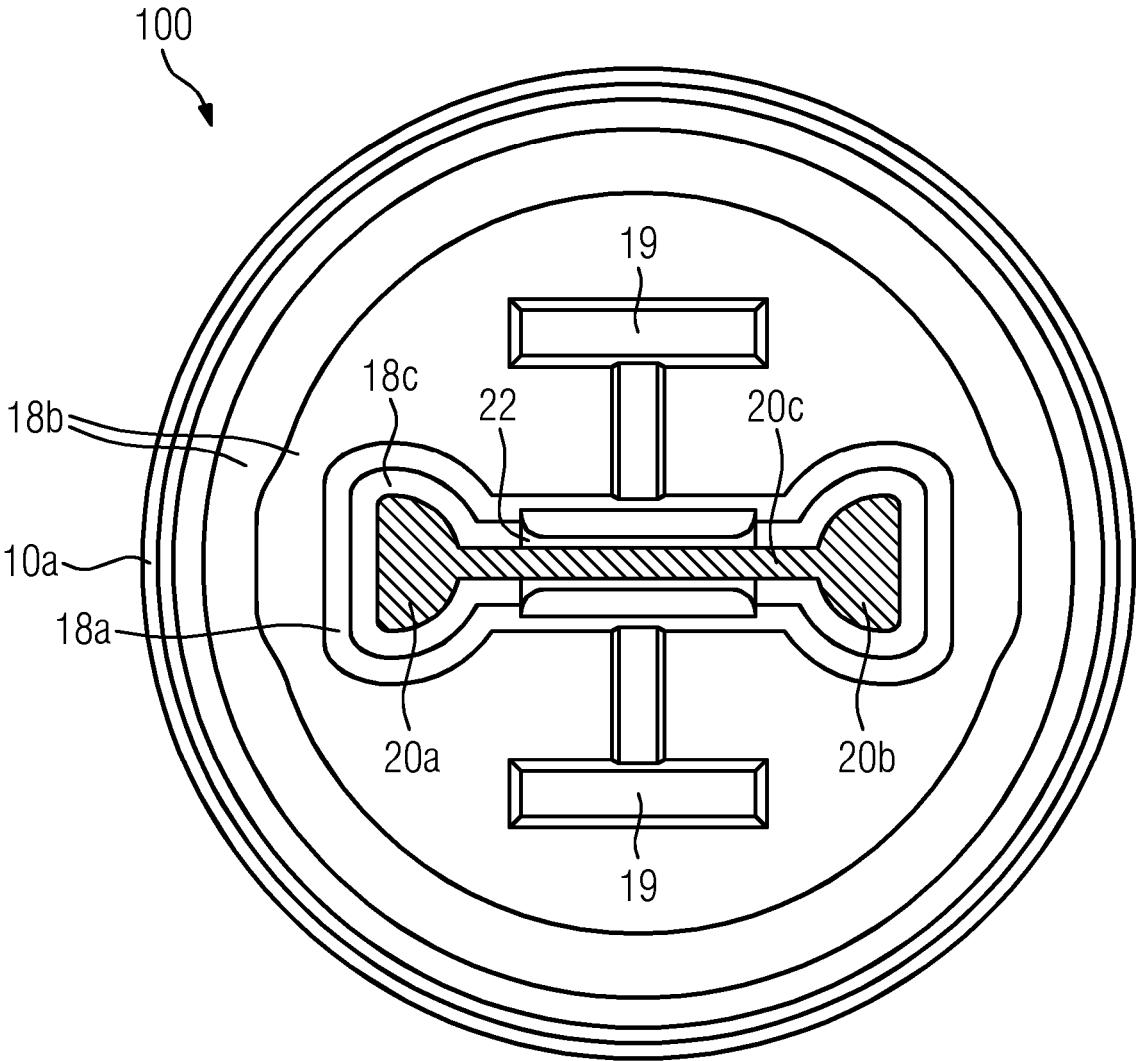


FIG 3

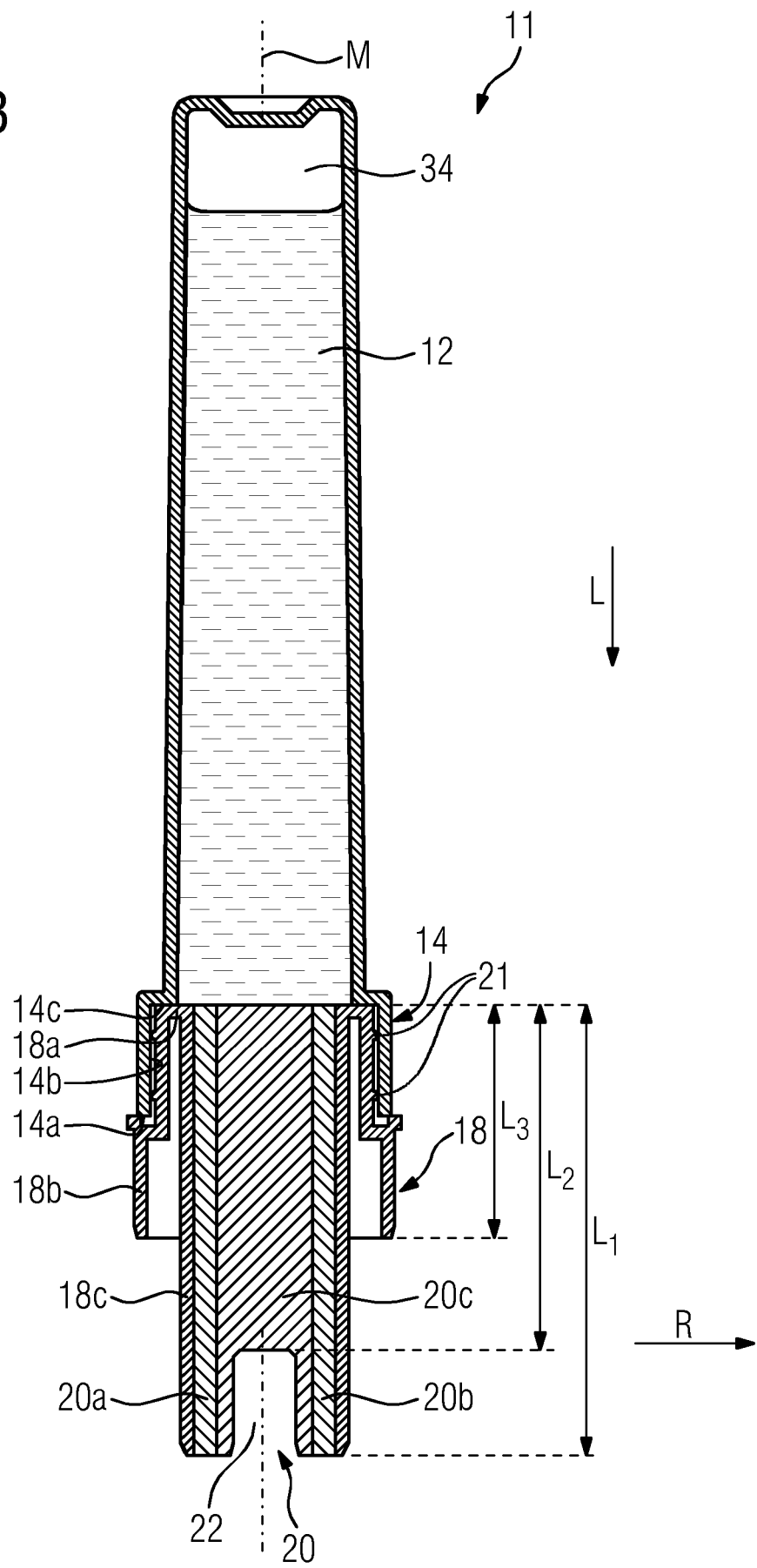


FIG 4

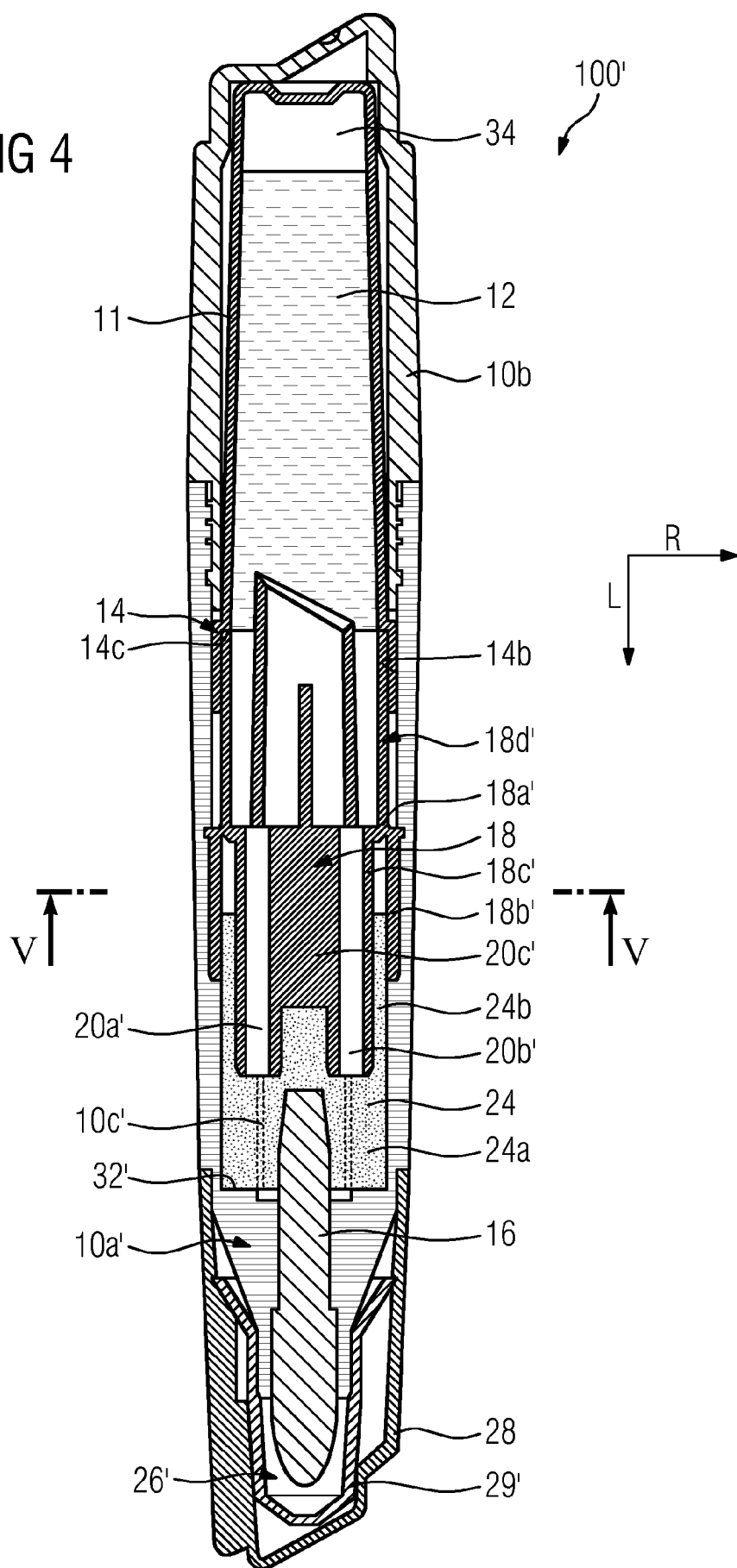


FIG 5

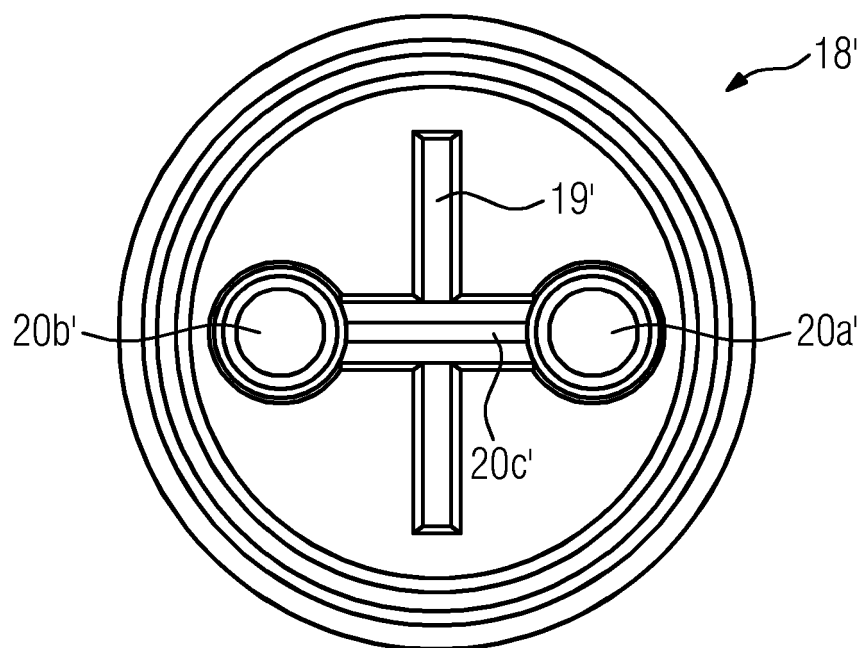


FIG 6

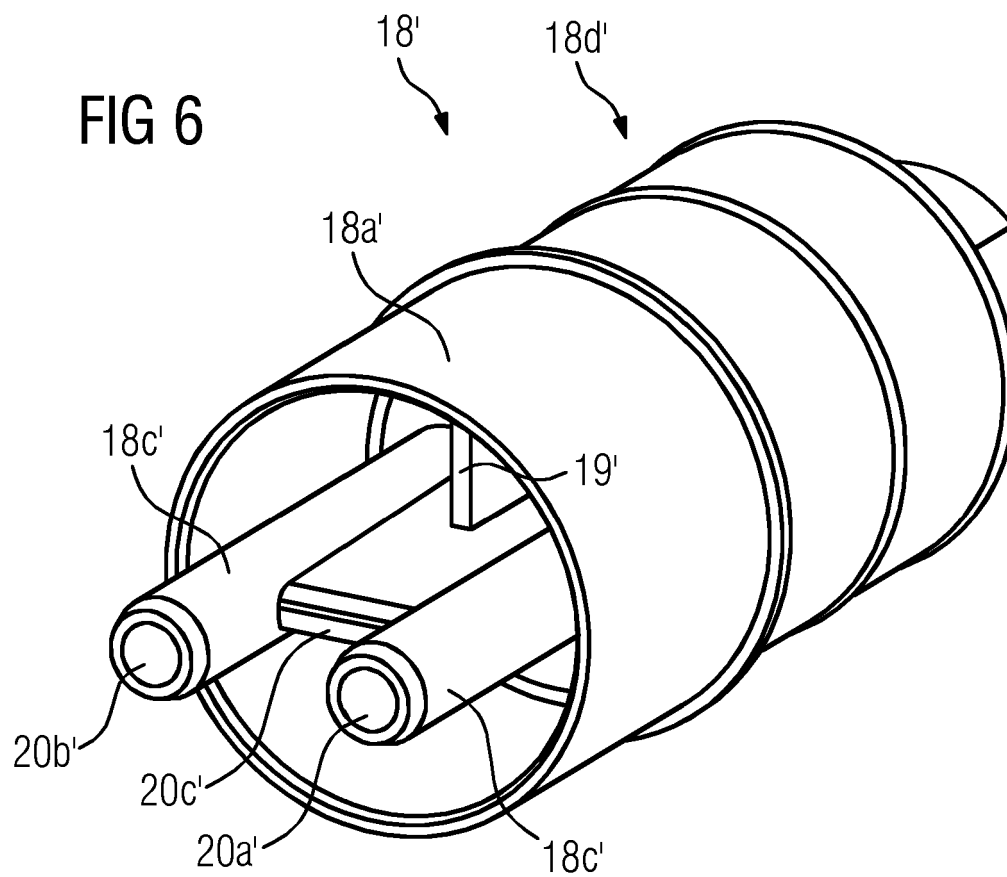
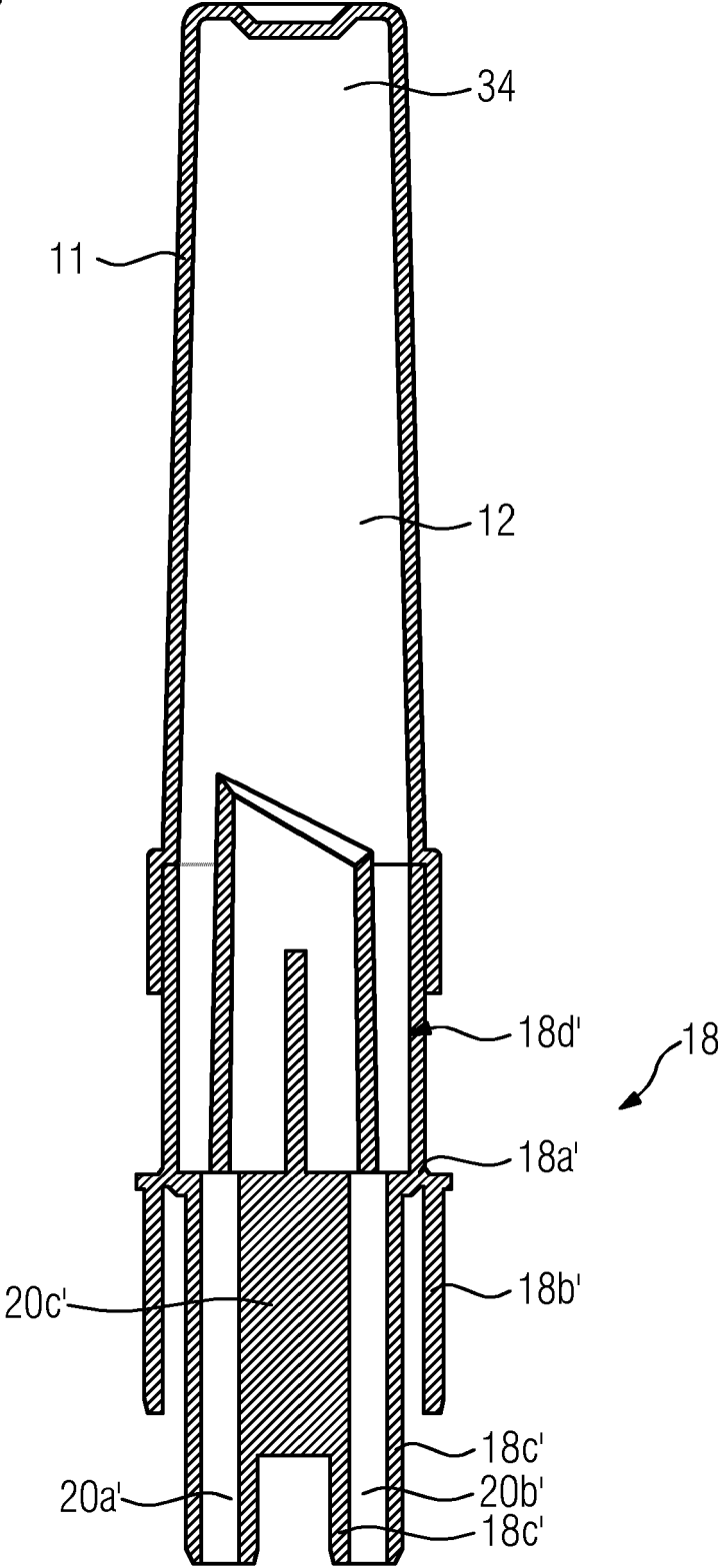


FIG 7





EUROPEAN SEARCH REPORT

Application Number

EP 24 21 6293

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X	US 6 619 871 B2 (MITSUBISHI PENCIL CO [JP]) 16 September 2003 (2003-09-16)	1-6,8-15	INV.
A	* column 9, line 18 - column 16, line 43; figures 1-12 *	7	B43K8/08 B43K8/12
A	US 2018/186172 A1 (KURITA TETSUHIRO [JP]) 5 July 2018 (2018-07-05) * the whole document *	1-15	
A	EP 2 431 192 B1 (TUNG YIK INTERNAT LTD [HK]) 27 May 2015 (2015-05-27) * the whole document *	1-15	
A	US 6 997 631 B2 (PENTEL KK [JP]) 14 February 2006 (2006-02-14) * the whole document *	1-15	
A	DE 20 2015 103960 U1 (TUNG YIK INTERNAT LTD [CN]) 4 November 2015 (2015-11-04) * the whole document *	1-15	
A	JP 2008 023755 A (PILOT INK CO LTD) 7 February 2008 (2008-02-07) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B43K
A	DE 20 01 553 B1 (DAHLE WILHELM METALLWAREN) 13 May 1971 (1971-05-13) * the whole document *	1-15	
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 2 May 2025	Examiner Kelliher, Cormac
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	

EPO FORM 1503 03.82 (P34C01)

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

EP 24 21 6293

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

02-05-2025

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 6619871 B2	16-09-2003	AU 1892501 A	25-06-2001
		CN 1409669 A	09-04-2003
		EP 1238820 A1	11-09-2002
		KR 20020095171 A	20-12-2002
		TW 509148 U	01-11-2002
		US 2002192008 A1	19-12-2002
		WO 0143986 A1	21-06-2001

US 2018186172 A1	05-07-2018	BR 112017027535 A2	21-08-2018
		CN 107709034 A	16-02-2018
		EP 3315313 A1	02-05-2018
		JP 6768649 B2	14-10-2020
		JP WO2016208436 A1	19-04-2018
		KR 20180021113 A	28-02-2018
		TW 201706145 A	16-02-2017
		US 2018186172 A1	05-07-2018
		WO 2016208436 A1	29-12-2016

EP 2431192 B1	27-05-2015	NONE	

US 6997631 B2	14-02-2006	AU 2003241882 A1	19-12-2003
		CN 1655954 A	17-08-2005
		EP 1541371 A1	15-06-2005
		KR 20050007355 A	17-01-2005
		TW I260280 B	21-08-2006
		US 2005169691 A1	04-08-2005
		WO 03101760 A1	11-12-2003

DE 202015103960 U1	04-11-2015	NONE	

JP 2008023755 A	07-02-2008	JP 4820701 B2	24-11-2011
		JP 2008023755 A	07-02-2008

DE 2001553 B1	13-05-1971	NONE	

EPO FORM P0459

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