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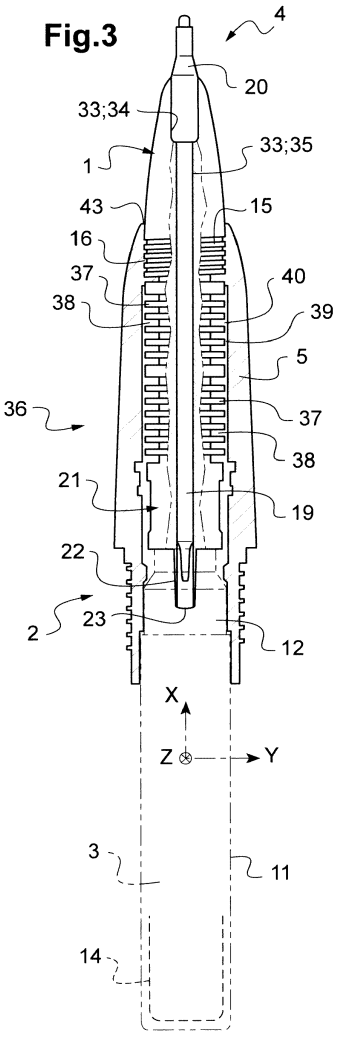
(54) **Felt tipped feeding assembly and writing instrument fed from a standard disposable cartridge of aqueous ink**

(57) The invention relates to a felt tipped feeding assembly (1) and writing instrument (2) fed from a standard disposable cartridge of aqueous ink (3).

The writing instrument (2) includes the feeding assembly (1) that comprises at least: a writing point (4), a feeder and a hollow core (21) for connection to an ink container. An ink flow regulator (36) includes a cylindrical lengthwise bore (39) formed inside the writing instrument (2), e.g. calculated from fluid parameters of the water based ink like dynamic viscosity. The writing point (4) is integrated to a stem feeder (19) to form the frontwards end thereof; the ink container is a standard sized water based ink cartridge (3) and the rear end of the hollow core (21) has a connection of the feeding assembly (1) to this standard ink cartridge (3).

The invention typically allows producing various types and shapes of writing instrument e.g. for drawing, marking and scriptural language, dedicated to various surfaces.

Fig.3



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Description

[0001] The invention concerns a felt tipped feeding assembly and a writing instrument fed from a standard disposable cartridge of aqueous ink.

[0002] The broadest technical domain of the invention is the one of writing instruments and more precisely of so-called felt tipped writing instruments. The term writing is indeed not limited to scriptural language. But it encompasses writing, drawing, marking or the like. The following provides some definitions relating to the domain of writing instruments.

[0003] Usually, a writing instrument is defined depending on the type of writing-point it has. The writing-point is the part of the instrument which comes into contact with the writing surface in order to deposit ink. Classical types of writing-points are balls, nibs and felt tips.

[0004] Ball writing instruments have a writing fluid feeding system based on a writing-point in the form of a rotatable ball writing tip mounted either in the instrument itself or in a detachable refill. In a fountain pen for instance, the writing-point is a nib, i.e. a metal part of the pen which deposits ink on the writing surface.

[0005] The invention is both distinct from ball and nibs writing instruments. Distinctively, so called felt tipped writing instruments are e.g. pens having a writing-point comprising fibres, felt, or similar porous or capillary material. As is for nibs, felt tips material, shape and size vary depending on their purpose.

[0006] Another distinction between writing instruments is whether it is disposable or can be refilled. When a writing instrument cannot be used again when no more writing is possible e.g when out of ink, it is called a disposable writing instrument or an instrument having a disposable refill.

[0007] Three ways are commonly available for refill of a non-single use writing instrument.

[0008] The older way is when the writing point of the writing instrument is dipped into a bottle of ink each time needed. Another way of refilling a writing instrument is when ink is fed or pumped into a reservoir fixedly integrated inside the writing instrument, from a larger recipient like a bottle.

[0009] Other writing instruments (mostly felt, ball or roller typed) comprise a disposable unitary assembly, usually called a refill, including the writing-point and an ink chamber integrated together. When the ink chamber is empty or the ink no more usable / convenient, the whole disposable unitary assembly is separated from the writing instrument and possibly exchanged with another new disposable unitary assembly.

[0010] Another way of refilling a writing instrument is to exchange an older ink cartridge for a new one. Although first introduced in the late 19th century, ink cartridges were not widely used until the advent of plastic ink cartridges in the early 1950s. Today, the most widespread ink cartridges are called "international" cartridges. These ink cartridges are for nib pens and form each a disposable, generally cylindrical, sealed recipient, slightly tapered towards a tip end. Distinctively from refills, the ink cartridges are depraved from a writing point.

[0011] To sum up, disposable unitary assemblies are typically used for ball pens and felt tipped pens. Ink cartridges are only used for ball pens and nib pens.

[0012] Another discriminant difference among writing instruments is whether the writing-point is fed with so called aqueous ink or with solvent based ink. The aqueous ink comprises a water based carrier medium, pigment dispersion or dye and limited quantities of additives e.g. aiming to enhance longevity of ink availability and / or eliminate film formation. Most of the times, water based inks are quite safe for health (if ingested or inhaled) and hardly dangerous for environment.

[0013] Other writing instruments (mostly felt, ball or roller typed) use so called non-aqueous ink, i.e. comprising non water based carrier medium. E.g. for ball pens, the non-aqueous ink is generally a writing fluid with a dynamic viscosity greater than 1000 mPa $\times$ s at 23 °C +/- 2 °C. Some solvent based inks may contain chemical products that can be harmful for health and / or deleterious for environment.

[0014] From the prior art documents below, it appears that no felt tipped writing instrument is fed from a standard disposable cartridge of aqueous ink.

[0015] The document FR2462274 describes a writing block for a ball type erroneously designated as a felt pen, nowadays called "cartridge roller". In a hollow body of the ball type pen is mounted a writing block. The writing block comprises a capillary wick e.g. of textile impregnated with resin. At the outer end of the capillary wick is a writing ball. The external outer end of the capillary wick is housed into a tip nozzle. The tip nozzle is engaged into an opening of the hollow body. The writing block includes ink regulating fins, transversally disposed and spaced apart one from another transverse gaps. The hollow body includes longitudinal canals facing the tip nozzle. The writing block has an axial tube with a cylindrical head for receiving a standard ink cartridge.

[0016] The document FR2552703 describes a method of manufacturing a plastic bottle. A cylindrical bottle manufactured previously is introduced into an injection mold comprising a cavity, cores, and other form a slit. In the previously manufactured bottle is formed integrally a neck portion and a shoulder. A manufacturing step provides an injection nozzle plastic resin and a spruced tip in response, on the side of the outer circumference of the neck portion of the bottle. Another manufacturing step provides a contraction of area at a specified fixed point of the neck portion or shoulder portion following it. Thereby is manufactured a one-piece molding of the bottle neck with the shoulder part following it.

[0017] The document GB802504 describes a deformable container made of polyethylene, polyvinyl chloride or like flexible thermoplastic material. The container of plastic material is open at one end. A manufacturing method comprises extruding a thin-walled tube of plastic material, mounting a length of the tube on a core member, clamping the core member and tube in a mould so that one end of the tube and an adjacent portion of its bore are exposed to, and form a closure for, a mould cavity defined by the mould and the core member, but so that the outer surface of the tube is shielded, and injecting plastic material into the cavity transversely of the axis of the tube so as simultaneously to form a closure cap and to weld said cap to said exposed end and adjacent portion of the bore of the tube only, said outer surface being so shielded that the cap is not welded thereto.

[0018] The document GB1039667 describes a replaceable cartridge type felt nib pen. The nib pen has a plug that is held intermediate two barrel portions against axial movement. A nose portion of the plug pierces the nozzle of a cartridge when a cap is screwed into the rear of the barrel portion. The forward barrel portion houses a filling of fibrous or felted material which provides capillary feed channels from the cartridge via the channel in the plug to the nib in contact therewith.

[0019] The document JP2005007740 describes a nib writing instrument adaptable to upward-posture writing and having an ink retention body serving as a circulation control member for supplying ink, housed in a free state in an ink tank. The ink retention body is composed of many comb-teeth-like fins provided perpendicularly to the axial direction of an outer peripheral surface, having a deep bottom-equipped narrow air circulation groove for connecting the ink tank with outside air. The groove is also for bringing the ink about the temporary retention of the outflow to the outside due to pressure change in the ink tank. A guide core is provided in the through-hole of the ink retention body for guiding the ink supplied from the ink tank part to the pen tip. The ink tank is replaceable. The diameter of the ink tank cartridge connecting hole can be in a range of 3-5 mm, and the length of the connecting hole can be 7-12 mm.

[0020] The document US4966480 describes how to wash a tubular nib pen. A washing liquid cartridge removably is positionable in the tubular nib pen and is of the type of a removable ink container. The washing liquid container has an engagement portion at one end that is removably engaged with an inner element of the tubular nib pen and an opening seal adjacent to the engagement portion. When the seal of the cartridge is opened and the cartridge is snugly fitted in position within the tubular nib pen in place of the ink container, the washing liquid washes the ink passage within the writing instrument.

[0021] The document US6276860 describes a liquid applicator. The liquid applicator has a front sleeve in a front barrel, by which a collector is inserted into front sleeve. A pen core forming the writing point is separated from a trunk core and connected to it for ink communication. The trunk core is tightly inserted in a communication passage while its rear end is loosely fitted to communication passage of a cylindrical projection formed on a rear sleeve side of a front barrel so as to create a gap. This collector is retained loosely with respect to an inner peripheral surface of front sleeve so as to allow air communication with the atmosphere. Formed in a central shaft of this collector is a communication passage that opposes and is in communication with communication passage of the cylindrical projection.

[0022] The document WO2002076762 describes a cylindrical nib type pen. The cylindrical nib pen is coupled with an integrated ink-storing cartridge. The cylindrical nib pen comprises an adjusting part coupled to an ink storing part to maintain it in a sealed state, and accommodating a cylindrical, rigid and hollow nib that forms a capillary duct. The hollow nib uses capillary action in accordance with an air balance. A holder secures the hollow nib that can be of various sizes, to an end of the adjusting part. A cap with a ventilation hole is coupled to a case for exposing the holder to outside. Only the whole unitary assembly including the integrated ink-storing cartridge, the hollow nib and the adjusting part together is replaceable. The ink-storing cartridge is not possibly replaceable.

[0023] Now, major weak points and drawbacks of the prior art are discussed.

[0024] From the above, appears that there is no available writing system or writing block able to equip any type of writing instrument barrel, e.g. of metal and / or plastic, composed of an acrylic tip working in conjunction with a short ink cartridge of international standard, for water based ink.

[0025] There is no available writing instrument that allows developing a wide range of felt type tip sizes and shapes, while assuming a perfect air/ink exchange to allow the regulation by capillarity of the water based ink output, through a single and simple guide forming an integral stem feeder incorporating a conducting fiber pipe and the writing point, this stem feeder extending from the ink cartridge to the writing point.

[0026] The above shows remaining limits and drawbacks pertaining to feeding assemblies and corresponding felt tipped writing instruments. Also, the use of harmless and environment friendly water based inks with felt tipped pens, would need to be made possible.

[0027] Therefore, a wide demand exits for enhanced felt tipped writing instruments compatible with water ink cartridges, because of their use comfort, clean behavior and variety of writing possibilities.

[0028] At least one of the following improvements would be useful: reduction of items number into the structure, of recurring costs and of manufacturing time. Besides, enhancing the feeding flow of water based ink and writing smoothness performances of felt tipped writing instruments would be useful. Increasing the range variety of felt type tip ends (shape and size) for writing instruments would be also highly beneficial.

[0029] The invention is therefore useful by offering a wide range of feeding assemblies, sizes and shapes of writing

points and making felt tipped writing instruments compatible with water based ink from a cartridge, e.g. of the so-called "international standard" type.

[0030] An object of the invention is a feeding assembly for a felt tipped writing instrument as defined by claim 1. Another object of the invention is a felt tipped writing instrument as defined by claim 14. Yet another object of the invention is a method of fabricating a felt tipped writing instrument as defined by claim 15.

[0031] In an embodiment, the feeding assembly (1) for a writing instrument of the felt tipped type, comprising at least:

- a writing point, a feeder and a hollow core having a connection for connecting the writing point to an ink container;
- the hollow core having outer attaching means for securing the feeding assembly to a front barrel of the writing instrument ; and
- an ink flow regulator, longitudinally between the attaching means and the connection to the ink container.

[0032] In an embodiment, the writing point is integrated to a stem feeder and forms a frontwards stem end thereof, the ink container being a water based ink cartridge of standard size and a rear end of the hollow core having a cylindrical rearwards projection forming the connection to the ink container with the stem feeder extending axially inside the cylindrical rearwards projection to have a water based ink to flow from the ink cartridge to the writing point frontward extending out of the hollow core, through the stem feeder.

[0033] In an embodiment, the front end of the stem feeder forming the writing point is beveled and slanted with a wide straight contact line; the writing point being a straight line extending on 1 mm to 9 mm millimeters and forming an angle of a less than 10-20 degrees, relatively to radial directions of the feeding assembly.

[0034] In an embodiment, the stem feeder forming the writing point has a uniform transverse diameter perpendicularly to a longitudinal direction.which generally equals to the inner diameter a traversing canal of the hollow core.

[0035] In an embodiment, the front end of the stem feeder forming the writing point is spherical shaped with a wide rounded contact area; the stem feeder having a ring abutment fixedly attached to and around the stem feeder and longitudinally backwards the writing point along a longitudinal direction, the ring abutment being rigidly secured to an outer diameter of the stem feeder at 2-6 mm from a front-most end of the writing point.

[0036] In an embodiment, the front end of the stem feeder forming the writing point is arrow shaped with a thin dot contact area; the stem feeder having a ring abutment fixedly attached to and around the stem feeder longitudinally along a longitudinal direction and rigidly secured to an outer diameter of the stem feeder at 2-8 mm from a front-most end of the writing point.

[0037] In an embodiment, the front end of the stem feeder forming the writing point is tubular shaped with a medium disk contact area; the stem feeder being fixedly attached to a ring abutment with an extension distance that goes frontwards ahead of a front-most surface of the ring abutment.

[0038] In an embodiment, the feeding assembly is adaptable to various types of writing instruments; the front barrel and / or rear barrel chosen among at least one of: metal, plastic, wood, stone, glass; in conjunction with an ink cartridge of international standard.

[0039] In an embodiment, the front end of the stem feeder forming the writing point has a maximal transverse dimension at its front-most end that is chosen among: 0.1 mm to 2.0 mm.

[0040] In an embodiment, the stem feeder is made from capillary fibers grouped and unified by a resin substrate; the capillary fibers of the stem feeder being porous pressed fibers or filaments, wherein the size and shape of the writing point is formed and smoothened.

[0041] In an embodiment, the capillary fibers are made from at least one composition of fibers chosen among: felt, acrylic, polymer, textile, recycled filaments, natural fibers.

[0042] In an embodiment, the resin substrate is made from at least one composition of resin chosen among: acrylic, polymer, poly-acetate, natural resin and wax.

[0043] In an embodiment, the stem feeder including the writing point has a cross section perpendicularly to a longitudinal direction arranged with a series of peripheral resin concentrates each filled with a resin substrate; the regularly spaced apart peripheral resin concentrates (having a transverse section chosen among: round, triangle and rectangular; the stem feeder having a number of peripheral resin concentrates chosen between: 1 to 15.

[0044] In an embodiment, the stem feeder including the writing point has a surrounding envelope that comprises merged capillary fibers and a resin substrate; at an outmost periphery of the surrounding envelope a surface protective layer being cylindrical shaped and peripherally / longitudinally to surround the stem feeder, except at its rear and front ends.

[0045] Another object of the invention is a felt tipped writing instrument. In an embodiment, the writing instrument of the felt tipped type includes a feeding assembly comprising at least: a writing point, a stem feeder and a hollow core for connecting the feeding assembly to an ink container. An ink flow regulator including a cylindrical lengthwise bore being formed inside a front barrel of the writing instrument to leave a narrow air clearance from an inner surface defined by a

crenel design defined together by radial disk-shaped shoulders longitudinally spaced apart on the hollow core and by radial round-shaped gaps along the hollow core; and the writing point being integrated to the stem feeder to form the frontwards end thereof; the ink container being a water based ink cartridge and the rear end of the hollow core connecting the feeding assembly to the ink cartridge.

[0046] Yet another object of the invention is a method of fabricating a felt tipped writing instrument. An embodiment of the method provides assembling a writing instrument with a feeding assembly as exposed above. This method comprises:

- a stem feeder plus ring tube abutment longitudinally inserting step;
- a subsequent step of mounting the feeding assembly into the hollow core ;
- a subsequent step of attaching the core plus stem-abutment longitudinally into the front barrel ;
- a subsequent step of receiving via a longitudinally insertion an ink cartridge; and
- optionally, a writing point covering step.

[0047] Presently preferred embodiments of the invention are presented in the following description, with reference to the attached drawings.

[0048] A short description of the drawings now follows.

Figure 1 is a schematic outer overall view of a felt tipped writing instrument of an example of embodiment of the invention, provided with a closing cap for protecting the semi-spherical shaped felt tip and avoiding spillage of the water based ink.

Figure 2 is a schematic perspective part split-view of an example of embodiment of the invention, showing the ink cartridge plugged into the feeding assembly, and the ring shaped ink collecting vanes and vanes spacing gaps.

Figure 3 is a partly longitudinally radially cut-out planar view of an embodiment of feeding assembly for a felt tipped writing instrument with an ink cartridge in phantom lines.

Figure 4 is a schematic longitudinally radially split planar view showing an example of an method of fabricating a feeding assembly for a felt tipped writing instrument according to the invention, with a stem feeder plus ring tube abutment longitudinally inserted into a feeding assembly hollow core, the core plus stem-abutment being longitudinally inserted into a front barrel of the writing instrument, the later receiving via a longitudinally insertion an ink cartridge.

Figures 5 to 8 show examples of stem feeder writing points end shapes, the stem feeder end of figure 5 being beveled and slanted with a wide straight contact line, the stem end of figure 6 being spherical shaped with a wide rounded contact area, the stem end of figure 7 being arrow shaped with a thin dot contact area and the stem end of figure 8 being tubular shaped with a medium disk contact area.

Figure 9 is a schematic outer longitudinally radial planar view showing details of an example of a feeding assembly with a screw molding for secured attachment to a front barrel for a felt tipped writing instrument according to the invention.

Figure 10 is an overall schematic outer longitudinally radial planar view showing an example of a feeding assembly according to the invention.

Figure 11 is a perspective partial view of an embodiment of the stem feeder incorporating the writing tip end, this conducting stem being made of acrylic fibers arranged in a lemon slice shape defining a surrounding envelope, radial extensions and an inner envelope, these envelopes and extensions delimiting hollow areas filled with resin.

Figure 12 is a planar transverse section of an embodiment of the stem feeder similar to the one of Figure 11, but showing an example of shapes of the surrounding envelope, radial extensions, and inner envelope, the hollow areas filled with resin and including a central hollow duct.

[0049] A detailed description of illustrated embodiments follows. In figure drawings, elements that are similar are given the same reference numerals.

[0050] The figures 1-12 show three mutually orthogonal directions X, Y and Z. The directions X, Y and Z together define a referential XYZ.

[0051] A reference direction X referred to as being longitudinal corresponds to the length dimension of the writing instruments and components described. Terms such as front or tip / rear or back are relative thereto. The longitudinal direction X is deemed to be either the symmetry center line or included in a symmetry plane of the writing instruments and components.

[0052] Another direction Y, said to be "transverse", corresponds to the thickness or lateral dimension of the structures described. The terms "radius" or "radially" are relative thereto. Another direction Z is referred to as the elevation direction. The direction Z corresponds to another radial / transverse of the structures described.

[0053] On the figures 1-3, is shown a feeding assembly 1 according to the invention. The feeding assembly 1 is part of a writing instrument 2. The writing instrument 2 is of the felt tipped type and is compatible with an ink cartridge 3 which feeds with water based ink the feeding assembly 1. The feeding assembly 1 has a felt tipped writing point 4.

[0054] The writing instrument 2 comprises a front barrel 5, a rear barrel 6 and in the example of figure 1, a closing cap 7.

[0055] As seen on figures 3-4, the plastic ink cartridge is a typical plastic ink cartridge 3 of the standard format called "international" cartridge.

[0056] The plastic ink cartridge 3 is an originally sealed recipient, intended to be opened for use, which is slightly tapered towards a tip end 8. At a bottom end 9 is longitudinally opposed to the tip end 8. Before use, the plastic ink cartridge 3 is closed by a radial barrier 10 most of the times integral with a peripheral wall 11 of the plastic ink cartridge 3. At tip end, the plastic ink cartridge has a neck extension 12 of reduced diameter compared to the peripheral wall, integral with it.

[0057] A shutting operculum 13 closes the neck extension. The shutting operculum 13 is molded integrally with the neck extension 12 but is detachable from it by tearing of a weak seal (not shown). When severed from the neck extension 12, the shutting operculum 13 is displaced inside the generally cylindrical slightly tapered recipient, to let water based ink 14 contained therein to flow outside the plastic ink cartridge towards he feeding assembly 1.

[0058] So called "international" plastic ink cartridges as e.g. 3 are approximately 38-40 mm (1.5 inches) long and approximately 6.35 mm (0.25 inches) in diameter water based ink 14 has a dynamic viscosity far lower than 1000 mPa $\times$ s at 23 °C +/- 2 °C, i.e. than most solvent based inks for felt pens.

[0059] The feeding assembly 1 and the writing instrument 2 have a mutual securing system called attaching means. On figure 3, an example of attaching means include on the feeding assembly 1 an outer screw 15 made by molding and complementary to an inner screw 16 molding of the front barrel 5. The attaching means (15, 16) allow secure but detachable securing of the feeding assembly 1 to the front barrel 5 i.e. with the writing instrument 2. Of course, in other embodiments, the feeding assembly 1 and the writing instrument 2 are fixedly attached together by other kind of attaching means, e.g. non reversible, gluing, clipping or the like.

[0060] Similarly, the front barrel 5 is rigidly attached to the rear barrel 6 by securing means (17, 18) always detachable to allow access to the ink cartridge 3. On example of figure 4, the front barrel 5 has detachable attaching means in the form of outer fastenings 17, dedicated to cooperate by screwing with complementary screwing of inner fastenings 18 of the rear barrel 6 (cf. figure 2).

[0061] As shown on figures 1 and 2, the ink cartridge 3 is both connected to the feeding assembly 1 and covered by the rear barrel 6 when the writing instrument 2 is ready for use, as shown on figure 1.

[0062] Also, depending on embodiments the front barrel 5, the rear barrel 6 and the closing cap 7 are made of various materials and from different production processes, e.g. chosen from molding plastics, molding metals, machined metals, and machined wood. Though, in shown embodiments, the front barrel 5 is made from molding plastics.

[0063] Similarly, the size and shape of the writing point 4 is formed and smoothened from the stem feeder 19, by at least one operation of: machining, grinding, polishing, molding, and press-forming.

[0064] As per figure 3, the feeding assembly 1 comprises from its front end to its read end the writing point 4, a stem feeder 19, a ring tube abutment 20 (though being optional in embodiments) and a hollow core 21, rearwardly terminated by a cylindrical rearwards projection 22, that forms a connection for the feeding assembly 1 with the ink cartridge 3.

[0065] The hollow core 21 has the outer attaching means (15) for securing the feeding assembly to the front barrel 5. Longitudinally between the attaching means 15 and the cylindrical rearwards projection 22, the hollow core 21 has a major part of an ink flow regulator 36 (described in details below).

[0066] The rear end of the hollow core 21 has the cylindrical rearwards projection 22, made for connecting the feeding assembly 1 to the neck extension 12 of the ink cartridge 3. The stem feeder 19 extends axially rearwardly inside the cylindrical rearwards projection 22. The water based ink 14 therefore flows from the ink cartridge 3 to the stem feeder 19, via the cylindrical rearwards projection 22.

[0067] Classically, the cylindrical rearwards projection 22 is having a rearmost sharp end 23, capable of separating the shutting operculum 13 from the neck extension 12 of the ink cartridge 3, when the later is forced onto the cylindrical

rearwards projection 22.

[0068] From figures 1 to 10, it appears that according to the invention, the writing point 4 is integrated to the stem feeder 19 and forms the frontwards end thereof. This means that the invention is depraved form an additional writing point that would be connected to a feeder arrangement.

[0069] Besides, with the invention, the writing point 4 is made from a peculiar and dedicated shaping of the material of the stem feeder 19. Otherway speaking, as visible on figure 3 for instance, the stem feeder 19 extends from its integrated writing point 4 to the cylindrical rearwards projection 22.

[0070] Figures 5 to 8 show examples of stem feeder writing points end shapes.

[0071] The stem end forming the writing point 4 on figure 5 is beveled and slanted with a wide straight contact line. The writing point 4 is a straight line extending on a few millimeters, that is forming an angle of a few degrees, e.g. less than 10-20°, relatively to the radial directions Y and Z, going from a summit spot (on the right) to a rearmost spot (on the left). To be noticed that the stem feeder 19 is depraved from any ring abutment 20, distinctively from the stem feeders 19 of figures 6-8. Besides, the stem feeder 19 of figure 5 has a transverse diameter, i.e. perpendicularly to the direction X, which generally equals to the diameter of the ring abutments 20 shown on figures 6-8.

[0072] The stem end forming the writing point 4 on figure 6 is spherical shaped with a wide rounded contact area. The stem feeder 19 of figure 6 has a ring abutment 20, fixedly attached to and around the stem feeder 19. Longitudinally along the direction X, the ring abutment 20 is rigidly secured to the outer diameter of the stem feeder 19, backwards by a few millimeters, e.g. 2-6 mm, from the front-most end of the writing point 4. On figure 6, from the front-most end of the ring abutment 20 and rearwards from the writing point 4 per se, the stem feeder is locally conical shaped with its diameter diminishing from the ring abutment 20 to the writing point 4 per se.

[0073] The stem end forming the writing point 4 on figure 7 is arrow shaped with a thin dot contact area. The stem feeder 19 of figure 7 also has a ring abutment 20, fixedly attached to and around the stem feeder 19. Longitudinally along the direction X, the ring abutment 20 is rigidly secured to the outer diameter of the stem feeder 19, a few millimeters, e.g. 2-8 mm, from the front-most end of the writing point 4. On figure 7, from the front-most end of the ring abutment 20 and rearwards from the writing point 4 per se, the stem feeder 19 is locally cylindrical.

[0074] The stem end forming the writing point 4 on figure 8 is tubular shaped with a medium disk contact area. The stem feeder 19 of figure 7 is also fixedly attached to a ring abutment 20. The extension distance that goes frontwards ahead of the front-most surface of the ring abutment 20 is similar to the one shown on figure 7.

[0075] From the figures 5-8, appears that the invention offers a feeding assembly 1 (also called writing block) that is adaptable to many types of writing instruments 2, e.g. with metal or plastic front barrel 5 and / or rear barrel 6, possibly combined with various shapes, material and sizes of writing points 4, in conjunction with a short ink cartridge of international standard.

[0076] In embodiments, the maximal transverse dimension of the writing point 4 at its front-most end is chosen among: 0.1 mm to 2.0 mm.

[0077] Notwithstanding the shape and size of the writing point 4, the stem feeder 19 is made from capillary fibers 24 grouped and unified by a resin substrate 25, e.g. synthetic, as illustrated on figures 11-12. Usually, the stem feeder 19 is made of porous, pressed fibers.

[0078] Depending on the intended type of writing instrument 2 to be made from a feeding assembly 1 and stem feeder 19 according to the invention, the capillary fibers 24 are made from at least one composition of fibers chosen among: felt, acrylic, polymer, textile, recycled filaments, natural fibers.

[0079] Depending on the intended type of writing instrument 2 according to the invention, the resin substrate 25 is made from at least one composition of resin chosen among: acrylic, polymer, natural resin. In embodiments, the resin substrate 25 is a poly-acetate resin.

[0080] This feeding assembly 1 allows developing a wide range of tip diameters and shapes. This is thanks to the insertion and setting inside a winged plastic tube structure, which serves as an air/ink exchange chamber and therefore allows the regulation by capillarity of the water based ink output through e.g. an acrylic cylinder stem feeder from the ink cartridge at one end of the stem, down to the other stem end in contact with the paper.

[0081] The stem feeder 19 is treated beforehand to be able to function in accordance with the water based ink physical characteristics.

[0082] Now referring to figure 11, an embodiment of stem feeder 19 that incorporates integrally the writing tip end 4, has a cross section perpendicularly to the longitudinal direction X, arranged with a series of peripheral resin concentrates 26. Each peripheral resin concentrate 26 is filled with the resin substrate 25 and generally depraved from capillary fibers 24.

[0083] On the figure 11, the stem feeder 19 has height (8) peripheral resin concentrates 26, regularly spaced apart one from the others. On figures 11 and 12, the peripheral resin concentrates 26 have each a lemon slice shape.

[0084] In other embodiments, the regularly spaced apart peripheral resin concentrates 26 have a transverse section chosen among: round, triangle and rectangular. Depending on embodiments, the stem feeder 19 of the invention has a number of peripheral resin concentrates 26 chosen between: 1 to 15.

[0085] On figure 11, the embodiment of the stem feeder 19 includes a surrounding envelope 27 that comprises merged

capillary fibers 24 and resin substrate 25. At the outmost periphery of the surrounding envelope 27 is a surface protective layer 28 of concentrated resin. The surface protective layer 28 is cylindrical shaped and peripherally / longitudinally surround the stem feeder 19, except at its rear and front ends. In embodiments, the resin of the surface protective layer 28 is a wax.

[0086] This embodiment of the stem feeder 19 also includes a series of radial extensions 29 that comprises merged capillary fibers 24 and resin substrate 25. Each radial extension 29 separates two neighboring peripheral resin concentrates 26 and extends radially and longitudinally within the stem feeder 19.

[0087] This embodiment of the stem feeder 19 further includes an inner envelope 30 of concentrated resin. These envelopes and extensions delimiting hollow areas filled with resin.

[0088] The figure 12 shows in a planar transverse section another embodiment of the stem feeder 19, similar to the one of Figure 11, but having centrally in the inner envelope 30, another hollow area filled with resin substrate 25 and forming a hollow duct 31. The hollow duct 31 of resin extends longitudinally along the stem feeder 19 and has a transverse cross section that is generally circular and that is by the center of the stem feeder 19 and of the envelope 30.

[0089] Now referring to figures 2, 9 and 10 in particular, the specific structural and dimensional characteristics of the invention that allows a perfectly constant flux delivery of water based ink to the writing point 4 is explained. This offers the invention optimized writing / drawing / marking comfort, allied to minimum leaking and evaporating issues in the writing instrument 2 according to the invention.

[0090] The writing point 4 of the stem feeder 19 is polished to provide a smooth and easy sliding of the writing instrument 2 with the writing surface (illustrated as 32 on figure 9).

[0091] As told above, the stem feeder 19 is rigidly and definitively secured to the ring abutment 20 by crimping / forced setting. This setting is calculated to resist the consistent rearwards forces that are applied to the stem feeder 19 thus having this stem feeder 19 tightly maintained in a static position relative to the hollow core 21, the front barrel 5 and therefore the whole writing instrument 2.

[0092] The stem feeder 19 is inserted in a traversing canal 33. The traversing canal 33 shown on figure 10 comprises a front enlarged bucket 34 for longitudinal positioning of the ring abutment 20 and also for rigid holding of it within the hollow core 21. The traversing canal 33 extends from one longitudinal end to the opposed longitudinal end of the hollow core 21, making the later opened on both sides.*

[0093] The front enlarged bucket 34 is rearwardly continued by a narrow canal section 35 that extends inside the hollow core 21 to the rearmost sharp end 23 of the cylindrical rearwards projection 22.

[0094] The narrow canal section 35 extends and opens at the cylindrical rearwards projection 22, to offer an end-to-end guiding path to the water based ink from the cartridge 3 to the writing point 4, through the stem feeder 19 that is housed inside the traversing canal 33.

[0095] From embodiment of figures 2 and 10, longitudinally between the attaching means outer screw 15 and the cylindrical rearwards projection 22, the hollow core 21 has a major part of the ink flow regulator 36. This ink flow regulator 36 includes radial disk-shaped shoulders 37 that are integrally formed from the structure of the hollow core 21. Typically, the radial disk-shaped shoulders 37 come from molding / machining of the hollow core 21.

[0096] The radial disk-shaped shoulders 37 are longitudinally spaced apart one from the other by radial round-shaped gaps 38. Along the hollow core 21, are formed series of radial disk-shaped shoulders 37 alternating and longitudinally distanced by intermediate location of radial round-shaped gaps 38.

[0097] Another part of the ink flow regulator 36 is a cylindrical lengthwise bore 39 formed inside the front barrel 5. The cylindrical lengthwise bore 39 of the ink flow regulator 36 leaves a narrow air clearance 40 having an outer surface of a smooth cylindrical shape defined by the front barrel 5.

[0098] The narrow air clearance 40 has an inner surface defined by the crenel design defined together by the radial disk-shaped shoulders 37 longitudinally spaced apart by the radial round-shaped gaps 38 along the hollow core 21. The shapes, lengthwise dimension and radial thickness of the narrow air clearance 40 are calculated to ensure an optimized ink flow regulation for the feeding assembly 1 and the writing instrument 2 of the invention.

[0099] This optimized ink flow regulation is specific for each type of water based ink contained in the cartridge 3. E.g. the radial dimension of the narrow air clearance 40 is calculated as a function of fluidic parameters of the water based ink 14, such as its dynamic viscosity. Similarly, the longitudinal dimensions along the direction X and / or the dimensions radial dimensions along the directions Y / Z of the radial disk-shaped shoulders 37 alternating and longitudinally distanced by intermediate location of radial round-shaped gaps 38 are calculated as a function of fluidic parameters of the water based ink 14, such as its dynamic viscosity.

[0100] In embodiments of the invention, the hollow core 21 comprises at least one series of longitudinally spaced apart alternative radial disk-shaped shoulders 37 and radial round-shaped gaps 38.

[0101] In the embodiment of figure 10, the hollow core 21 comprises two series of longitudinally spaced apart alternative radial disk-shaped shoulders 37 and radial round-shaped gaps 38. The two series of longitudinally spaced apart alternative radial disk-shaped shoulders 37 and radial round-shaped gaps 38 are longitudinally spaced apart by an intermediate partition wall 41 integrated to the hollow core 20 between each series.

[0102] Each radial disk-shaped shoulder 37 has a longitudinal dimension i.e. thickness, comprised between 0.2 mm and 0.8 mm. Each radial round-shaped gaps 38 has a longitudinal dimension i.e. thickness, comprised between 0.3 mm and 0.9 mm. In this embodiment, all the radial disk-shaped shoulders 37 and all the radial round-shaped gaps 38 have respectively the same longitudinal dimension, while the longitudinal dimension of the radial disk-shaped shoulders 37 is smaller than the one of the radial round-shaped gaps 38.

[0103] Each radial disk-shaped shoulder 37 has a radial dimension i.e. extension size, comprised between 0.5 mm and 2 mm, from a central trunk 42 of the hollow core 21 to the narrow air clearance 40.

[0104] With the above arrangement, the air inlet that is necessary to an optimized ink flow regulation by the means of the ink flow regulator 36, is thus obtained by the concentric free space defined between the hollow core 21 and the inside surface of the front barrel 5, with an air feeding junction at a circular core-barrel transition 43 shown on figures 1-3 and 9-10.

[0105] Now the structural characteristics of the feeding assembly 1 and of the writing instrument 2 are defined, the inventive method of assembling the feeding assembly 1 with the felt tipped writing instrument 2 is described, referring to figure 4.

[0106] As explained before, the stem feeder 19 is crimped / set into the ring abutment 20. The group of the stem feeder 19 with the ring abutment 20 is then inserted into the traversing canal 33 of the hollow core 21. Then the group of the stem feeder 19, the ring 20 plus the hollow core 21 is attached to the front barrel 5, e.g. by screwing them together. Then, an ink cartridge 3 is inserted onto the cylindrical projection 22 of the core 21, thus feeding the water based ink through the stem feeder 19 to its front end that forms the writing point 4 of the writing instrument 2 obtained by assembling to the above group, the rear barrel 6 that covers the ink cartridge 3. Should this be needed, then or before attaching the rear barrel 6 to the hollow core 21 plus front barrel 5 group, the closing cap 7 is mounted on the front barrel 5 so as to protect the writing point 4 integral to the stem feeder 19.

[0107] This is illustrated on figure 4 by the steps of the method according to the invention, with a stem feeder 19 plus ring tube abutment 20 longitudinally inserting step S1, a subsequent step S2 of mounting the feeding assembly 19-20 into the hollow core 21, a subsequent step S3 of attaching the core plus stem-abutment longitudinally into the front barrel 5, a subsequent step S4 of receiving via a longitudinally insertion an ink cartridge 3. The writing point covering step S5 is also shown.

[0108] The following table T1 is listing the references signs in the drawings.

Table T1.

REF.	DESIGNATION	
X	Longitudinal direction	Length dimension of instrument
Y	Transverse direction	A radial dimension of instrument
Z	Elevation direction	Another radial dimension
A	Method of Assembling	See figure 4
S1	Longitudinal inserting step	
S2	Stem-core mounting step	
S3	Attaching front barrel step	
S4	Cartridge receiving step	
S5	Covering step	
1	Feeding assembly	Part of writing instrument
2	Writing instrument	Felt typed tipped
3	ink cartridge	e.g. "international standard"
4	writing point	Feeding assembly
5	front barrel	Writing instrument
6	rear barrel	Writing instrument
7	closing cap	Writing instrument
8	tip end	Cartridge

(continued)

REF.	DESIGNATION	
9	Bottom end	Cartridge
10	radial Barrier	Cartridge
11	Peripheral wall	Cartridge
12	Neck extension	Cartridge
13	shutting operculum	Cartridge
14	water based ink	in cartridge
15	outer screw	of attaching means (15, 16)
16	inner screw	of attaching means (15, 16)
17	outer fastenings	of attaching means (17, 18)
18	inner fastenings	of attaching means (17, 18)
19	stem feeder	Feeding assembly
20	ring abutment	Feeding assembly
21	hollow core	Feeding assembly
22	cylindrical rearwards projection	Feeding assembly
23	rearmost sharp end	Feeding assembly
24	capillary fibers	Feeding assembly
25	resin substrate	Feeding assembly
26	peripheral resin concentrates	Feeding assembly
27	surrounding envelope	Feeding assembly
28	surface protective layer	Feeding assembly
29	radial extensions	Feeding assembly
30	inner envelope	Feeding assembly
31	hollow duct	Feeding assembly
32	writing surface	e.g. paper.
33	traversing canal	Feeding assembly
34	front enlarged bucket	Feeding assembly
35	narrow canal section	Feeding assembly
36	ink flow regulator	Writing instrument
37	radial disk-shaped shoulders	Feeding assembly
38	radial round-shaped gaps	Feeding assembly
39	cylindrical lengthwise bore	Writing instrument
40	narrow air clearance	Writing instrument
41	intermediate partition wall	Feeding assembly
42	central trunk	Feeding assembly
43	circular core-barrel transition	Writing instrument

[0109] The invention may be subjected to variations as to its implementation, e.g. by combining various features of distinct embodiments described herein, said variations not being possibly identified exhaustively.

[0110] The invention offers e.g. a writing system (writing block) able to equip any type of writing instrument, either

metal, plastic, wood, stone or glass, composed of an acrylic tip working in conjunction with a short ink cartridge of international standard.

[0111] This system allows developing a wide range of tip diameters and shapes. The invention provides insertion and setting inside a winged plastic tube that serves as an air/ink exchange chamber and therefore allows the regulation by capillarity of the water ink output through the stem feeder 19 from the ink cartridge 3 at one end of the stem, down to another longitudinally opposed stem end in contact with the writing surface 32, e.g. paper, cardboard or the like.

[0112] The stem feeder 19 is treated beforehand to be able to function in accordance with the water ink physical characteristics. One of these physical characteristics or fluid parameter, is the dynamic viscosity that is fairly lower than 1000 mPa x s at 23°C +/- 2°C, e.g. about 500-800 mPa x s.

[0113] Among numerous advantages and useful applications of the invention, comes the possibility to buy a writing instrument first and then to be free of choosing which color of water-based ink it will be fed with. For scholar people this also allows to feed the inventive writing instrument with erasable ink, scriptural markings being thus erasable with the same standard eraser pen than the one used for a fountain pen.

Claims

1. Feeding assembly (1) for a writing instrument (2) of the felt tipped type, comprising at least:

- a writing point (4), a feeder and a hollow core (21) having a connection for connecting the writing point (4) to an ink container;
- the hollow core (21) having outer attaching means for securing the feeding assembly (1) to a front barrel (5) of the writing instrument (2); and
- an ink flow regulator (36), longitudinally between the attaching means and the connection to the ink container;

characterized in that the writing point (4) is integrated to a stem feeder (19) and forms a frontwards stem end thereof, the ink container being a water based ink cartridge (3) of standard size and a rear end of the hollow core (21) having a cylindrical rearwards projection (22) forming the connection to the ink container (3) with the stem feeder (19) extending axially inside the cylindrical rearwards projection (22) to have a water based ink (14) to flow from the ink cartridge (3) to the writing point (4) frontward extending out of the hollow core (21), through the stem feeder (19).

2. Feeding assembly (1) of claim 1,
characterized in that the frontwards stem end of the stem feeder (19) forming the writing point (4) is beveled and slanted with a wide straight contact line; the writing point (4) being a straight line extending on 1 mm to 9 mm millimeters and forming an angle of a less than 10-20 degrees, relatively to at least one of radial directions (Y, Z) of the feeding assembly (1).

3. Feeding assembly (1) of claim 2,
characterized in that the stem feeder (19) forming the writing point (4) has a uniform transverse diameter perpendicularly to a longitudinal direction (X); the uniform transverse diameter being generally equal to the inner diameter of a traversing canal (33) of the hollow core (21).

4. Feeding assembly (1) of claim 1,
characterized in that the front end of the stem feeder (19) forming the writing point (4) is spherical shaped with a wide rounded contact area; the stem feeder (19) having a ring abutment (20) fixedly attached to and around the stem feeder (19) and longitudinally backwards the writing point (4) along a longitudinal direction (X), the ring abutment (20) being rigidly secured to an outer diameter of the stem feeder (19) at 2-6 mm from a front-most end of the writing point (4).

5. Feeding assembly (1) of claim 1,
characterized in that the front end of the stem feeder (19) forming the writing point (4) is arrow shaped with a thin dot contact area; the stem feeder (19) having a ring abutment (20) fixedly attached to and around the stem feeder (19) longitudinally backwards the writing point (4) along a longitudinal direction (X) and rigidly secured to an outer diameter of the stem feeder (19) at 2-8 mm from a front-most end of the writing point (4).

6. Feeding assembly (1) of claim 1,
characterized in that the front end of the stem feeder (19) forming the writing point (4) is tubular shaped with a

medium disk contact area; the stem feeder (19) being fixedly attached to a ring abutment (20) with an extension distance that goes frontwards ahead of a front-most surface of the ring abutment (20).

7. Feeding assembly (1) of claim 1,
characterized in that the feeding assembly (1) is adaptable to various types of writing instruments (2); the front barrel (5) and / or rear barrel (6) being chosen among at least one of: metal, plastic, wood, stone, glass; in conjunction with an ink cartridge of international standard.

8. Feeding assembly (1) of claim 1,
characterized in that the front end of the stem feeder (19) forming the writing point (4) has a maximal transverse dimension at its front-most end that is chosen among: 0.1 mm to 2.0 mm.

9. Feeding assembly (1) of claim 1,
characterized in that the stem feeder (19) is made from capillary fibers (24) grouped and unified by a resin substrate (25); the capillary fibers (24) of the stem feeder (19) being porous, pressed fibers or filaments; the size and shape of the writing point (4) being formed and smoothened from the stem feeder (19), by at least one operation of: machining, grinding, polishing, molding, press-forming.

10. Feeding assembly (1) of claim 9,
characterized in that the capillary fibers (24) are made from at least one composition of fibers chosen among: felt, acrylic, polymer, textile, recycled filaments, natural fibers.

11. Feeding assembly (1) of claim 9,
characterized in that the resin substrate (25) is made from at least one composition of resin chosen among: acrylic, polymer, poly-acetate, natural resin and wax.

12. Feeding assembly (1) of claim 1,
characterized in that the stem feeder (19) including the writing point (4) has a cross section perpendicularly to a longitudinal direction (X) arranged with a series of peripheral resin concentrates (26) each filled with a resin substrate (25); the regularly spaced apart peripheral resin concentrates (26) having a transverse section chosen among: round, triangle and rectangular; the stem feeder (19) having a number of peripheral resin concentrates (26) chosen between: 1 to 15.

13. Feeding assembly (1) of claim 1,
characterized in that the stem feeder (19) including the writing point (4) has a surrounding envelope (27) that comprises merged capillary fibers (24) and a resin substrate (25); at the outmost periphery of the surrounding envelope (27) a surface protective layer (28) being cylindrical shaped and peripherally / longitudinally to surround the stem feeder (19), except at its rear and front ends.

14. Writing instrument (2) of the felt tipped type, **characterized in that** the writing instrument (2) includes a feeding assembly (1) comprising at least: a writing point (4), a stem feeder (19) and a hollow core (21) for connecting the feeding assembly (1) to an ink container; an ink flow regulator (36) including a cylindrical lengthwise bore (39) formed inside a front barrel (5) of the writing instrument (2) to leave a narrow air clearance (40) from an inner surface defined by a crenel design defined together by radial disk-shaped shoulders (37) longitudinally spaced apart on the hollow core (21) and by radial round-shaped gaps (38) along the hollow core (21); and the writing point (4) being integrated to the stem feeder (19) to form the frontwards end thereof; the ink container being a water based ink cartridge (3) and the rear end of the hollow core (21) connecting the feeding assembly (1) to the ink cartridge (3).

15. Method (A) of assembling a writing instrument (1) with a feeding assembly (1) according to one of claims 1-13,
characterized in that the method (A) comprises: a stem feeder (19) plus ring tube abutment (20) longitudinally inserting step (S1); a subsequent step (S2) of mounting the feeding assembly (19-20) into the hollow core (21), a subsequent step (S3) of attaching the core plus stem-abutment longitudinally into the front barrel (5,) a subsequent step (S4) of receiving via a longitudinally insertion an ink cartridge (3) and optionally a writing point covering step (S5).

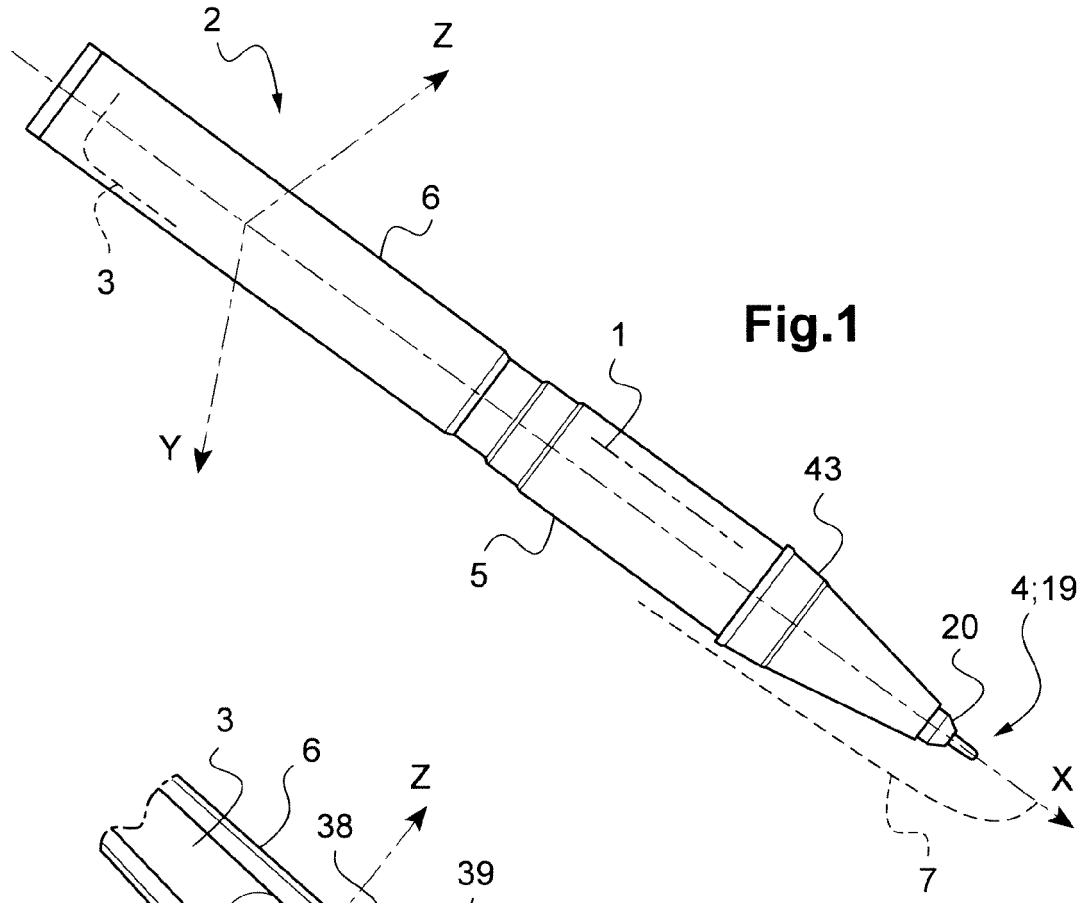


Fig.1

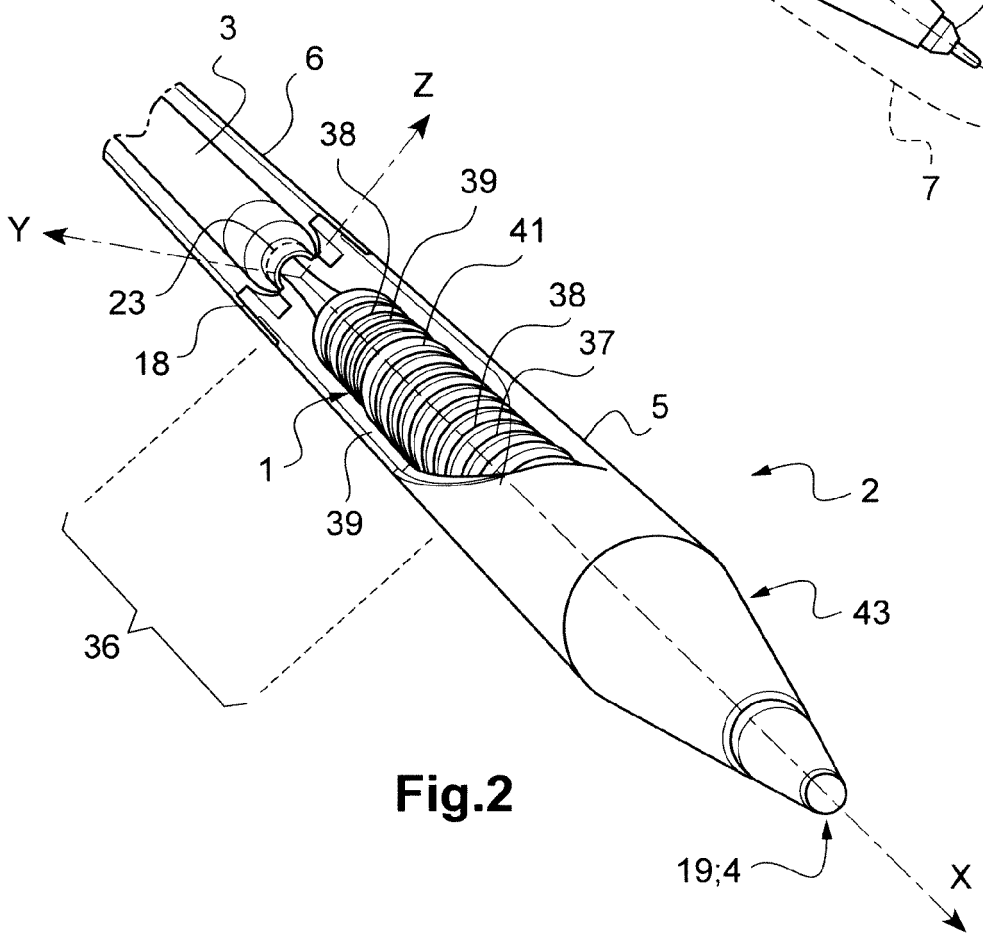
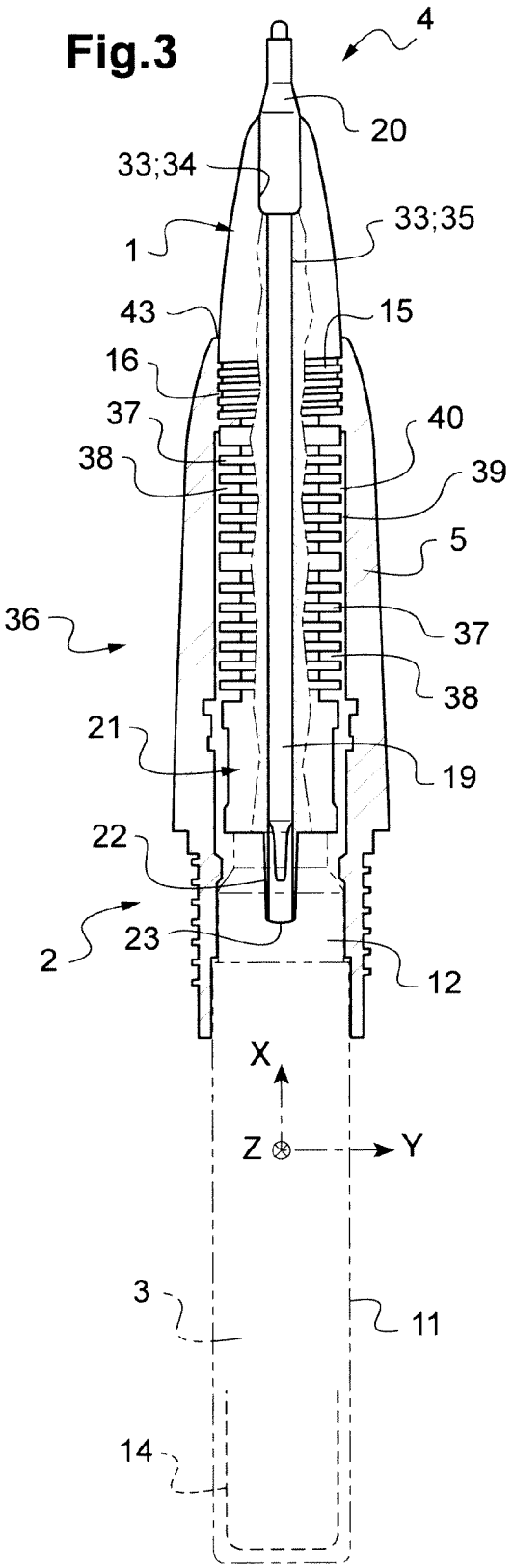


Fig.2

Fig.3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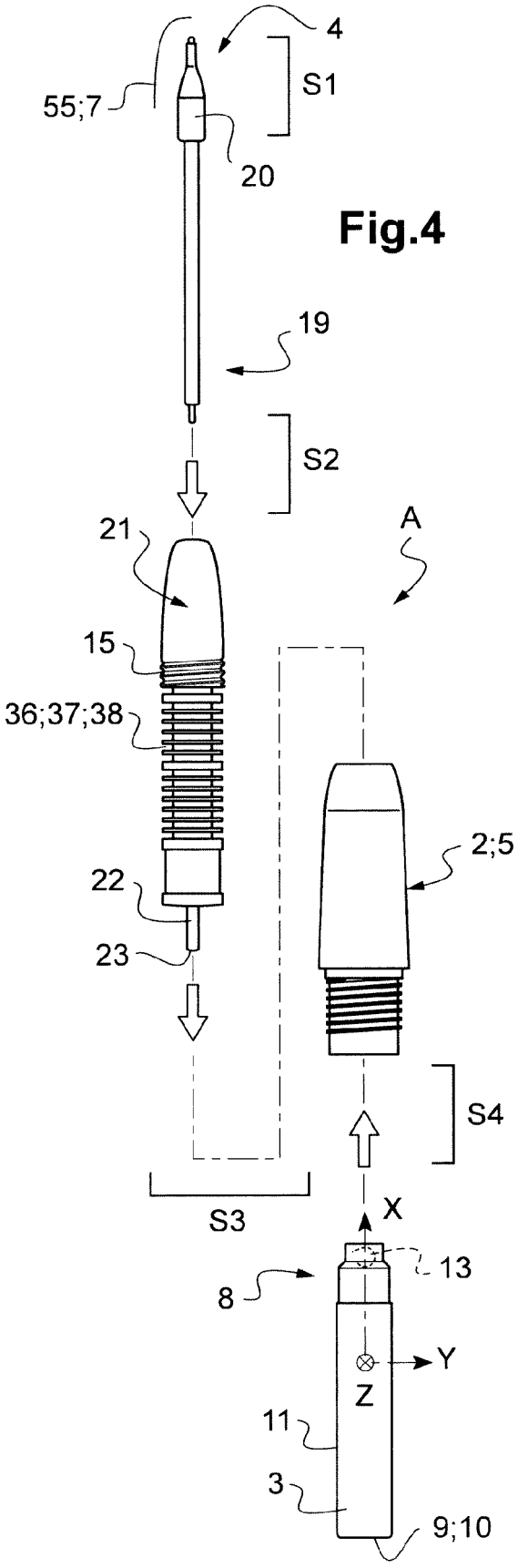
12
X
Z
Y
3
11
14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9;10

Fig.4

Fig.5

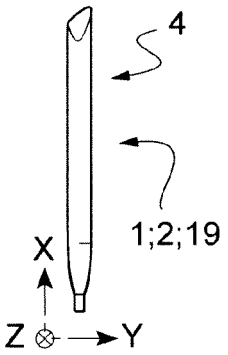


Fig.6

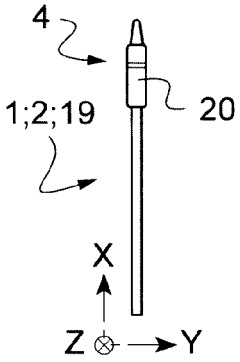


Fig.7

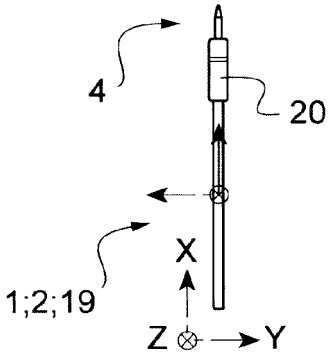


Fig.8

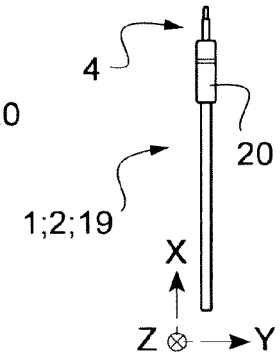


Fig.9

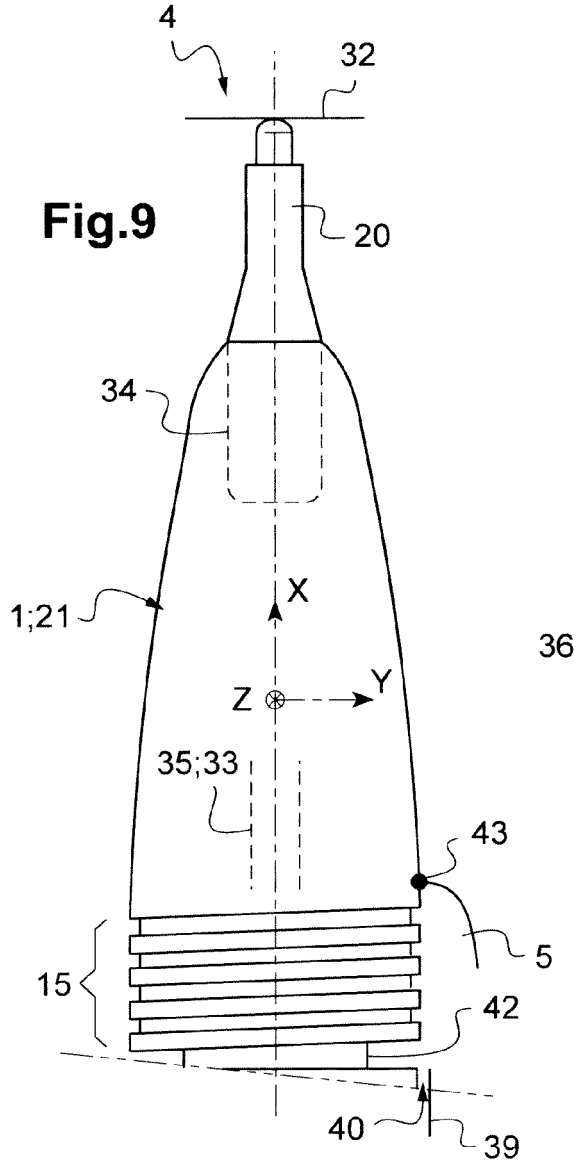


Fig.10

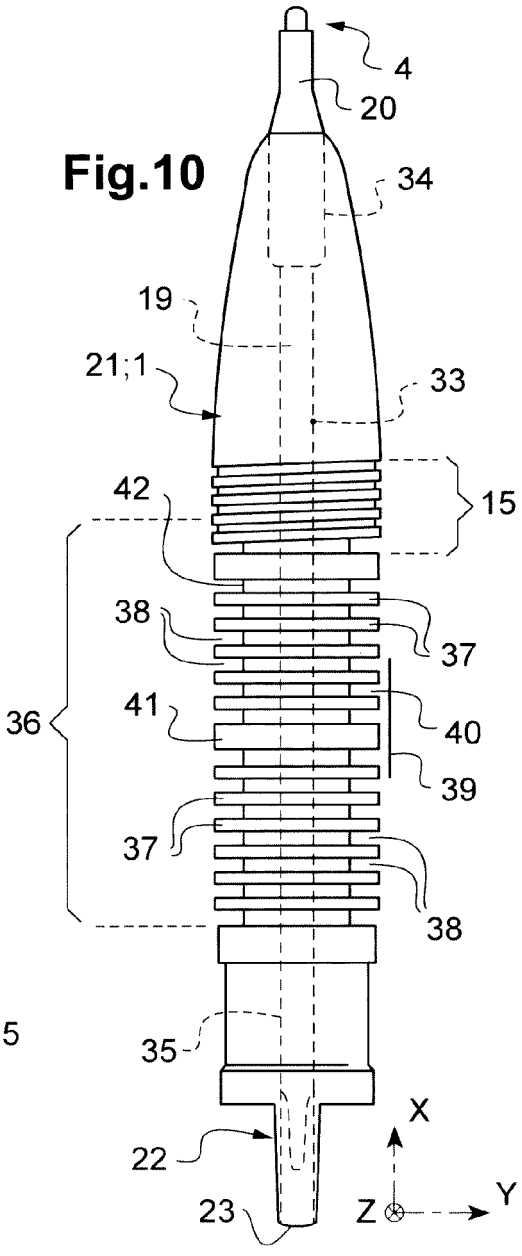


Fig.11

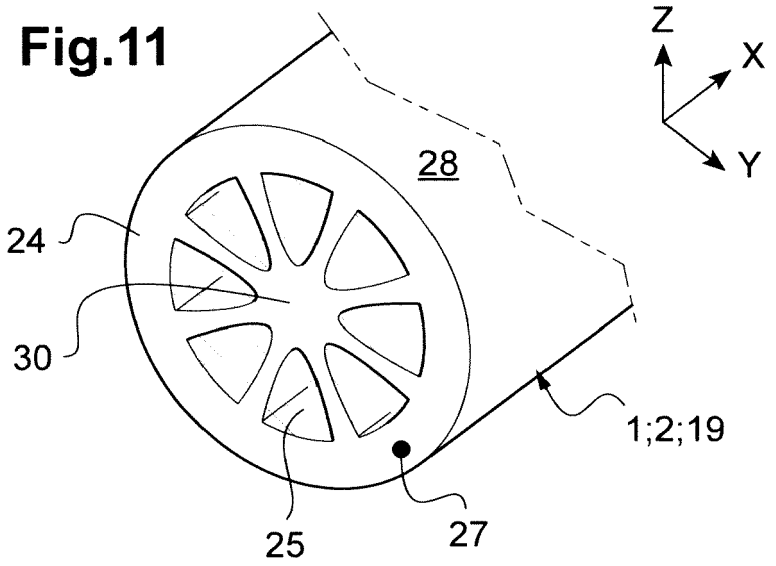
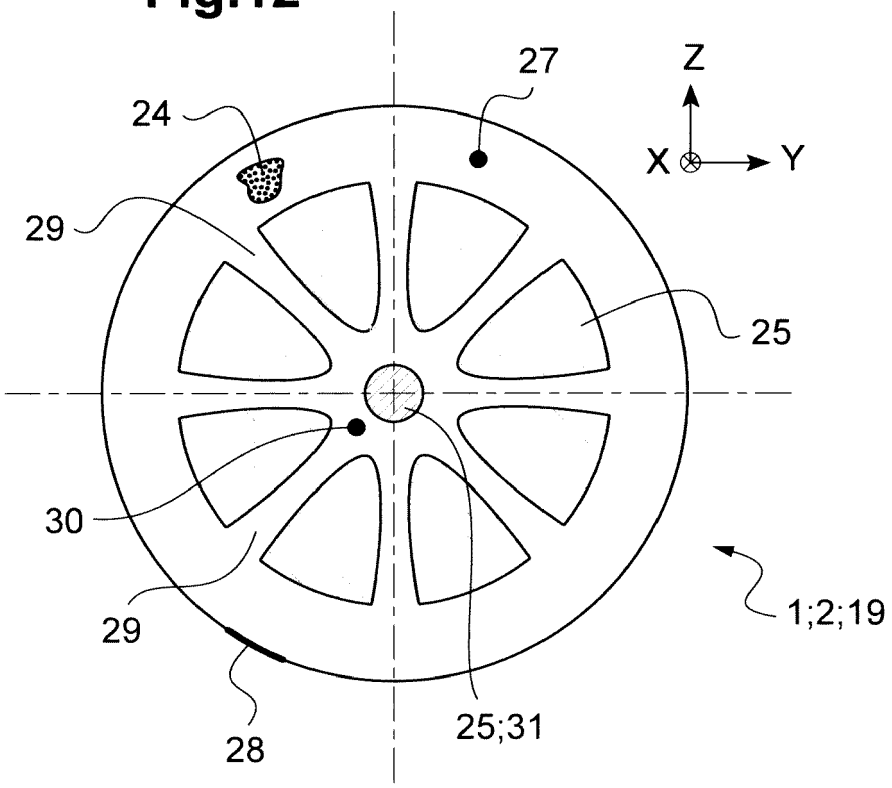


Fig.12



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EUROPEAN SEARCH REPORT

Application Number
EP 14 00 4191

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X,D	FR 2 462 274 A1 (LYON RICHARD [FR]) 13 February 1981 (1981-02-13) * page 1, line 31 - page 4, line 12; figure 1 *	1-15	INV. B43K8/02 B43K8/03 B43K8/12 B43K8/14
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B43K

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	16 March 2015	Kelliher, Cormac

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