(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 570 460 A1**

(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
18.06.2025 Bulletin 2025/25

(21) Application number: **23216369.1**

(22) Date of filing: **13.12.2023**

(51) International Patent Classification (IPC):
B26B 21/52 *(2006.01)*

(52) Cooperative Patent Classification (CPC):
B26B 21/52; B26B 21/521

(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:
KH MA MD TN

(71) Applicant: **BIC Violex Single Member S.A.**
14569 Anoixi (GR)

(72) Inventors:
- **KOPELAS, Panagiotis**
  14569 Anoixi (GR)
- **EFTHIMIADIS, Dimitrios**
  14569 Anoixi (GR)

(74) Representative: **BIC**
58, Aghiou Athanasiou
Anoixi 14569 (GR)

(54) RAZOR CONNECTOR

(57) A connector (10,10',10") for engaging a blade assembly (20) to a razor handle (30,30',30") comprising a connector body (100, 100', 100") extending between a handle engaging portion (300, 300', 300") and a blade assembly engaging portion (200) along a longitudinal axis (A, A', A") wherein the handle engaging portion (300, 300', 300") comprises a retracting shaft (310, 310', 310"), an actuator (320, 320',320") and a locking element (330,330',330") coupled to the retracting shaft (310,310',310") wherein the actuator (320,320',320") is configured to move the retracting shaft (310,310',310") such that the locking element (330,330',330"), expands in an angled direction (b) with respect to the longitudinal axis (A, A',A").

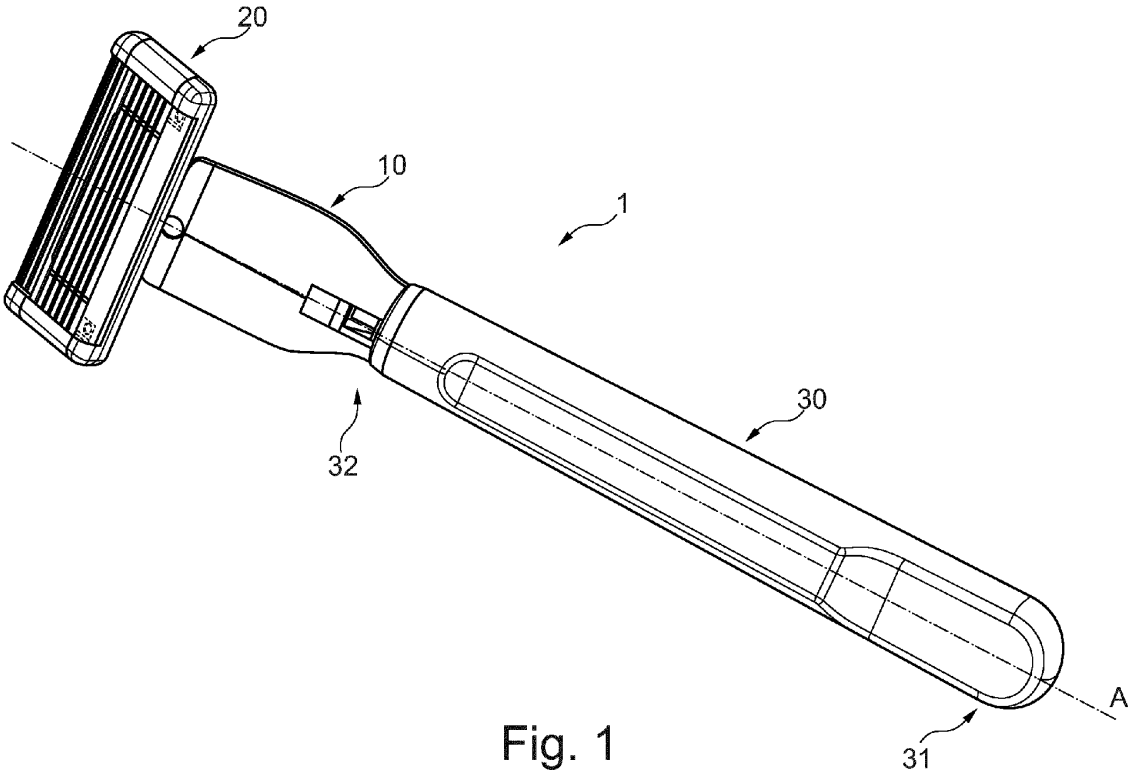

Fig. 1

EP 4 570 460 A1

Description

Technical Field

[0001] The present disclosure relates to a connector for engaging a blade assembly to a razor handle, and a razor handle comprising the connector.

Background

[0002] Razors (also known as safety razors) have a blade assembly that is permanently or removably attached to a razor handle which, in use, is oriented in shaving direction. Blade assemblies typically comprise one or more cutting members, each supporting a cutting element (blade), mounted perpendicular to the shaving direction. Blade assemblies are also typically provided with a guard (at a leading longitudinal side of the blade assembly in the shaving direction) and a cap (at a trailing longitudinal side of the blade assembly in the shaving direction). In use, a user holds the razor handle in the shaving direction and brings the blade assembly into contact with a portion of skin defining a shaving plane.

[0003] In the field of razors, there are various razor models available on the market wherein the razor handles and/or blade assemblies differ in shape, features, aesthetics, color and/or material. On the one hand, there are razors having a blade assembly permanently attached to the razor handle, which may be disposed of when the razor blades are worn out. On the other hand, there are razors wherein the blade assembly is removably attached to the razor handle such that, when the razor blades are worn out, the blade assembly can be decoupled, disposed of, and replaced by a new blade assembly. The state of the art discloses various connection mechanisms for such razors, including snap-fit, threaded or magnetic connections. When a blade assembly is removably attached to a razor handle of a specific razor model, it may not be connectable to a razor handle of a different razor model. However, it would be desirable to be able to connect a blade assembly with different razor handles.

[0004] Additionally, there is a growing demand for razors that can accommodate various handle designs and materials, providing consumers with greater customization options and improved ergonomics. Thus, every user will be able to gain an improved shaving experience by using a razor that fits well in his/her hand and provides safe handling during the shaving process. However, existing razor designs often lack the flexibility required to accommodate different handle designs.

[0005] The object of the present disclosure is to address these challenges by providing a connector that allows for easy replacement of the blade assembly when the blades become dull, while also providing the flexibility to accommodate various handle designs.

Summary

[0006] The present disclosure relates to a connector for connecting a blade assembly to a razor handle as defined in claim 1, a razor handle as defined in claim 13 and a razor system as defined in claim 15. The dependent claims depict exemplary embodiments of the present disclosure.

[0007] According to a first aspect of the present disclosure, a connector for engaging a blade assembly to a razor handle comprises a connector body extending between a handle engaging portion and a blade assembly engaging portion along a longitudinal axis, the handle engaging portion comprising a retracting shaft, and a locking element coupled to the retracting shaft, wherein the actuator is configured to move the retracting shaft such that the locking element expands in an angled direction b with respect to the longitudinal axis A. Since the connector comprises a handle engaging portion with an actuator, a retracting shaft and a locking element (expanding and/or contracting mechanism), a blade assembly can be assembled to razor handles of any suitable shape, features, aesthetics, color and/or material in a secure and robust way. The connector may lead to less engineering complexity. Furthermore, tight tolerances and dimensional limitations of different razor handle materials may play no part since the expanding and/or contracting mechanism is utilized for the expansion and/or contraction of the handle engaging portion.

[0008] The expanding and/or contracting mechanism can be configured to couple the connector to the razor handle by a non-positively locking connection, more specifically by a friction-locking connection.

[0009] The connector is designed to securely connect a handle and a blade assembly together, while also allowing for quick and easy detachment of the blade assembly for replacement purposes.

[0010] Furthermore, the connector is designed to be compatible with a variety of handle designs made of different materials, allowing users to select a handle that meets their individual preferences. This provides users with greater convenience, flexibility, and customization options.

[0011] In embodiments, the connector comprises an actuator configured to move the retracting shaft so that the retracting shaft expands at least one locking element, wherein the actuator is a lever that is configured to move from a rest position to a locked position, such that when the lever is in the locked position, the locking element is expanded.

[0012] In embodiments, the lever is rotatable along a rotation axis which is perpendicular to the longitudinal axis, when the lever moves from a rest position to a locked position or vice versa.

[0013] In embodiments, the actuator is a rotating ring configured to move from a rest position to a locked position, wherein when the rotating ring is in the locked position the locking element is expanded.

[0014] In embodiments, the actuator is a pushing or rotating element configured to engage with an inclined surface of the retracting shaft and move the retracting shaft from the rest position to the locked position.

[0015] In embodiments, the pushing or rotating element is rotatable along a rotation axis which is parallel to the longitudinal axis, when the pushing or rotating element moves from a rest position to a locked position or vice versa.

[0016] In embodiments, the locking element comprises an elastomeric portion.

[0017] In embodiments, the locking element is located on the retracting shaft.

[0018] In embodiments, the retracting shaft comprises a recess and wherein the locking element is a ring that is located on that recess.

[0019] In embodiments, the actuator comprises at least one arm having a connection surface, wherein the connection surface has a cylindrical shape configured to mate with a cylindrical rotation pin of the retracting shaft, allowing the actuator to rotate over the rotation pin along a rotation axis.

[0020] In embodiments, the connector comprises more than one locking element, for example two locking elements, one locking element located adjacent to the end of the retracting shaft and the other locking element located adjacent to the actuator.

[0021] In embodiments, a sleeve may be arranged between the locking element and the actuator.

[0022] In embodiments, the connector comprises a shaft carrier coupled to the retracting shaft, wherein the actuator during use, causes the shaft carrier to move the locking element along the longitudinal axis, thereby expanding the locking element in an angled direction b with respect to the longitudinal axis.

[0023] In embodiments, the actuator comprises an engagement surface, so that when the actuator moves towards the locked position the actuator engagement surface engages with an engagement surface of the shaft carrier and thereby securing the actuator to the locked position.

[0024] In embodiments, the connector further comprises a release button for disengaging a blade assembly from the blade assembly engaging portion.

[0025] According to a second aspect of the present disclosure, a razor handle may extend between a distal end and a proximal end, wherein the proximal end comprises a cavity for receiving the handle engaging portion of the connector.

[0026] In embodiments, the cavity of the razor handle has a cylindrical shape.

[0027] According to a third aspect of the present disclosure, a razor system may comprise the blade assembly, the connector and the razor handle wherein the connector is configured to releasably connect the blade assembly and the razor handle.

[0028] Additional objects, details and features of embodiments are described in reference to the drawings as follows.

Brief Description of the Drawings

[0029] Other characteristics will be apparent from the accompanying drawings, which form a part of this disclosure. The drawings are intended to further explain the present disclosure and to enable a person skilled in the art to practice it. However, the drawings are intended as non-limiting examples. Common reference numerals on different figures indicate like or similar features.

Fig. 1 is a perspective view of a razor system.

Fig.2 is a partial exploded view of the razor handle and the connector according to the first embodiment.

Figs. 3A and 3B are side section views according to the first embodiment, in an unlocked and locked position.

Fig. 4A is another partial exploded view of the razor handle and the connector.

Fig. 4B is a section view of the connector engaged into the handle.

Fig.5 is a perspective view of the handle and the connector according to a second embodiment.

Fig. 6 is a partial exploded view of the handle and the connector according to a second embodiment.

Fig. 7 is a side section view of the handle and the connector according to a second embodiment.

Fig. 8 is a perspective view of the handle and the connector according to a third embodiment.

Fig. 9 is a partial exploded view of the handle and the connector according to a third embodiment.

Fig. 10 is a side section view of the handle and the connector according to a third embodiment.

Fig. 11 is an exploded view of the blade assembly engaging portion of the connector.

Detailed Description

[0030] Embodiments of the connector, the razor handle and the razor system according to the present disclosure will be described in reference to the drawings as follows:

Fig. 1 shows a schematic view of a razor system 1 and a connector 10 for connecting a blade assembly 20 to a razor handle 30 according to the present disclosure. The razor system 1 comprises a razor handle 30, a blade assembly 20 and a connector 10. The connector 10 can be coupled to the razor handle 30 and/or to the blade assembly 20. In embodiments, the blade assembly 20 can be releasably attached to the connector 10 via a pivotable or non-pivotable coupling. In other embodiments, the blade assembly 20 is fixedly attached to the connector 10 via a pivotable or non-pivotable coupling. As shown, e.g. in Fig. 1, the connector 10 can be releasably coupled to the razor handle 30 and/or to the blade assembly 20.

[0031] Referring to Figs. 2 to 4B, the connector 10

comprises a connector body 100, a blade assembly engaging portion 200 extending from the connector body 100 and a handle engaging portion 300 extending from the connector body 100 on the opposite direction with respect to the handle engaging portion 300. The blade assembly engaging portion 200 is configured to be coupled to the blade assembly 20. The handle engaging portion 300 is configured to be coupled to the razor handle 30. The handle engaging portion 200 comprises a retracting shaft 310. The handle engaging portion 200 further comprises an actuator 320 configured to move the retracting shaft 310 so that the retracting shaft 310 expands at least one locking element 330, adapted to expand towards an angled direction (b) with respect to the longitudinal axis A. The locking element 330 is arranged on the retracting shaft 310. In examples, the locking element 330 is arranged between the actuator 320 and the stop element 316. In examples the locking element 330 may be arranged between the shaft carrier 340 and the stop element 316. The retracting shaft 310 may comprise a stop element 316 which prevents the locking element 330 to be decoupled by the retracting shaft 310. The stop element 316 may be in the form of a protrusion extending perpendicularly from the longitudinal Axis A. The actuator 320 may be rotatably connected to the retracting shaft 310. In examples, the actuator 320 may further comprise at least one arm 322 (shown in Fig. 4A) which comprises a connection surface 323. The connection surface 323 may have a cylindrical shape configured to mate with a cylindrical rotation pin 315 of the retracting shaft, allowing the actuator 320 to rotate over the rotation pin 315 along the rotation axis x. The axis x may be substantially perpendicular to the longitudinal axis A.

[0032] The connector 10 may further comprise a shaft carrier 340 arranged between the actuator 320 and the locking element 330 (as shown for example in fig. 2). The shaft carrier 340 may comprise an engagement surface 342. Respectively, the actuator 320 may comprise an actuator engagement surface 327. The actuator engagement surface 327 may be substantially curved. A curved surface provides an easier and smoother actuation of the actuator compared for example to a plurality of angled surfaces. When the actuator 320 moves towards the locked position, the actuator engagement surface 327 engages the engagement surface 342 of the shaft carrier 340 and secures the actuator 320 to the locked position. A locked position is considered to be the position of the actuator 320 where the locking element 330 is expanded thus the connector 10 is secured inside the handle's cavity 33. A rest position is considered to be the position of the actuator 320 where the locking element 330 is not expanded, thus the connector can be inserted or removed from the cavity 33 of the handle 30. The engagement surface 342 of the shaft carrier 340 may be substantially flat. This provides more safety and prevents any accidental disengagement between the handle 30 and the connector 10 during use. Additionally, the shaft carrier 340 transfers to the locking element 330 the force to expand provided by the actuator 320. When the user triggers the actuator 320, the actuator moves the retracting shaft 310 along the longitudinal direction A, more specifically towards the proximal end 32 of the handle. The shaft carrier 340, compresses the locking element 330 so that the locking element 330 expands in an angled direction b with respect to the longitudinal axis A. The angled direction (b) may have an angle (f) of 0 to 90 degrees measured with respect to the longitudinal direction A. For example, the angle (f) may be 90 degrees. The expansion may comprise a deformation of the locking element 330. Thus, the locking element 330 may comprise an elastomeric portion or may be made of any material that provides elasticity such that it can be deformed when the actuator is in the locked position and be able to return back to its original state when the actuator returns to the rest position. In between the locking element 330 and the actuator 320, a sleeve 350 may be arranged. In examples, a sleeve 350 is arranged between the locking element 330 and the shaft carrier 340. The sleeve 350 may be a rigid, meaning a non-deformable element (made of a non-deformable material that resists deformation under forces that are created during coupling and de-coupling of the components) which extends along the longitudinal direction A. The sleeve may have the shape of a tube. The sleeve 350 may be free to move along the longitudinal direction A within the bounders of the retracting shaft.

[0033] Since the connector 10 comprises the blade assembly engaging portion 200, a blade assembly 20 can be assembled to razor handles 30 of any suitable shape, features, aesthetics, color and/or material in a secure and robust way. Connector 10 leads to less engineering complexity. Furthermore, tight tolerances and dimensional limitations of different razor handle materials play no part since the locking element 330 can be utilized for a safe connection of the handle engaging portion 300. In other words, the locking element 330 that is configured to expand, can compensate for tolerances between razor handle 30 and connector 10, more specifically between razor handle 30 and handle engaging portion 300. However, apart from the respective geometries, the following factors can have an influence on the tolerance requirements: material (including individual material characteristics of the assembled razor handle), precision, quality and environmental conditions of manufacturing, age and/or transportation of parts before assembly.

[0034] In embodiments, the connector body 100 can be cylindrical or can have an oval, spherical, rectangular or polygonal shape (or cross-section). In embodiments, the connector body 100 can have an asymmetric shape (or cross-section). The handle engaging portion 300 can be integrally formed with the connector body 100 or can be connected to the connector body 100 by positively locking, non-positively locking and/or adhesive bond. The handle engaging portion 300 can be connected to a first connector body end face 102.

[0035] As shown in Fig. 2, a longitudinal axis A extends in the longitudinal direction of the connector 10 and through the geometric center of the connector 10. Furthermore, the connector 10 comprises a radial direction r, which is perpendicular to the longitudinal direction A. Furthermore, the connector 10 comprises a retracting shaft 310 connected to an actuator 320 configured to move the retracting shaft 310 so that the retracting shaft 310 expands at least one locking element 330, adapted to expand towards an angled direction b with respect to the longitudinal axis A, which is configured to couple the razor handle 30.

[0036] In embodiments, the blade assembly engaging portion 200 can be integrally connected to the body portion 100. Alternatively, the blade assembly engaging portion 200 can be formed as a separate component and can be connected to the connector body 100 by a positively locking and/or non-positively locking connection.

[0037] Figs. 1 to 4B are schematic views of the connector 10 according to a first embodiment. The handle engaging portion 300 comprises a length 1, a diameter d and an outer circumferential surface 390. More specifically, the handle engaging portion 300 is cylindrical. However, in embodiments, the handle engaging portion 300 may have a square-like or rectangular shape (or cross-section). In this case, the handle engaging portion 300 may have a cross-section having a width and a thickness instead of diameter d. The length 1 may be between 10 mm to 70 mm, more specifically between 15 mm to 60 mm, in particular between 20 mm to 50 mm. The diameter d may be between 0.5 mm to 20 mm, more specifically between 3 mm to 15 mm, in particular between 5 mm to 12 mm.

[0038] According to the first embodiment, the actuator 320 is a lever configured to rotate over a rotation axis x. The actuator 320 is rotatably connected to the retracting shaft 310. This means that the actuator 320 can move the retracting shaft between a rest and a locked position or vice versa. While moving to the locked position, the retracting shaft causes a locking element 330 to expand towards an angled direction b with respect to the longitudinal axis A. When the locking element 330 is expanded the connector 10 is safely secured to the razor handle 30. The actuator 320 may comprise a user engaging portion 320a configured to receive the user's hand so as trigger the actuator. The actuator 320 may further comprise at least one arm 322 (shown in Fig. 4A) which comprises a connection surface 323. In examples, the actuator comprises two arms 322. The connection surface 323 may have a cylindrical shape configured to mate with a cylindrical rotation pin 315 of the retracting shaft, allowing the lever to rotate over the rotation pin 315 along the axis x.

[0039] The retracting shaft 310 may comprise a recess 311 that extends from the outer circumferential surface 390 of the retracting shaft in the radial direction r. The recess 311 comprises a longitudinal shape extending substantially in the direction of the longitudinal axis x. The locking element 330 may be made of elastic material. When in contact with another component or surface, the locking element may provide increased friction force between the respective components. The locking element 330 may comprise a polymeric material having a shore hardness of 10 A to 60 A, in particular of 20 A to 50 A. The polymeric material may be an elastomer, a thermoplastic elastomer (TPE), rubber (synthetic or natural) or silicone. In embodiments, the polymeric material may be combined with additives. Amongst others, the additives may include one or more of plasticizers, oily compounds that improve rheological properties, fillers that improve mechanical properties and reduce costs, stabilizers that prevent certain chemical reactions, antistatic agents and/or colorants. The locking element 330 may be a material that can be expanded and/or contracted and is capable of regaining its original shape when the expanding and/or contraction force is no longer applied. In embodiments, the connector 10 can be manufactured by die-casting and/or moulding, and/or the locking element 330 can be manufactured by casting and/or injection moulding. In embodiments, the locking element 330 can be manufactured by extrusion, blow moulding, injection moulding, compacting / compaction, punching, plate pressing, rolling, calendering and/or die casting.

[0040] Referring to Figs. 3A and 3B, the locking element 330 may be arranged in the recess 311 of the retracting shaft 310. The recess has a width, a length and a depth. The recess 311 is adapted to receive the locking element 330. In other words, the recess 311 may have a complementary shape with respect to the shape of the locking element 330. In embodiments the recess 311 can be in the form of a circumferential groove on the outer circumferential surface 390 of the retracting shaft 310. In this case, the locking element 330 may have a tubular shape and the recess 311 may have a complementary shape to receive the locking element 330. In examples, the locking element can be provided as a sleeve that is disposed about the retracting shaft 310. The locking element 330 is configured to expand and/or contract in the radial direction r as will be described in more detail below. The recess 311 may comprise a complementary shape with respect to the shape of the locking element 330. In examples, a sleeve 350 may be provided, as shown in figs. 3A and 3B, located between the locking element 330 and the actuator 320. More specifically the sleeve 350 may be located between the shaft carrier 340 and the locking element 330. The sleeve may partially cover the retracting shaft 310. The sleeve 350 may be made from a rigid, meaning a non-deformable material that resists deformation under forces that are created during coupling and de-coupling of the components (i.e. ABS material) and can be used to transfer the longitudinal movement from the actuator 320 to the locking element 330.

[0041] The locking element 330, when inserted into the recess 311, extends in the radial direction r up to the outer circumferential surface 390. In embodiments, the locking

element 330 may extend below the circumferential surface 390 by a distance (not shown in figures) of at least 0.05 mm, more specifically by at least 0.10 mm, in particular by up to 0.30 mm, when the actuator 320 is in rest position. The locking element 330 may extend over the circumferential surface 390 by a distance (not shown in figures) of at least 0.05 mm, more specifically by at least 0.10 mm, in particular by up to 0.30 mm, when the actuator 320 is in locked position. The locking element comprises a length l1, which can be between 1 mm to 20 mm, more specifically between 2 mm to 15 mm, in particular 2 to 5mm. Furthermore, the locking element comprises a width w1, which can be between 0.2 mm to 15 mm, more specifically between 0.5 mm to 2 mm. An increased length l1 and/or width w1 of the locking element 330 may lead to a larger contact surface when coupled to the razor handle 30, thus increasing friction-force between the respective components/surfaces. The locking element 330 comprises an upper face 330a and a lower face 330b, wherein the upper face 330a and/or the lower face 330b have the length l1 and the width w1. The lower face 330b faces the retracting shaft 310 and the upper face 330a is the opposite face. The upper face 330a may further comprise texture or other surface features that increase friction in order to provide an even more secure connection.

[0042] In embodiments, there are two locking elements separated by the sleeve 350. In embodiments, the locking element 330 may be elastic arranged in respective recess of the retracting shaft 310. The locking element 330 may be arranged partially or all around the retracting shaft 310 with respect to the circumferential direction or may be arranged on the outer circumferential surface 310 at different angles in the circumferential direction.

[0043] In embodiments, the recess 311 extends in the radial direction r through the whole diameter d of the retracting shaft 310. In this case, the retracting shaft 310 comprises two locking elements 330, wherein a sleeve 350 is arranged between the two locking elements 330. The presence of two locking elements 330 provides an even more secure connection between the handle 30 and the connector 10. The at least one locking element comprises a diameter d1 that is larger than the diameter d of the retracting shaft 310. In embodiments, the diameter d1 can be at least 1.1 times larger than the diameter d. In particular, the diameter d1 can be at least 1.2 times larger than the diameter d. In case the retracting shaft 310 is coupled to the razor handle 30, the locking element 330 is pressed against an inner surface 34 of the recess of the razor handle 30, as will be described in more detail below. When the locking element 330 extends through the whole diameter d of the retracting shaft 310, the locking element can be pressed against the inner surface 34 on a circular distribution. This allows the pressure to be equally distributed on the material of the razor handle 30. The locking element 310 can have a cylindrical shape wherein increased friction force can be provided. The actuator 320 provides more pressure to the locking element 310, thus securing the retracting shaft 310 inside the cavity 33 of the razor handle 30.

[0044] Referring to Fig. 4B the locking element 330 may have a cross-section that tapers from the upper face 330a and/or lower face 330b towards a geometric center of the locking element 330. The recess may have a complementary shape. Thus, the locking element 330 can be retained in place when inserted into the recess 311 extending through the whole diameter d. The locking element 330 may comprise a plane which is parallel to the upper and/or lower faces 330a,330b and extends through the geometric center of locking element 330.

[0045] As shown in Fig. 4A, recess 311 comprises a complementary shape with respect to the shape of the locking element 330. The cross-section of the recess 311 may taper from the outer circumferential surface 390 in the radial direction r towards the longitudinal axis A on each side. The recess 311 may taper perpendicularly from the outer circumferential surface 390. Due to the taper that extends between longitudinal axis A and outer circumferential surface 390, the locking element 330 can be held in place. The retracting shaft 310 can be manufactured by die cast or injection molding. The recess 311 can be made directly by the opening directions of the mold, thereby simplifying the molding operations and consequently the manufacturing process.

[0046] As shown in Figs. 2 to 4B, the razor handle 30 comprises a cavity 33 with an inner surface 34, an inner diameter d2 and a length l2. The handle engaging portion 300 of the connector 10 can be inserted into the cavity 33. The inner diameter d2 may be larger than the diameter d of the retracting shaft 310 such that the handle engaging portion 300 can be inserted into the cavity 33 of the razor handle 30. The locking element 330 is configured to couple the connector 10 to the razor handle 30 by a non-positively locking connection, more specifically by a press-fit connection, in particular by a friction locking connection. The locking element 330 is adapted to expand and/or contract in the radial direction r perpendicular to the longitudinal axis x. When the actuator is triggered, the locking element 330 applies a force in the radial direction r against the inner surface 34 of the cavity 33. In an embodiment, the locking element 330 may apply a force of at least 0.5 N, more specifically of at least 3 N, in particular of at least 5 N, in the radial direction r. The handle engaging portion 300 may be coupled to the razor handle 30 by a press-fit connection. A non-positively locking connection means that a normal force is applied on the surfaces to be coupled. Their mutual displacement is prevented as long as the counterforce caused by static friction is not exceeded. In other words, the surfaces of a non-positively locking connection only slip with respect to each other when a tangential force is greater than the static friction force occurring between the surfaces. In the present case, the tangential force can be regarded as a force extending in the direction of the longitudinal axis x. In embodiments, the length l2 may be larger than the length l1 such that the first body portion

end face 102 mates against a razor handle end face 35 when the connector is coupled to the razor handle. In other words, the first body portion end face 102 and the razor handle end face 35 may function as end collars forming a stop.

[0047] When inserted into the cavity 33 as shown in Figs. 3A to 3B, the locking element 330 can expand in the radial direction r in order to increase an effective diameter and/or to compensate for tolerances between the respective components, when the actuator 320 moves from the rest position to a lock position. Upon the movement of the actuator to the lock position, the retracting shaft 310 moves along the longitudinal axis A and compresses the locking element 330 forcing it to expand towards the radial direction r, thus increasing its effective diameter d1. According to the first embodiment, the locking element 330 extends beyond the outer circumferential surface 390 when the actuator is in the locked position. Thereby, an outer diameter of the locking element 330 (see, e.g., d1) or a diameter measured between the handle engaging portion 300 and an outer face of the locking element 330 in the radial direction r may be larger than the inner diameter d2 of the cavity of the handle. In order to insert the handle engaging portion 300 into the cavity 33 of the razor handle 30, the actuator 320 needs to be in the rest position and the locking element 330 shall not be expanded. As described above, the locking element 330 can be a polymeric material which is capable of regaining its original shape when contracted. Thus, when inserted into the cavity 33 and the actuator 320 is moved to the locked position, the locking element 330 expands in the radial direction r and applies force against the inner surface 34, resulting in a coupling of handle engaging portion 300 and razor handle 30. Increasing the contact surfaces of the locking element 330 and the inner surface 34, e.g., by providing a plurality of locking elements 330 and/or increasing the length and/or the width of the locking elements 330, may lead to increased friction force and thus to a more stable coupling.

[0048] Figs. 5 to 7 are schematic views of the connector 10' according to a second embodiment of the current disclosure, which can be combined with any of the features as described above. The handle engaging portion 300' comprises an actuator 320' configured to rotate along a rotation axis x' which is substantially parallel to the longitudinal axis A'. The actuator 320' is configured to move from a rest position to a locked position by the user. When the actuator 320' is moved to the locked position (not shown in figures), a push portion 320d' of the actuator 320' engages with an inclined surface 314' of the retracting shaft 310', and moves towards the longitudinal axis A'. This movement of the actuator 320' along with its engagement with the inclined surface 314' of the retracting shaft 310', causes the retracting shaft to move longitudinally along the longitudinal axis A' towards a proximal end 32'. This movement, of the retracting shaft 310' provides pressure on the locking element 330', thus expanding the locking element 330' in the radial direction r' and applies force against the inner surface 34', resulting in a coupling of handle engaging portion 300' and razor handle 30'. The actuator 320' may be rotatably connected to a shaft carrier 340'. When the actuator 320' is moved to the locked position, a pin 325' is inserted in a groove 341' of the shaft carrier 340'. The pin 325' and the groove 341' may have the same width, thus when they are engaged a friction connection is achieved.

[0049] As shown in figure 7 the inclined surface 314' of the retracting shaft 310', may comprise a lock cavity 315' adjacent to the inclined surface 314'. When the actuator 320' moves to the locked position the pin 325' slides over the inclined surface 314' and falls into the lock cavity 315', where it is secured in order to avoid any accidental movement back to the rest position.

[0050] This second embodiment comprises one locking element 330'. However, more than one locking elements 330' can be present, separated by a sleeve 350 as described in the first embodiment.

[0051] Figs. 8 to 10 are schematic views of the connector 10" according to a third embodiment of the current disclosure. The handle engaging portion 300" comprises an actuator 320" configured to rotate along the longitudinal axis A". The actuator 320" comprises an inner groove 326" in which a pin 325" of the retracting shaft 310" extends. When a user wants to engage the connector 10" with the razor handle 30", the actuator 320" is rotated towards the engagement direction. During that operation the inner groove 326", which has a helical shape like a thread, is mated with the pin 325" of the retracting shaft 310", thus moving the retracting shaft 310"along the longitudinal axis A". When the actuator 320" is moved from the rest position towards the locked position (not shown in figures), the retracting shaft 310" moves accordingly from the rest position to the locked position. In the locked position, the locking element 330" expands in the radial direction r" and applies force against the inner surface 34", resulting in a coupling of handle engaging portion 300" and the razor handle 30".

[0052] The connector (10") comprises one locking element 330". However, more than one locking elements 330" can be contemplated without deviating from the scope and the teachings of the current disclosure. The more than one locking elements 330" may be also separated by a sleeve 350, as described in the first embodiment.

[0053] Referring to Fig. 11 the blade assembly engaging portion 200 may comprise a release mechanism 220. The release mechanism shall comprise a housing 230, a plunger 240, a first spring 250, a U-shaped ejector 260, a release button 210 and a second spring 270. The release mechanism is assembled at least partially inside connector body's recess 103. The user may actuate the release mechanism by pushing the release button 210 with his/her finger towards the longitudinal axis A. The release button 210 will compress the second spring 270. When pushed, the release button 210 is engaged with an inclined surface of the U-shaped ejector 260 and moves it

along the longitudinal direction. The two arms 208 of the ejector push the blade assembly 20 and force it to decouple from the connector 10. When the user removes his/her finger from the release button 210, the second spring 270 will provide a return force to the button to return to its rest position. The release mechanism described above may be adapted in any of the embodiments described in the description above.

[0054] The plunger 240 is connected to the U-shaped ejector 260 through a first spring 250. This connection provides a pivot force to the blade assembly 20 when connected to connector 10. In addition to that the first spring 250 provides a return force to the U-shaped ejector 260 when the user no longer pushes the release button 210. The pivot mechanism described above may be adapted in any of the embodiments described in the description above.

Claims

1. A connector (10,10',10") for engaging a blade assembly (20) to a razor handle (30,30',30") comprising:

   - a connector body (100, 100', 100") extending between a handle engaging portion (300, 300', 300") and a blade assembly engaging portion (200) along a longitudinal axis (A, A', A");
   wherein the handle engaging portion (300, 300', 300") comprises:

     - a retracting shaft (310, 310', 310")
     - an actuator (320, 320',320")
     - a locking element (330,330',330") coupled to the retracting shaft (310,310',310")

   wherein the actuator (320,320', 320") is configured to move the retracting shaft (310,310', 310") such that the locking element (330,330',330"), expands in an angled direction (b) with respect to the longitudinal axis (A, A', A").

2. The connector (10) of claims 1 or 2, wherein the actuator (320) is a lever that is configured to move from a rest position to a locked position, wherein when the lever is in the locked position the locking element (330) is expanded.

3. The connector (10) of claim 2, wherein the actuator (320) is rotatable along a rotation axis (x) which is perpendicular to the longitudinal axis (A), when the actuator moves from the rest position to the locked position or vice versa.

4. The connector (10") of claim 1, wherein the actuator (320") is a rotating ring configured to move from a rest position to a locked position, wherein when the rotating ring is in the locked position the locking element (330") is expanded.

5. The connector (10') of claim 1, wherein the actuator (320') is a pushing or rotating element configured to engage with an inclined surface (314') of the retracting shaft (310') and move the retracting shaft (310') from a rest position to a locked position.

6. The connector (10,10',10") of claims 1 to 3, wherein the actuator (320) comprises at least one arm (322) having a connection surface (323), wherein the connection surface (323) has a cylindrical shape configured to mate with a cylindrical rotation pin (315) of the retracting shaft (310), thereby allowing the actuator (320) to rotate over the rotation pin (315) along a rotation axis (x).

7. The connector (10,10',10") of claims 1 to 6, wherein the retracting shaft (330,330',330") comprises a recess (311,311',311") and wherein the locking element (330,330',330") is located in the recess (311,311',311").

8. The connector (10,10',10") of claims 1 to 7 comprising two locking elements (330,330',330"), wherein a first locking element is arranged adjacent to an end of the retracting shaft (310,310',310") and the other locking element (330,330',330") is arranged adjacent to the actuator (320,320',320").

9. The connector (10,10',10") of any of claims 1 to 8, further comprising a sleeve (350) located between the locking element (330) and the actuator (320), wherein the sleeve is made of a rigid material.

10. The connector (10) of any of claims 1 to 3, further comprising a shaft carrier (340) coupled to the retracting shaft (310), wherein the actuator (320) during use, causes the shaft carrier (340) to move the locking element (330) along the longitudinal axis (A), thereby expanding the locking element (330) in an angled direction with respect to the longitudinal axis (A).

11. The connector (10) of claim 10, wherein the actuator (320) comprises an actuator engagement surface (327), so that when the actuator (320) moves towards the locked position, the actuator engagement surface (327) engages with the engagement surface (342) of the shaft carrier (340) thereby securing the actuator to the locked position.

12. The connector (10,10',10") of any of the preceding claims, further comprising a stop element (316) located at the end of the retracting shaft (310,310',310") which is opposite to the end adjacent to the actuator (320,320',320"), wherein the stop

element (316) prevents the locking element (330,330',330") from being decoupled by the retracting shaft (310,310',310").

13. A razor handle (30,30',30") extending between a distal end (31,31',31") and a proximal end (32,32',32"), wherein the proximal end (32,32',32") comprises a cavity (33,33',33") for receiving the handle engaging portion (300,300',300") of the connector (10,10',10") of any of the preceding claims.

14. The razor handle (30,30,30',30") according to the preceding claim, wherein the cavity (33,33',33") has a cylindrical shape.

15. A razor system (1) comprising:

- a blade assembly (20);
- the connector (10,10',10") of any of claims 1 to 12;
- the razor handle (30,30',30") of any of claims 13 to 14;

wherein the connector (10,10',10") is configured to releasably connect the blade assembly (20) and the razor handle (30,30',30").

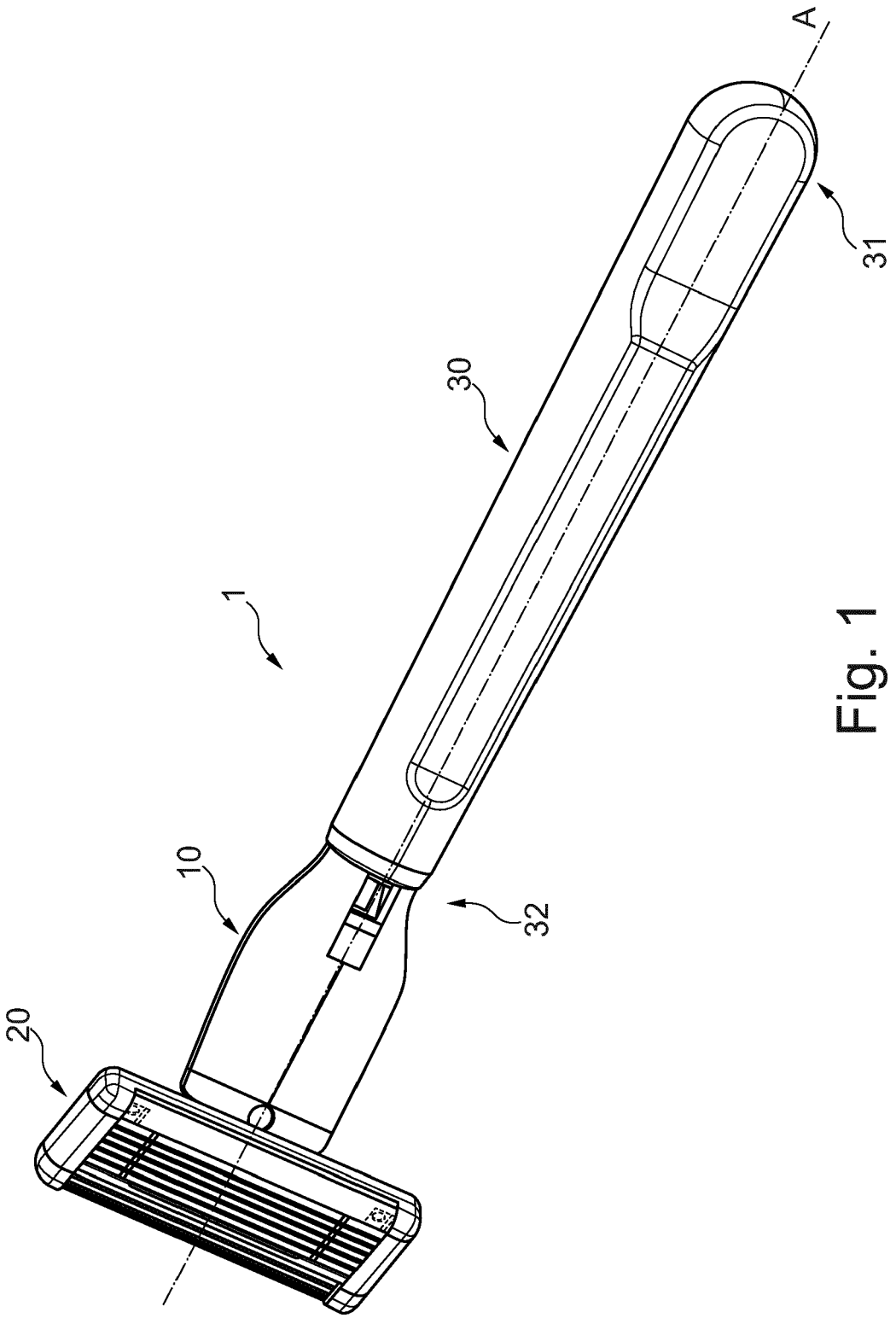

Fig. 1

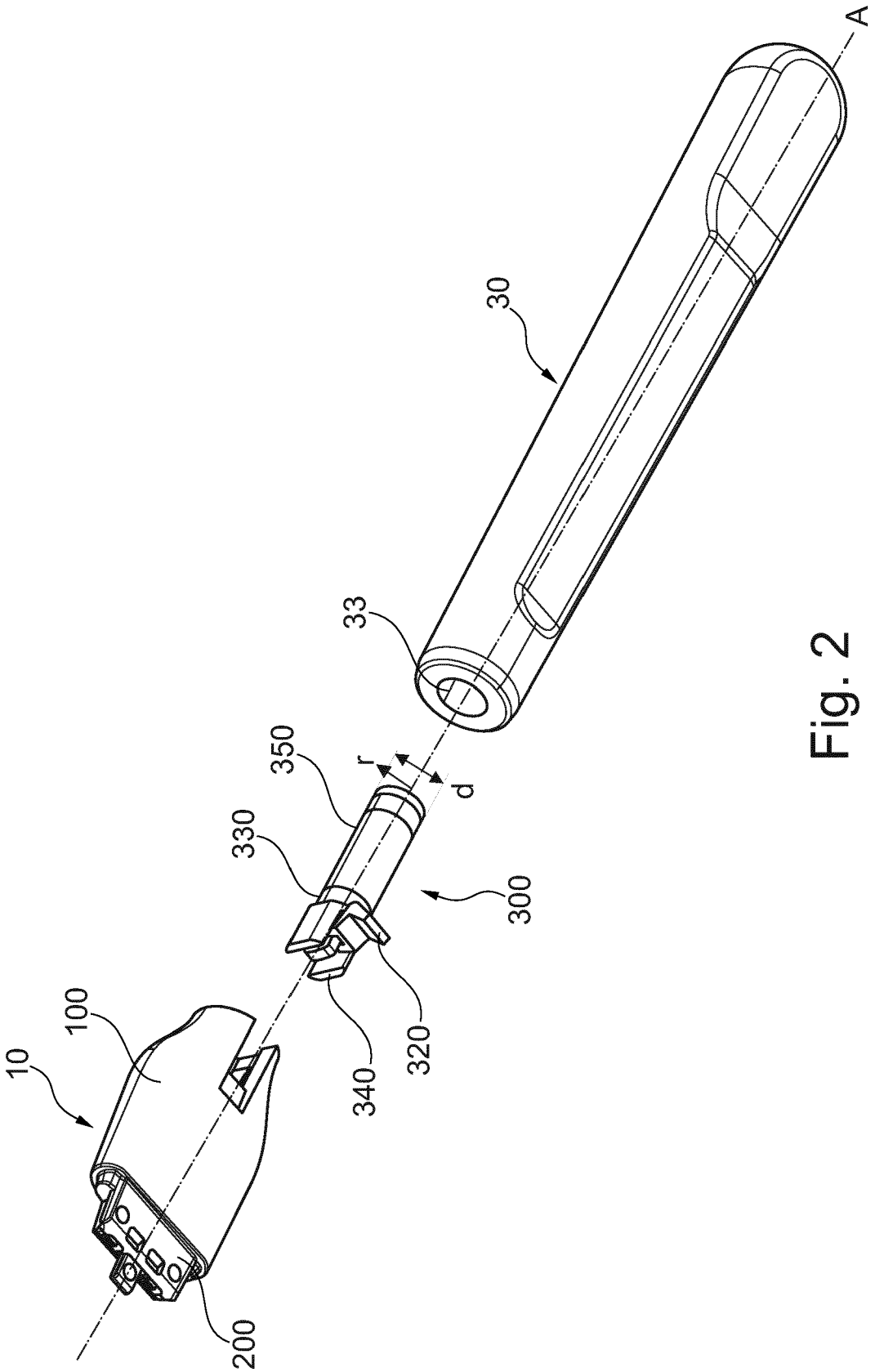

Fig. 2

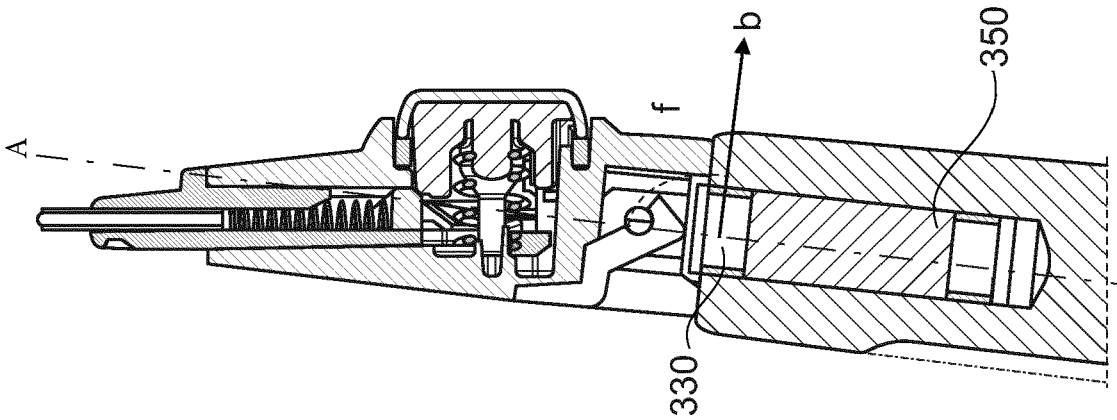

Fig. 3B

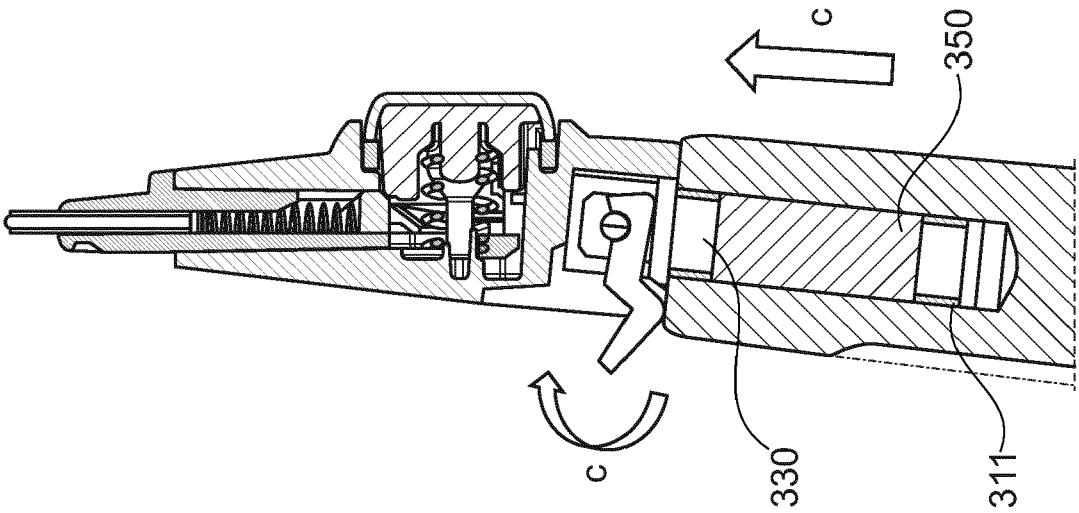

Fig. 3A

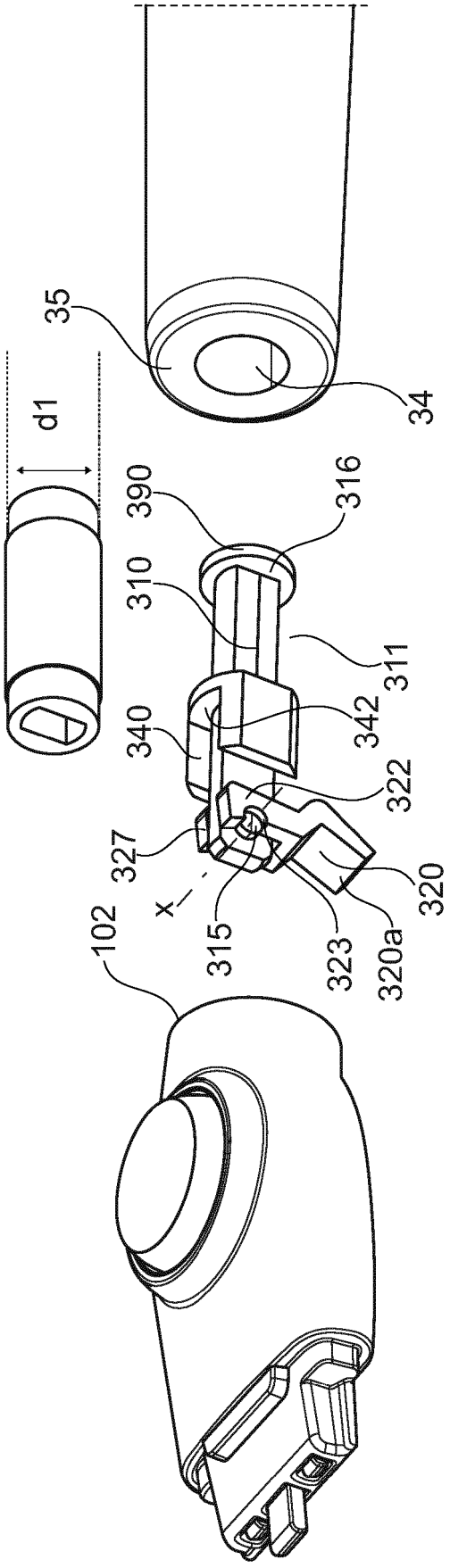

Fig. 4A

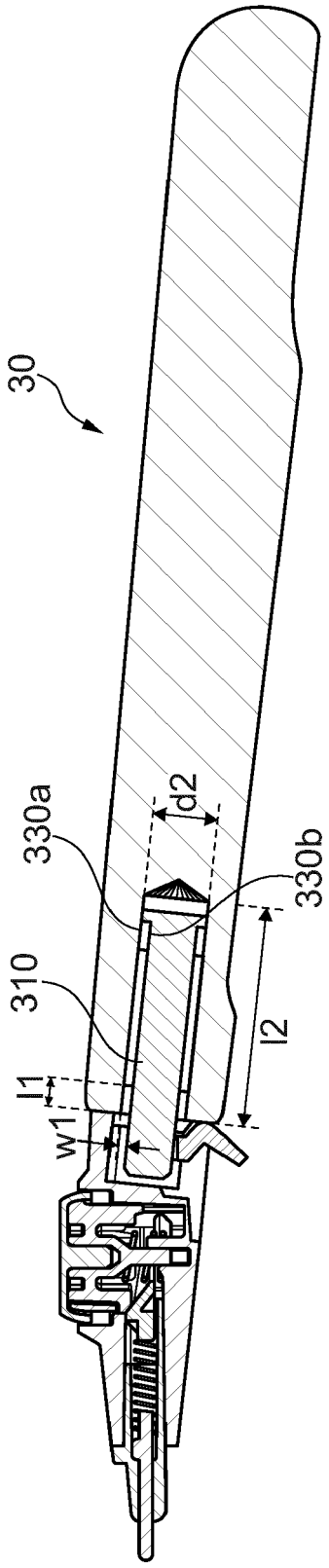

Fig. 4B

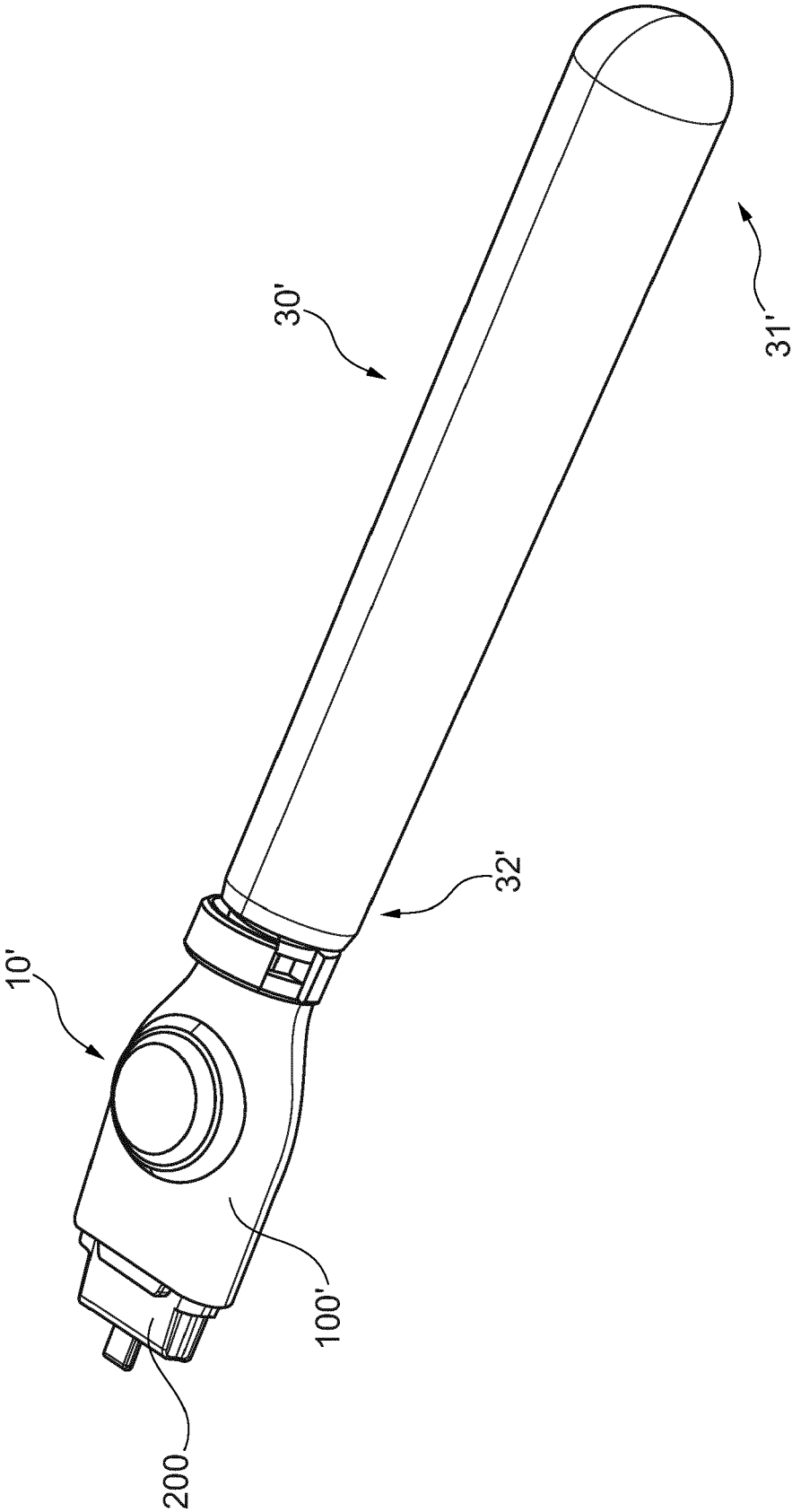

Fig. 5

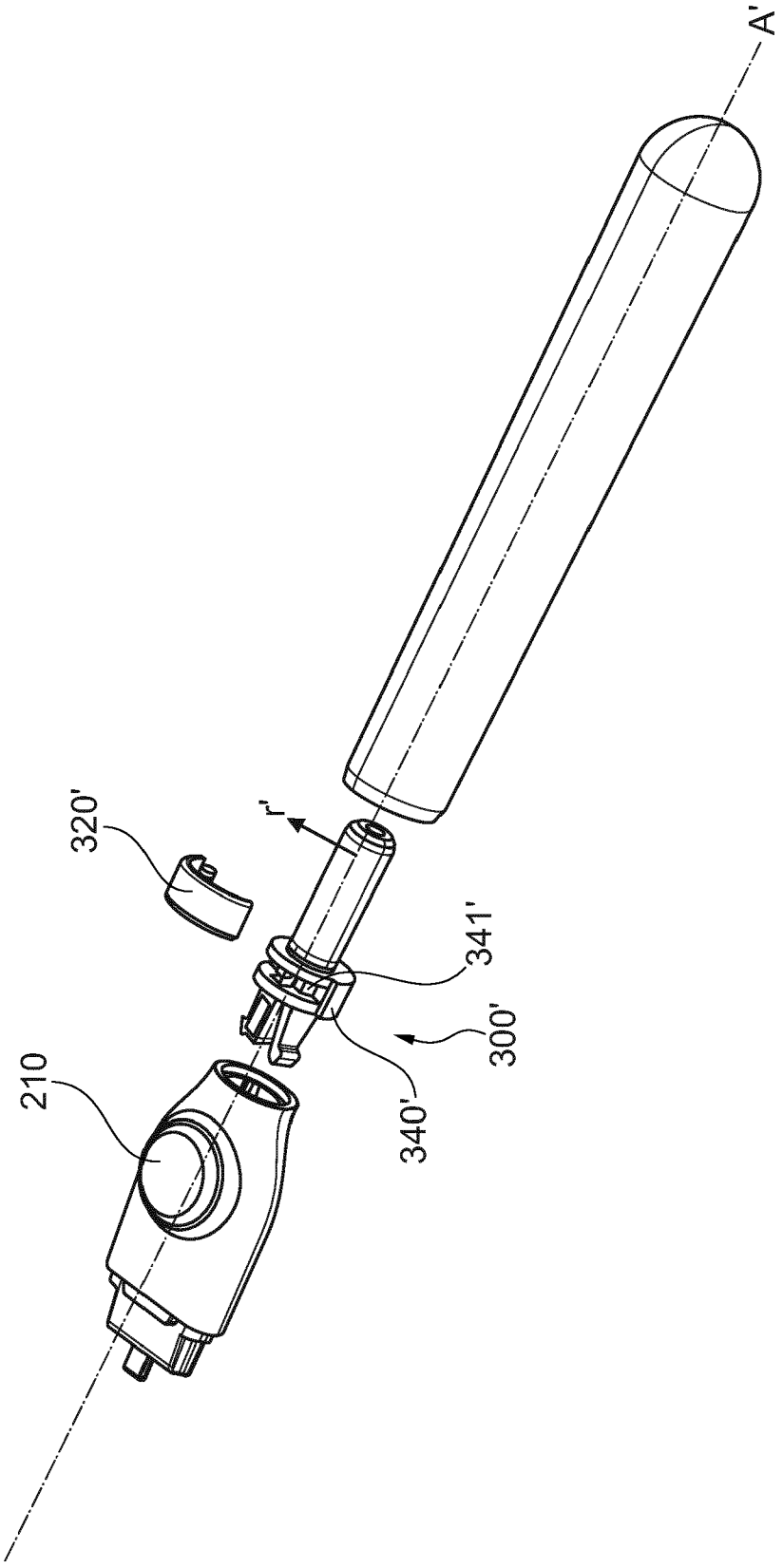

Fig. 6

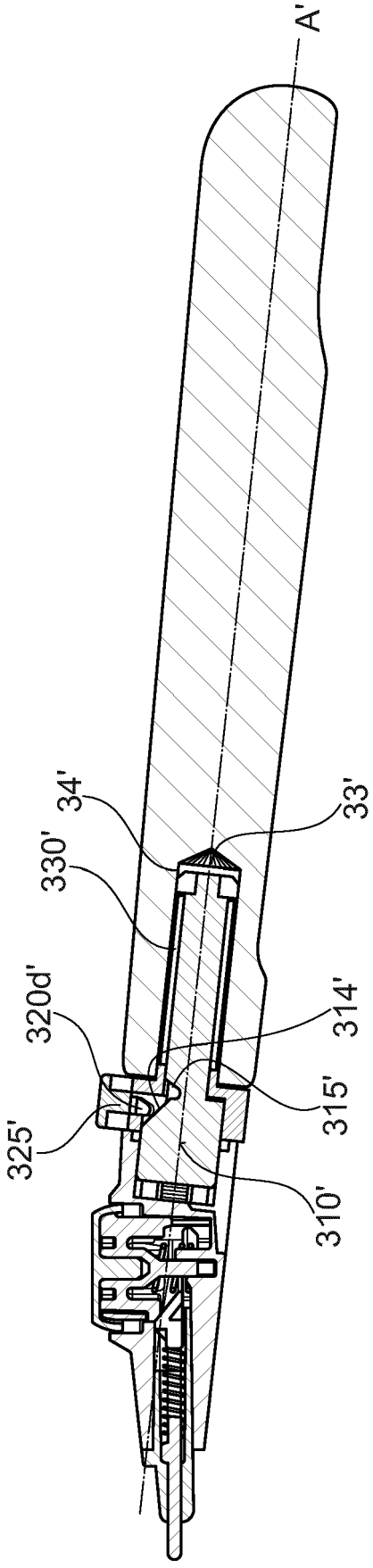

Fig. 7

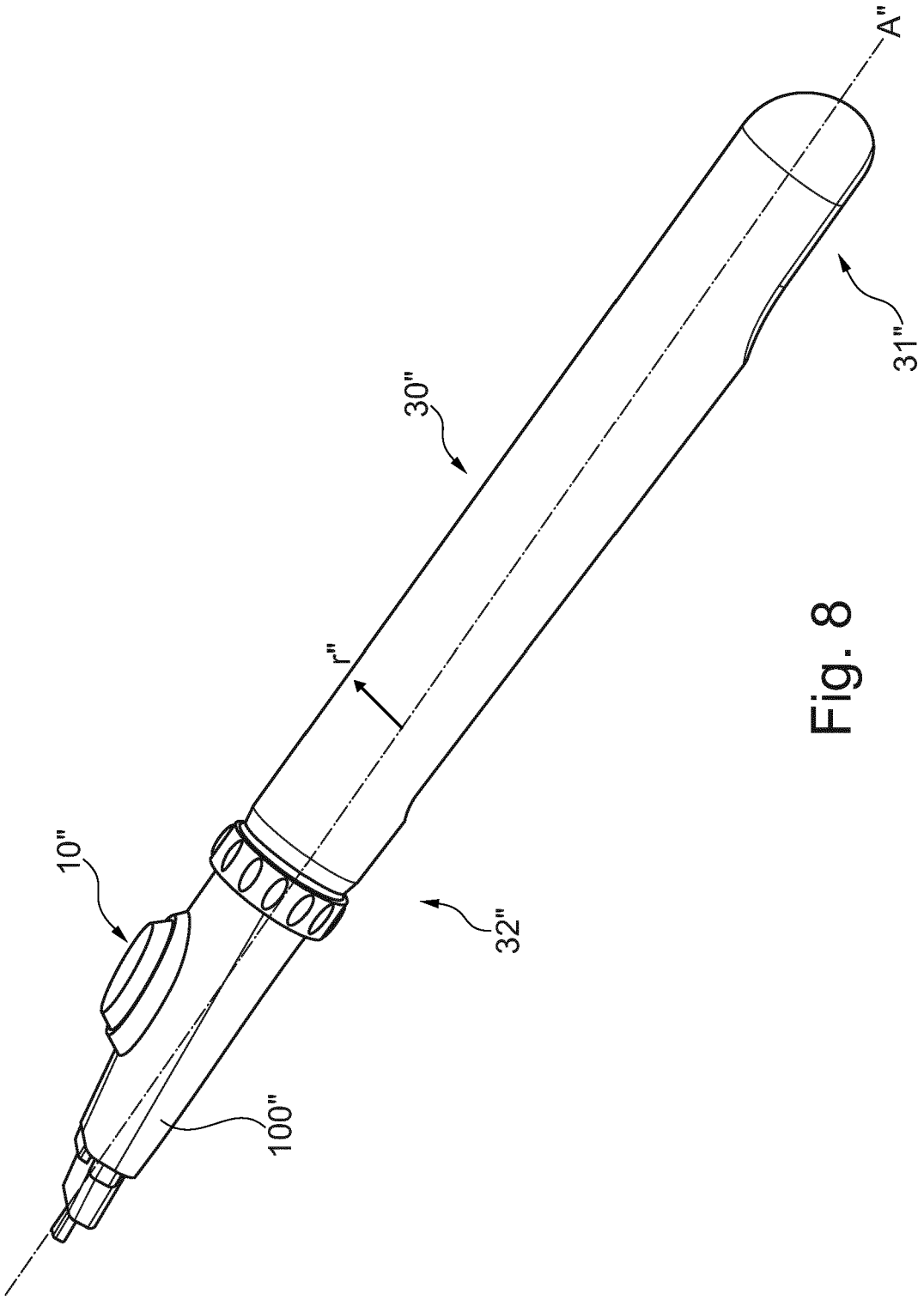

Fig. 8

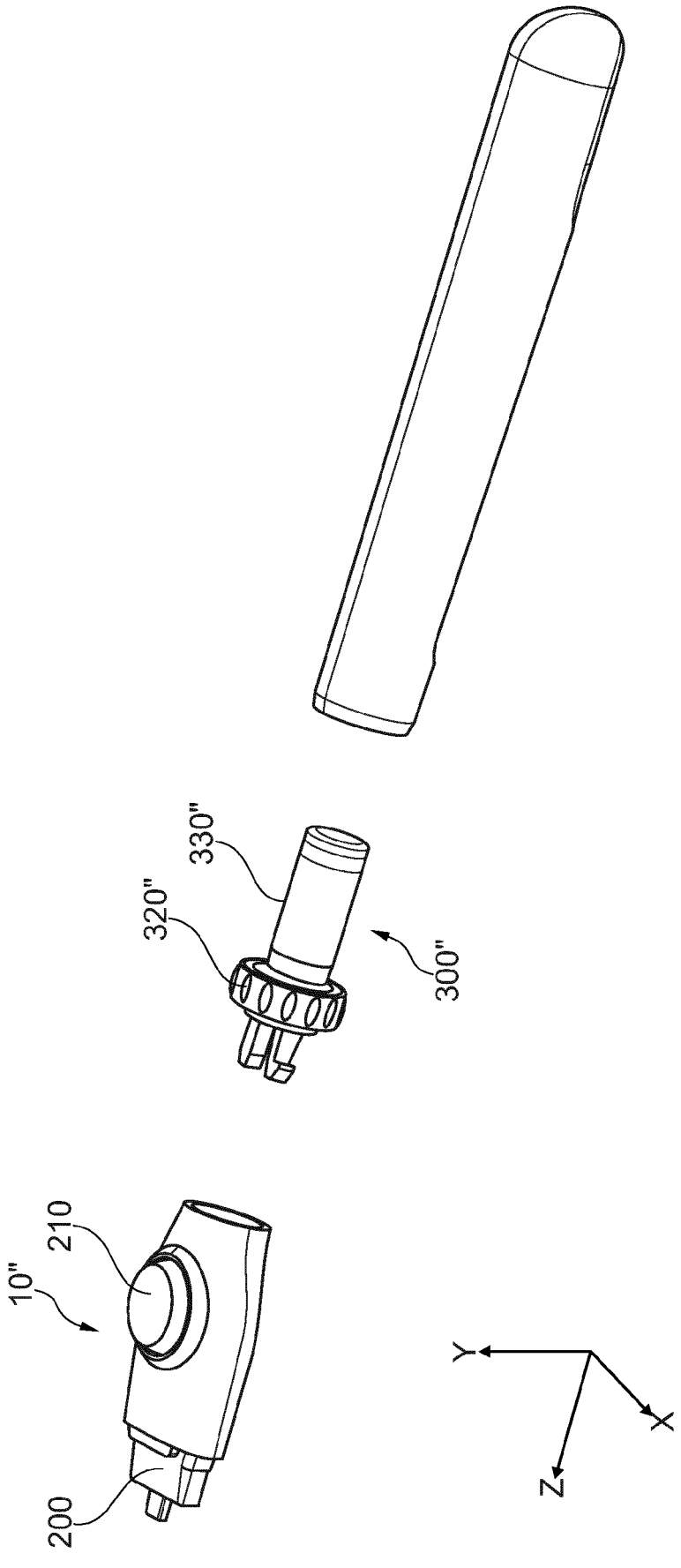

Fig. 9

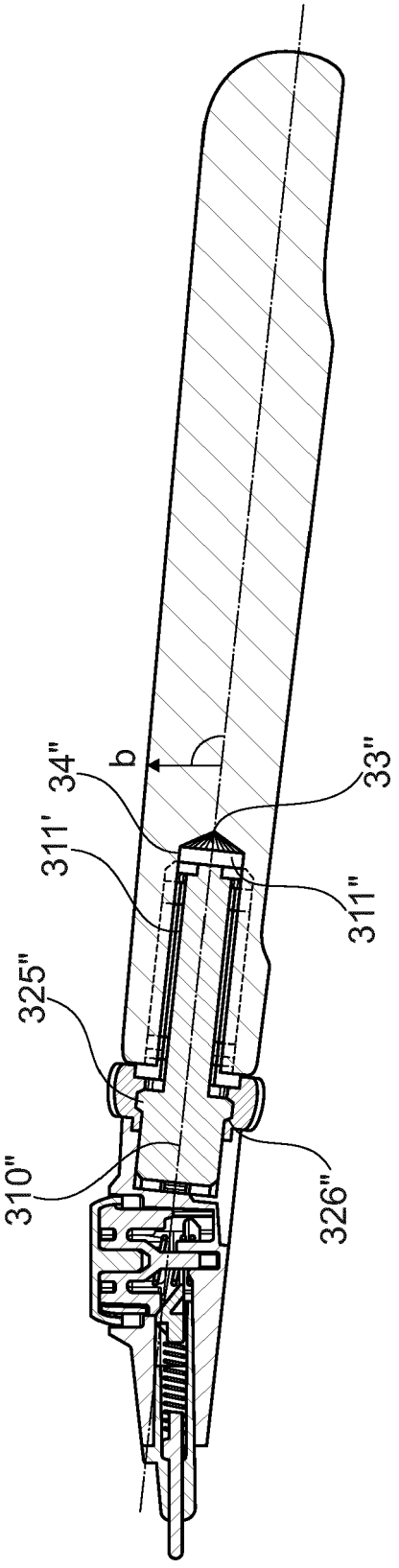

Fig. 10

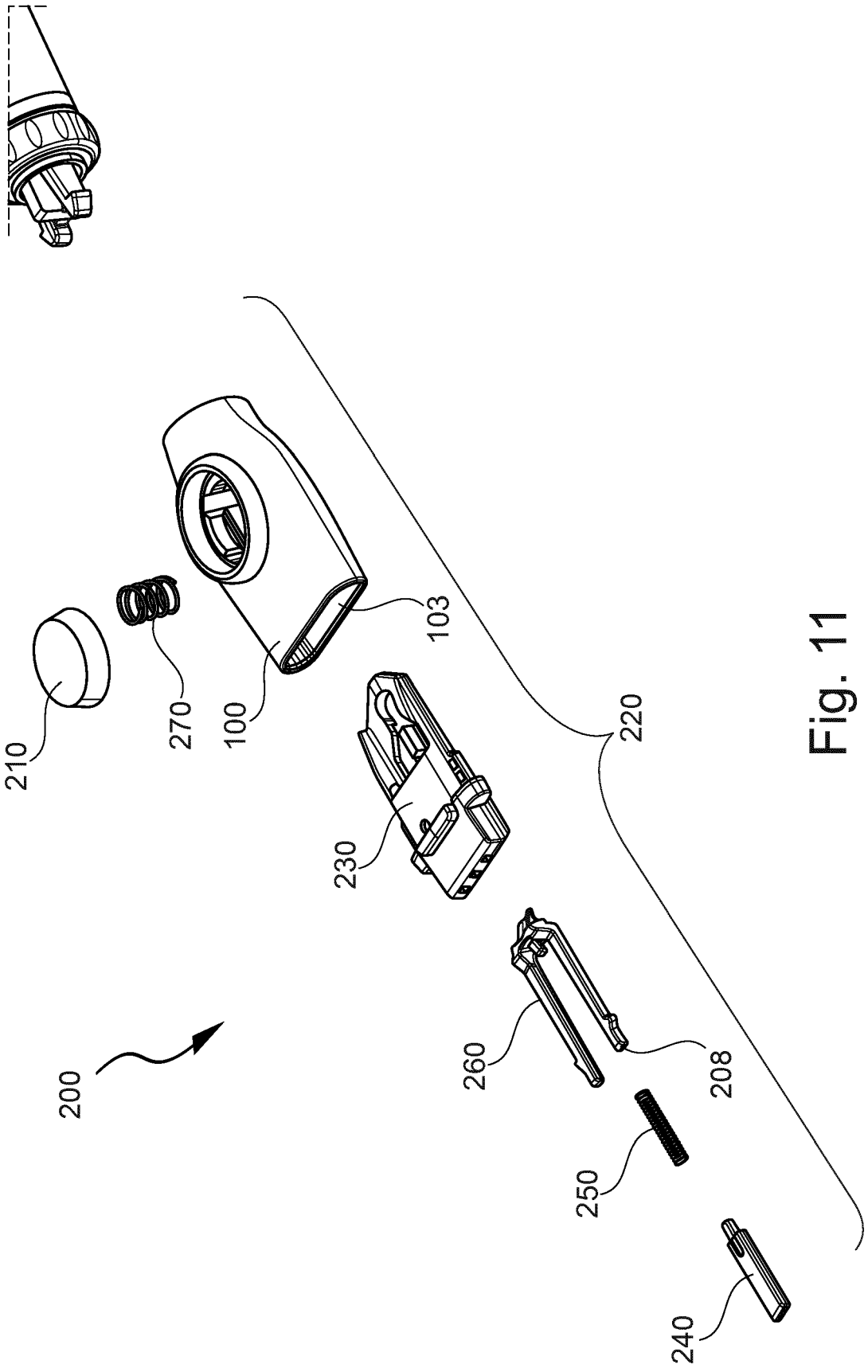

Fig. 11

Europäisches Patentamt
European Patent Office
Office européen des brevets

EUROPEAN SEARCH REPORT

Application Number
EP 23 21 6369

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 A	EP 4 011 573 A1 (BIC VIOLEX SINGLE MEMBER SA [GR]) 15 June 2022 (2022-06-15) * page 15, line 1 - page 18, line 23 * * figures 2-6 *	13,14 1-12,15	INV. B26B21/52
X A	US 2020/223082 A1 (ROBERTSON RUAIRIDH [US] ET AL) 16 July 2020 (2020-07-16) * paragraphs [0347] - [0549] * * figures 1-25 *	13,14 1-12,15	
A	GB 888 738 A (HEINZ OSBERGHAUS) 7 February 1962 (1962-02-07) * figure 1 *	1-15	
A	EP 1 115 537 A1 (TRITEC INTERNAT CORP [US]) 18 July 2001 (2001-07-18) * the whole document *	1-15	
A	US 2008/086899 A1 (GALLAGHER RICHARD N [US]) 17 April 2008 (2008-04-17) * the whole document *	1-15	TECHNICAL FIELDS SEARCHED (IPC) B26B

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
Munich	18 June 2024	Calabrese, Nunziante

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 (P04C01)

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 21 6369

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.

18-06-2024

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 4011573 A1	15-06-2022	EP 4011573 A1	15-06-2022
		US 2024042634 A1	08-02-2024
		WO 2022128352 A1	23-06-2022
US 2020223082 A1	16-07-2020	US 2018079095 A1	22-03-2018
		US 2019061187 A1	28-02-2019
		US 2020016782 A1	16-01-2020
		US 2020223082 A1	16-07-2020
		US 2021094197 A1	01-04-2021
		US 2024025066 A1	25-01-2024
GB 888738 A	07-02-1962	NONE	
EP 1115537 A1	18-07-2001	AU 763098 B2	10-07-2003
		BR 9816028 A	29-05-2001
		CA 2344872 A1	30-03-2000
		CN 1359323 A	17-07-2002
		DE 69835377 T2	23-08-2007
		EP 1115537 A1	18-07-2001
		ES 2267195 T3	01-03-2007
		HK 1048086 A1	21-03-2003
		JP 2002526220 A	20-08-2002
		MX PA01002969 A	15-05-2003
		WO 0016951 A1	30-03-2000
US 2008086899 A1	17-04-2008	NONE	

EPO FORM P0459

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