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(72) Inventeurs/Inventors:
WEBER, TOBIAS, DE;
BERLICH, ROBERT, DE;
MAGER, GERHARD, DE

(73) Propriétaire/Owner:
FRESENIUS MEDICAL CARE DEUTSCHLAND GMBH, DE

(74) Agent: AVENTUM IP LAW LLP

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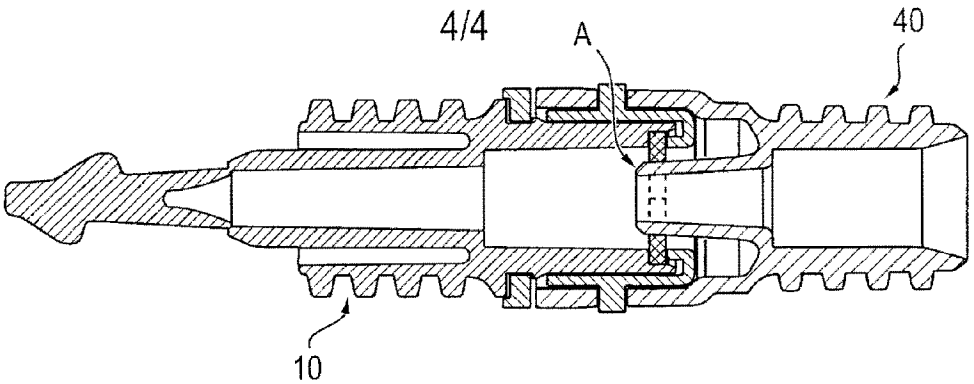


(57) Abrégé/Abstract:
The invention relates to a connector comprising at least one first connector part and at least one second connector part, wherein the connector parts can be connected to one another in a fluid-tight manner and can be locked to one another via at least one closure element, wherein one of the connector parts has at least one sealing element which blocks a throughflow in the closed state and which can be opened, in particular a septum or a sealing disk, and the other one of the connector parts has at least one opening element for opening the sealing element, and wherein one of the connector parts has at least one projection and the other one of the connector parts has at least one receiver, wherein the opening element and the sealing element are arranged with respect to one another such that the opening element only opens the sealing element when the projection has been introduced into the receiver.

Abstract

The invention relates to a connector comprising at least one first connector part and at least one second connector part, wherein the connector parts can be connected to one another in a fluid-tight manner and can be locked to one another via at least one closure element, wherein one of the connector parts has at least one sealing element which blocks a throughflow in the closed state and which can be opened, in particular a septum or a sealing disk, and the other one of the connector parts has at least one opening element for opening the sealing element, and wherein one of the connector parts has at least one projection and the other one of the connector parts has at least one receiver, wherein the opening element and the sealing element are arranged with respect to one another such that the opening element only opens the sealing element when the projection has been introduced into the receiver.

CONNECTOR

FIELD OF THE INVENTION

The present invention relates to a connector comprising at least one first connector part and at least one second connector part, wherein the connector parts can be connected to one another in a fluid-tight manner and can be locked to one another via at least one closure element, wherein one of the connector parts has at least one sealing element which blocks a throughflow in the closed state and which can preferably be sealingly opened, in particular a septum or a sealing disk, and the other one of the connector parts has at least one opening element for opening the sealing element, and wherein one of the connector parts has at least one projection and the other one of the connector parts has at least one receiver.

BACKGROUND

Treatment fluids are typically provided in bags in extracorporeal blood treatment. In this respect, in dependence on the type of therapy and on the patient needs, a plurality of different treatment fluids is provided which can differ in the composition and in the concentration of the individual solution components.

The bags generally have a connector part which can be connected to a complementary connector part, i.e. to a connector part to which the bag connector part can be connected, to remove the treatment fluid from the bag for the treatment and to transfer it, for example, into a hose system at which the complementary connector part is arranged.

In particular in the event that a plurality of treatment fluids is used simultaneously in the therapy, there is a risk that individual bags are not connected to the connections of a hose system provided for this purpose due to confusion. This can have the result that the incorrect fluid is used for the blood treatment or for another treatment and in the worst case is infused into a patient, which can be accompanied by considerable health risks.

There is therefore a need to provide a connector which makes it possible that a bag of one kind of treatment fluid can also only be associated with exactly one

connection provided for this purpose so that confusion is precluded. It is known from the prior art in accordance with WO 09/024807 A1 to provide a connector comprising two connector parts, wherein locking projections are arranged at one connector part and complementary projections are arranged at the other connector part which cooperate in the connected state and in this manner "emit" a connection signal. It is furthermore known from WO 11/131783 A2 to connect a medication container to an injection apparatus via a connector. It is therein disclosed to code the connection of complementary connector parts. A coding projection which engages into a groove is used.

SUMMARY OF EMBODIMENTS OF THE INVENTION

According to an aspect of at least one embodiment there is provided a connector for preventing an incorrect treatment fluid from being supplied to a patient due to a mistake.

Provision is accordingly made that the opening element and the sealing element, in particular the septum, a sealing disk or the like, which blocks a throughflow and which can be opened up, i.e. opened, are arranged with respect to one another such that the opening element only opens the sealing element, in particular the septum, etc., when the projection has been introduced into the receiver.

The two connector parts are preferably connector parts which can be connected to one another in the manner of a bayonet connection.

The receiver and the projection are preferably located peripherally at the connector parts.

It is furthermore conceivable that a connector part has an opening element such as a cone which cooperates with a septum or the like, for example with a slit seal, in a specific position of the connector parts with respect to one another such that the opening element opens the septum. This is, however, only possible when the projection has been received in the receiver, which is in turn only the case when the two connector parts fit one another, i.e. are complementary, and which is not

the case when the connector parts do not fit one another. It is prevented in this manner that an opening of the septum takes place with connector parts which are not complementary to one another since in this case the projections cannot be introduced into the receiver or can at least not be introduced in the receiver such that the opening element opens the septum.

This means that the septum or the like remains closed in this case and the administration of an incorrect fluid to the patient is precluded.

The projection and the receiver, which serve as coding elements, thus do not only have the object of holding the two connector parts to one another e.g. in a shape-matching manner or do not only serve as coding elements, but also provide a solution for the need for security, according to which the administration of an incorrect treatment fluid is reliably avoided on an incorrect connection, i.e. on a connection of non-complementary connector parts.

Provision is thus made in accordance with the invention that the opening element of the one connector part can only break open or pierce the septum or the like, preferably the slit septum of the other connector part, when the projection and the receiver at the connector parts are complementary, i.e. when the connector parts fit one another. If this is not the case, the opening element cannot break open or open the septum so that an incorrect infusion or administration of a treatment fluid is reliably prevented.

The opening element can preferably be a fluid channel of one of the connector parts.

The present invention furthermore relates to a connector comprising at least one first connector part and at least one second connector part, wherein the connector parts can be connected to one another in a fluid-tight manner and can be locked to one another via at least one closure element, wherein one of the connector parts has at least one sealing element with an aperture, in particular a sealing ring, and the other one of the connector parts has at least one contact surface for the sealing

element, and wherein one of the connector parts has at least one projection and the other one of the connector parts has at least one receiver, wherein the sealing element and the contact surface are arranged with respect to one another such that a fluid-tight connection is only present between the first and the second connector parts when the projection has been introduced into the receiver.

If the connection of the two connector parts has not been correctly carried out, this is indicated by a leak because there is no fluid-tight connection between the two connector parts in this state. A fluid-tight connection in which no leak occurs to the outside is only present in this embodiment of the invention when the connection has been correctly established, i.e. when the named projection has been introduced into the receiver.

Instead of the sealing ring, any other suitable sealing element can also be used so that the term "sealing ring" does not only stand for a ring seal, but as a representative for peripheral sealing elements (e.g. a sealing cuff, a perforated disk, angular rings, etc.) having an aperture for receiving a connection stub.

The present invention furthermore relates to a connector comprising at least one first connector part and at least one second connector part, wherein the connector parts can be connected to one another in a fluid-tight manner and can be locked to one another via at least one closure element, wherein one of the connector parts has at least one projection and the other one of the connector parts has at least one receiver, wherein the projection can be introduced into the receiver with complementary connector parts.

Provision is made in this respect in accordance with the invention that the projection or the receiver is arranged at an additional part, preferably at a ring-shaped or sleeve-shaped additional part, which is led over a section of the connector part and preferably over its base body. In this case, the projection and/or the receiver are arranged at a separate part which is pushed over the base body. This design is in particular advantageous for economic reasons since only one

single base body type has to be manufactured which can be combined with a plurality of coding means and closure means.

Provision is made in a further embodiment of the invention that the closure element is formed by at least one pin and by at least one groove-like receiver for this pin, with provision preferably being made that the groove is configured such that it extends over a part region in an axial direction of the connector part and over a part region in the peripheral direction of the connector part so that a sliding movement and a rotary movement of the two connector parts relative to one another is necessary for the locking. In this case, the connection of the two connector parts thus takes place in a comparable manner to a bayonet connection.

One or more latch elements can be provided at the groove and can be contacted by the pin on the reaching of the locking position of both contact parts. These latch elements can serve as a securing of the locking and can furthermore cause a noise on a passing over of the pin so that it can be perceived acoustically by the user that the locking position has been reached. Alternatively or additionally, a haptic feedback is conceivable and is also covered by the invention on the reaching of the locking position, that is when the pin snaps over the latch element.

Provision is preferably made that the pin is visible on the reaching of the locking position so that a visual control of the locking position is also possible.

Provision is made in a further embodiment of the invention that the additional part or another color marking, which is located on the connector part, is color-coordinated with the second connector part. The same can also apply accordingly to the second connector part. It is thus possible via a color design of the two connector parts or of additional elements such as rings etc. to indicate that the two connector parts are complementary, i.e. can be connected to one another.

Provision is preferably made that the additional part or the other marking element are arranged such that they are also visible in the connected state of the connector parts so that a visual control of the complementary connector parts is also possible.

Provision is made in a further embodiment of the invention that the additional part has a pressing surface for the sealing element such as for the ring seal or for the septum and that the connector part on which the additional part is arranged has a sealing surface which is contacted by the sealing means such as by the ring seal or the septum. In this case, the additional part not only satisfies the function of bearing the projection or the receiver, but additionally also of the fixing of the sealing means, in particular of the ring seal or of the septum, to the connector part.

The term "sealing element" used in the following is to be understood as overarching. It does not only stand for sealing disks in the manner of a septum, but also as a representative for any and all desired sealing elements which can be opened in sealing manner or already have an aperture for receiving a sealing surface of a stub.

Provision is made in a further embodiment of the invention that the first connector part or the second connector part has a base body onto which the additional part is applied, wherein the base body has one or more latching noses which engage into at least one opening in the additional part, wherein the connection between the latching noses and the opening is preferably configured such that it is not manually releasable. It is thus conceivable, for example, to place the additional part onto a base body or onto a section of the base body and to lock it e.g. by a latched connection, with provision preferably being made that the additional part cannot be released, or can only be released with a considerable exertion of force, from the base body after the establishing of the latch connection.

Provision can furthermore be made that the at least one projection is designed as an elevated portion which extends in the longitudinal direction and in the peripheral direction of a connector part and/or the receiver extends in the longitudinal direction and in the peripheral direction of the other connector part.

Provision is preferably made that the projections and the receiver in complementary connector parts are dimensioned such that the at least one projection can be received into the receiver and such that this is not the case with connector parts

which are not complementary to one another. It is thus conceivable, for example, that the projections can be completely pushed into the receiver with complementary connector parts and that this is not the case with non-complementary connector parts. This has the consequence that a pushing together of the connector parts is only possible, where it is possible at all, to the extent that the opening element does not open the septum, as has been described in more detail above, with non-complementary connector parts.

Provision is made in a further embodiment of the invention that the opening element is configured as a preferably conically tapering stub which forms a region flowed through by a fluid in the connected state of the connector parts. This stub is set back as a contact protection with respect to the open end region of the connector part at which the connection with the other connector part is carried out.

Provision can furthermore be made that both connector parts have grip surfaces which lie in a common area in the locked state of the connector parts and which do not lie in a common area in the non-locked state of the connector parts. A visual control is thus also easily possible as to whether the two connector parts have been locked in the desired position or whether this is not the case. A haptic control is also alternatively or additionally possible in this case on the reaching of the desired position of the connector parts, which is likewise also covered by the invention.

According to an aspect of at least one embodiment, there is provided a medical fluid line connector comprising: a base; a conduit portion having a peripheral sidewall extending axially from the base; and a shroud extending axially from the base, the shroud positioned circumferentially about the peripheral sidewall of the conduit portion, the shroud defining: a slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends axially from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and a recess that extends circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot, wherein the slot is configured

to receive a radially extending bayonet pin of a complementary connector, the recess is configured to axially receive a radially extending projection of the complementary connector and to allow the projection to slide circumferentially within the recess, and the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess, wherein the slot and the recess are arranged such that a projection of a non-complementary connector is circumferentially offset from the recess when a bayonet pin of the non-complementary connector is disposed in the slot such that the projection cannot be received in the recess as the bayonet pin slides axially within the first segment of the slot, and wherein the conduit portion is configured to move axially through a septum of the complementary connector upon sliding the bayonet pin into the proximal end of the first segment of the slot and sliding the projection axially into the recess, and the conduit portion is configured to generate a fluid path between the base and the complementary connector upon movement of the conduit portion through the septum.

According to an aspect of at least one embodiment, there is provided a medical fluid line connector comprising: a base having a cylindrical neck encircling a cylindrical space; a septum coupled to the cylindrical neck to seal the cylindrical space at a first end; a bayonet pin extending radially outward from the cylindrical neck; and a projection extending radially outward from the cylindrical neck, the projection being axially and circumferentially spaced from the bayonet pin, wherein the bayonet pin and the projection are arranged such that the bayonet pin slides axially into a proximal end of a first segment of a slot formed in a complementary connector as the projection is axially received by a recess of the complementary connector, and the bayonet pin slides circumferentially within a second segment of the slot as the projection slides circumferentially within the recess, wherein the bayonet pin and the projection are arranged such that the projection is circumferentially offset from a recess of a non-complementary connector when the bayonet pin is disposed in a first axially extending segment of a slot of the non-complementary connector such that the projection cannot be received in the recess

of the non-complementary connector as the bayonet pin slides axially within the first axially extending segment of the slot, and wherein the septum is configured to axially receive a conduit extending from the complementary connector and thereby permit fluid communication between the cylindrical space of the fluid line connector and the conduit of the complementary connector when the bayonet pin slides axially into the proximal end of the first segment of the slot and the projection is axially received by the recess of the complementary connector.

According to an aspect of at least one embodiment, there is provided a medical fluid line connector assembly comprising: a first medical fluid line connector comprising: a first base having a cylindrical neck encircling a cylindrical space; a septum coupled to the cylindrical neck to seal the cylindrical space at a first end; a bayonet pin extending radially outward from the cylindrical neck; and a projection extending radially outward from the cylindrical neck, the projection being axially and circumferentially spaced from the bayonet pin; and a second medical fluid line connector configured to be releasably coupled to the first medical fluid line connector, the second medical fluid line connector comprising: a second base; a conduit portion having a peripheral sidewall axially extending from the second base; and a shroud extending axially from the second base, the shroud positioned circumferentially about the peripheral sidewall of the conduit portion, the shroud defining: a slot configured to receive the bayonet pin, the slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends in an axial direction from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and a recess configured to axially receive the projection and to allow the projection to slide circumferentially within the recess, the recess extending circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot, wherein the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess, wherein the slot and the recess

are arranged such that a projection of a non-complementary connector is circumferentially offset from the recess when a bayonet pin of the non-complementary connector is disposed in the slot such that the projection cannot be received in the recess as the bayonet pin slides axially within the first segment of the slot, and wherein the conduit portion of the second medical fluid line connector is configured to move axially through the septum of the first medical fluid line connector upon sliding the bayonet pin into the proximal end of the first segment of the slot and sliding the projection axially into the recess, and the conduit portion is configured to generate a fluid path between the first and second medical fluid line connectors upon movement of the conduit portion through the septum.

According to an aspect of at least one embodiment, there is provided a medical fluid line connector comprising: a base; a conduit portion having a peripheral sidewall extending axially from the base; and a shroud extending axially from the base, the shroud positioned circumferentially about the peripheral sidewall of the conduit portion, the shroud defining: a slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends axially from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and a recess that extends circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot, wherein the slot is configured to receive a radially extending bayonet pin of any of multiple different medical fluid line connectors, the recess is configured to axially receive a radially extending projection of any of the multiple different medical fluid line connectors and to allow the projection to slide circumferentially within the recess, and the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess, the projections of the multiple different medical fluid line connectors being located at different circumferential positions along those connectors, wherein the conduit portion is configured to move axially through a septum of one of the multiple different medical fluid line

connectors upon sliding the bayonet pin of the one of the multiple different medical fluid line connectors into the proximal end of the first segment of the slot and sliding the projection of the one of the multiple different medical fluid line connectors axially into the recess, and the conduit portion is configured to generate a fluid path between the base and the one of the multiple different medical fluid line connectors upon movement of the conduit portion through the septum.

According to an aspect of at least one embodiment, there is provided a method comprising: connecting a first medical fluid line connector, configured for coupling to each of multiple different second medical fluid line connectors, to one of the second medical fluid line connectors, the first medical fluid line connector comprising a shroud defining: a slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends axially from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and a recess that extends circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot, wherein the slot is configured to receive a radially extending bayonet pin of any one of the multiple different second medical fluid line connectors, the recess is configured to axially receive a radially extending projection of any one of the multiple different second medical fluid line connectors and to allow the projection to slide circumferentially within the recess, and the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess, wherein the projections of the multiple different second medical fluid line connectors are located at different circumferential positions along those connectors, and connecting the first medical fluid line connector to one of the multiple different second medical fluid line connectors comprises sliding the bayonet pin of the one of the multiple different second medical fluid line connectors into the slot of the first medical fluid line connector and rotating the first medical fluid line connector with respect to the one of the multiple different second medical

fluid line connectors such that the projection slides circumferentially within the recess.

BRIEF DESCRIPTION OF THE DRAWINGS

Further details and advantages of the invention will be explained in more detail with reference to an embodiment shown in the drawings. There are shown:

Figure 1: a perspective view of the base body of a connector part;

Figure 2: a perspective view of a septum;

Figure 3: a perspective representation of the additional part;

Figure 4: different views of the second connector part;

Figure 5: different views of a protective cap as an individual part and in the state placed on;

Figure 6: a perspective view of the second connector part with color coding ring;

Figure 7: different views of the connector in the locked and non-locked state;

Figure 8: a sectional representation through the connector in the locked state;

Figure 9: perspective representations of two connector parts which are not complementary; and

Figure 10: a representation of connector parts which are complementary to one another.

DETAILED DESCRIPTION

Figure 1 shows the base body 10 which forms the first connector part together with the additional part shown in Figure 3 (in the following: coding ring).

The second connector part is formed by the hose connector 40 shown in Figure 4.

The base body shown in Figure 1 remains the same in all variants of the connector.

This brings about the advantage that a possible contact with a medical solution or with a pharmaceutical is always only present with one component.

Since the color coding is carried out via the other connector components, namely via the coding ring 30 and the hose connector 40, any and all input by elutable or contact-active color granulates can be dispensed with in the base body 10 in accordance with Figure 1. In this manner, interactions between any color granulates and medical solutions are reduced to a minimum since there are no material variations in direct contact with the medicaments or solutions.

In Figure 1, the reference numeral 12 shows a break-off cone and the reference numeral 13 shows a hose seat (solution side) for plugging on a hose. These two parts form the solvent-contacting side.

The reference numeral 14 designates a grip surface of the base body or of the first connector element which is flattened and which predefines the correct connection position intuitively by its haptics and optics.

A preferably peripheral latch nose for the coding ring shown in Figure 3 is shown by the reference numeral 15. A weld connection is optionally also possible.

The reference numeral 16 designates the sealing surface for the sealing element shown by way of example in Figure 2.

The sealing element in accordance with Figure 2 having the reference number 20 can, for example, be a sealing disk of silicone, for example, which has a slit opening 22. Optional sealing elements are an O ring, a sealing disk or also an element of different elasticity.

A different design of the sealing element can generally also be realized or a double seal can also be realized by the introduction of a further sealing element, which is, however, accompanied by an increased effort and increased costs.

The reference numeral 30 in Figure 3 designates the coding ring which is placed on the section of the base body shown at the left in Figure 1.

The coding ring satisfies the functions of the mechanical coding with the hose connector shown in Figure 4, a color coding as well as the pressing and holding of the sealing element, preferably without welding or adhesive bonding.

A securing against rotation of the coding ring 30 is given by the geometry of the latch noses 15 or of the weld noses and of the openings 32 of the coding ring. The coding ring is preferably non-releasably snapped onto the base body 10 or is welded or otherwise fixed there by the corresponding shape of the latch noses at the base body.

In Figure 3, the reference numeral 31 shows coding pins, i.e. the projections in the sense of the invention whose positions can vary from connector to connector.

These coding pins extend, as can be seen from Figure 3, in the longitudinal direction of the coding ring 30, on the one hand, and in the peripheral direction, on the other hand.

The reference numeral 32 designates the opening for the latch noses 15 of the base body 10 and simultaneously serve as a security against rotation of the coding ring 30.

A pin for the bayonet connector is characterized by the reference numeral 33 which cooperates with a groove of the hose connector 40 in accordance with Figure 4 and so forms the closure element.

A ring of the coding ring 30, also visible in the connected state, which serves the color coding is designated by the reference numeral 34. The total coding ring 30 is preferably colored.

The reference numeral 35 finally designates a pressing surface which is inwardly disposed and which serves the pressing of the sealing element which in turn contacts the sealing surface 16 of the base body 10 in accordance with Figure 1. The sealing element is thus pressed between the base body and the coding ring.

A recess which serves as a contact protection of the sealing element is designated by the reference numeral 36.

The connection is unambiguous and non-confusable due to the coloring and due to the mechanical coding.

As stated above, Figure 4 shows the hose connector which forms the counter piece to the base body 10 and to the coding ring 30.

Only the respective correct hose connector preferably fits onto the correspondingly matching coding ring 30. The feedback of a performed and secure connection takes place both visually and acoustically as well as haptically.

As can be seen from Figure 4, the coding ring has flattened grip surfaces 41 which intuitively predefine the correct connection position. In the connected state, these grip surfaces lie in one plane with the corresponding surfaces 14 of the base body 10.

The reference numeral 42 characterizes the receiver in the sense of the present invention which is configured as an inwardly disposed cut-out which extends in the peripheral direction.

This cut-out serves for the reception of the coding pins 31 of the coding ring 30. Their position can vary from connector to connector.

An aperture for the pin 33 of the bayonet connection at the coding ring 30 is designated by the reference numeral 43. As can be seen from Figure 4, the groove for receiving the pin 33 extends in the longitudinal direction of the hose connector, on the one hand, and in the radial direction, on the other hand.

Latch elements are designated by the reference numeral 44 which serve the securing of the connection against a self-release of the connection and for the visual and haptic feedback. It can thus easily be detected by a user that a latching and thus a sufficient locking has taken place.

The color coding which delivers an unambiguous association between the hose connector and the base body or the coding ring 30 can, for example, take place via a completely colored hose connector 40 which can have the same color as the coding ring 30 or also via a ring snapped on at one position or colored. What is important is a color association between the hose connector, on the one hand, and the first connector part, i.e. the base body or the coding ring 30, on the other hand.

A cone, i.e. the opening element in the sense of the present invention, is designated by the reference numeral 46. This cone serves the sealing of the connection with the aid of an elastic sealing element in accordance with Figure 2 at the base body.

A recess of the cone as a contact protection is provided with the reference numeral 47 and a chamfer for easier fine positioning is provided with the reference numeral 48.

The reference numeral 50 in Figure 5 designates a protective cap which can be placed onto the base body 10 provided with the coding ring 30. As can be seen from Figure 5, this protective cap 50 has a peripheral coding cut-out 51 so that the protective cap 50 can be placed onto any desired coding ring 30 and is thus universal. The use of a universal adapter would also be able to be realized using this principle, which universal adapter e.g. has the possibility of providing a standard Luer connection on all connectors.

Figure 5, right hand representation, shows a sectional representation and illustrates that a support of the sealing disk in accordance with Figure 2 takes place at the position 52 in order to hold the sealing disk closed, and thus leak tight, on non-use.

The hose connector, i.e. the second connector in accordance with the invention, is designated in Figure 6. As can be seen from Figure 6, a snapped-on color coding ring 60 is provided which may have a different color than the hose connector itself. If a monochrome coding or a coloring of the hose connector itself should not be sufficient, the color range can be extended as desired by one or more such color coding rings 60. This naturally does not only apply to the side of the hose connector, but also to the side of the base body or of the coding ring.

It would also be possible by this color coding in the form of the ring to dispense completely with colored plastics in the solution-contacting regions of the total connector.

The principle of the connection of the two connector parts can be seen from Figure 7.

In accordance with Figure 7, left hand representation, the latched connection or locking is open; and in Figure 7, right hand representation, it is closed.

As can be seen from Figure 7, right hand representation, the grip region of the first connector part and the grip region of the second connector part is in one plane in the locked or closed position. The grip region of the connector is thus designed

such that a preferred position in the fingers results ergonomically on grasping, i.e. a prepositioning in accordance with Figure 7, left hand representation. The right hand representation in Figure 7 is then reached by the rotary movement.

The locating of the latch elements is considerably facilitated by the prepositioning.

As can further be seen from Figure 7, both the first and the second connector parts have a bulgy region whose radius with respect to the connector axis is larger than the spacing of the grip regions with respect to the connector axis and which is designed as round. Both connector parts furthermore have one or more almost flat or planar regions which form the grip region and which are set back with respect to the outer periphery of the curved region. The fluting in the grip regions also provides grip with a moist connector. Introduction slopes at the caps facilitate the fine positioning.

As can be seen from Figure 7, right hand representation, the pin 33 of the coding ring 30 is received in the end region of the groove of the hose connector 40 in the locked position and is fixed there by the named latching elements. A visual control of the complete locking is also possible in this manner.

Figure 8 illustrates in a sectional representation that the cone 46 penetrates the sealing disk 20 and opens it at the position A in the connected and locked state so that a throughflow of the connector is possible.

The connector is thus correctly connected.

Figure 9 shows a situation in which two non-complementary connection parts, i.e. "wrong" connection parts, should be connected to one another.

As can be seen from Figure 9a, in this case a gap is present at the point B and, due to the fact that the pin 33 is not yet received in the part of the groove extending in the peripheral direction, a rotation is prevented.

As can be seen from Figure 9b, the cone in this case does not penetrate the sealing disk (cf. reference symbol C) so that no throughflow is possible.

The connection is prevented in that, in accordance with Figure 9c, the coding pins, i.e. the projections, are made wider than the receiver at the coding ring so that an introduction is not possible.

In contrast, Figure 10 shows an embodiment with complementary connector parts in which the coding pins 31 fit into the cut-out 42 so that the gap B can be overcome and the two connector parts can be completely pushed together and then rotated.

Further preferred properties and advantages of the connector in accordance with the invention will be described in more detail in the following:

There is a maximum mechanical security against confusion, i.e. no connection and no throughflow is possible with incorrect connector parts since the cone or the opening element stops in front of the sealing disk or the septum.

A secure handling is possible due to a color coding and due to the intuitive handling (generally of known bayonet connectors) with positioning aid by grip surfaces.

There is preferably no resilient element which engages directly at the pin as with a known bayonet connection. A resilience results by the septum which should not be understood as a resilient element in this sense.

On the disconnection, there is a drip protection and a throughflow barrier on a use of a sealing disk.

There is a contact protection due to the set-back sealing surfaces.

The color codings can be variable and can, for example, be formed by rings or other markings.

Only an unchanging component can be designed as contacting product in the long term without said component having color or material variations.

An accidental disconnection is prevented since latching elements and the sealing element prevent a sole turning back. A maximum security against disconnection on suddenly occurring tensile stresses is ensured by the principle of the bayonet connection. In contrast to a screw movement, no engaging around is preferably necessary on the closing of the connector. A rotation by a few degrees is sufficient.

This is also advantageous with respect to the fact that the hose is accordingly only twisted a little.

There are a defined end position of the latched connection, defined latching forces and a latched position with respect to the sealing elements in the interior of the connector.

The connection may not be made too light and also not too firm. It should be made such that it is not self-releasing and also not too firm so that it is generally non-releasable.

The feedback of a closed connector can be fed back visually by the position of the grip surfaces and by the visible bayonet connector. An acoustic and haptic feedback is also conceivable and advantageous by a latching of the closure.

Persons with poor eyesight can also operate the connector largely "blind" since it is not absolutely necessary to use a color coding for the correct connection. These persons can, for example, orient themselves on the orientation of the grip surfaces or also on the acoustic or haptic feedback of the complete locking.

The base body in accordance with Figure 1 and the universal protective cap in accordance with Figure 5 are preferably the same with all connectors; a cost

reduction is thus possible with very high unit volumes without compromises in security being present.

The same component is preferably always in contact with the solution.

The principle of the universal protective cap in accordance with Figure 5 can also be reworked to a universal adapter which fits on all connectors.

The coding ring in accordance with Figure 3 and the sealing element in accordance with Figure 2 are preferably fixed in their positions without adhesive bonding and welding, but only by non-releasable snap-in elements. Welding and adhesive bonding nevertheless remain an optional possibility of connection.

The number of possible permutations is theoretically unlimited due to the free number and positionability of the coding pins and is only restricted by the existing available space of the connector which is ultimately determined by the size of the connector.

By inserting e.g. a third coding pin, higher ranking solutions are also conceivable which fit a plurality of subgroups, but not all subgroups. It is thus conceivable, for example, that a connector A and a connector B are admittedly incompatible between one another, but that a "main key C" fits both on the connector A and on the connector B. The "general key D" can then in turn fit on all counter pieces.

The embodiment and a preferred aspect of the invention relate to a bayonet-like closing unit without a resilient element being necessary and relates to the mechanical coding of the connection by the coding pins.

The operation of the connector is self-explanatory, intuitive and secure against confusion and has a plurality of feedback options to the user whether the connection was closed correctly or not. Incorrect operations are also largely precluded with untrained technical personnel. The operability can also be carried

out intuitively for laymen and for blind persons, also for patients who connect themselves, e.g. in home dialysis.

As stated above, the number of possible codings is only restricted by the size of the connector. It is possible to use a connector as a general key to implement a plurality of main keys having subgroups in this type of coding.

The area of use of dialysis was stated above. The present invention is, however, not restricted to this area of use. A limitation to a medical indication is also not absolutely provided. The connection in accordance with the invention is conceivable wherever a connection of a line flowed through by fluid and/or gas is necessary in the low-pressure range with security against confusion and contact. It is not significant in this respect whether the principle is applied by a connector used once or used a plurality of times.

The advantages of the connector can be named as follows in dependence on the embodiment:

- Maximum mechanical swappability, i.e. no connection and no throughflow is possible with incorrect connection partners since the cone stops in front of the sealing disk.
- Color coding
- Intuitive handling (principle of bayonet connector is familiar to everyone and is visible at first glance. The user has positioning assistance by predefined grip surfaces)
- No resilient element of separate design required (on use of a sealing disk, however, a slight resilient effect occurs which can by all means be of advantage for the handling of the connector)
- Drip protection and throughflow block on disconnection (on use of a sealing disk)
- Contact protection due to set-back sealing surfaces (with respect to standard Luer connections)
- Variable color coding (optional)

- Only one component is present with long-term product contact and can always have the same design for different connectors with different color and/or material variations
- No accidental disconnection possible since latch noses and the sealing element prevent a sole turning back. Maximum security against disconnection is ensured on suddenly occurring tensile stresses due to the principle of the bayonet connection
- In contrast to a screw movement, no engaging around is necessary on the closing of the connector
- The hose is only twisted by a few degrees
- There are a defined end position of the latched connection, defined latching forces and a latched position with respect to the sealing elements in the interior of the connector
- Visual feedback of a closed connector by the aligned position of the grip surfaces and due to the visible bayonet connection
- Acoustic feedback; the closure latches audibly
- Haptic feedback; the closure latches tangibly
- People with poor eyesight can also operate the connector "blind". It is not absolutely necessary to recognize the color coding of the connector for the correct connection.
- The base body and the universal protective cap or additional part are the same for all connectors so that a cost reduction is possible with very high unit volumes without endangering safety
- Design of a universal protective cap or of a universal adapter is possible for all color and coding variations
- The coding ring and the sealing element can be fixed at their position without adhesive bonding and welding, but rather only by non-releasable snap-in elements (welding and adhesive bonding remains an optional possibility for the connection, however).

CLAIMS

1. A medical fluid line connector comprising:

a base;

a conduit portion having a peripheral sidewall extending axially from the base; and

a shroud extending axially from the base, the shroud positioned circumferentially about the peripheral sidewall of the conduit portion, the shroud defining:

a slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends axially from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and

a recess that extends circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot,

wherein the slot is configured to receive a radially extending bayonet pin of a complementary connector, the recess is configured to axially receive a radially extending projection of the complementary connector and to allow the projection to slide circumferentially within the recess, and the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess,

wherein the slot and the recess are arranged such that a projection of a non-complementary connector is circumferentially offset from the recess when a bayonet pin of the non-complementary connector is disposed in the slot such that the projection cannot be received in the recess as the bayonet pin slides axially within the first segment of the slot, and

wherein the conduit portion is configured to move axially through a septum of the complementary connector upon sliding the bayonet pin into the

proximal end of the first segment of the slot and sliding the projection axially into the recess, and the conduit portion is configured to generate a fluid path between the base and the complementary connector upon movement of the conduit portion through the septum.

2. The medical fluid line connector according to claim 1, wherein the slot and the recess are arranged such that the projection of the non-complementary connector abuts a distal end of the sidewall portion adjacent the recess when the bayonet pin slides toward the distal end of the first segment of the slot.

3. The medical fluid line connector according to claim 1, wherein the slot and the recess are arranged such that the bayonet pin of the non-complementary connector cannot enter the second segment of the slot.

4. The medical fluid line connector according to claim 1, wherein the conduit portion is conical.

5. The medical fluid line connector according to claim 1, wherein the base is fluidly coupled to a medical fluid bag.

6. The medical fluid line connector according to claim 1, wherein the recess extends along an entire circumference of the sidewall portion.

7. The medical fluid line connector according to claim 1, wherein the base includes spaced apart gripping regions.

8. The medical fluid line connector according to claim 7, wherein the spaced apart gripping regions are positioned opposite one another.

9. The medical fluid line connector according to claim 8, wherein the spaced apart gripping regions are configured to be axially aligned with a second set of

gripping regions on the complementary connector when the bayonet pin is moved to a terminal point in the second segment of the slot.

10. A medical fluid line connector comprising:

a base having a cylindrical neck encircling a cylindrical space;

a septum coupled to the cylindrical neck to seal the cylindrical space at a first end;

a bayonet pin extending radially outward from the cylindrical neck; and

a projection extending radially outward from the cylindrical neck, the projection being axially and circumferentially spaced from the bayonet pin,

wherein the bayonet pin and the projection are arranged such that the bayonet pin slides axially into a proximal end of a first segment of a slot formed in a complementary connector as the projection is axially received by a recess of the complementary connector, and the bayonet pin slides circumferentially within a second segment of the slot as the projection slides circumferentially within the recess,

wherein the bayonet pin and the projection are arranged such that the projection is circumferentially offset from a recess of a non-complementary connector when the bayonet pin is disposed in a first axially extending segment of a slot of the non-complementary connector such that the projection cannot be received in the recess of the non-complementary connector as the bayonet pin slides axially within the first axially extending segment of the slot, and

wherein the septum is configured to axially receive a conduit extending from the complementary connector and thereby permit fluid communication between the cylindrical space of the fluid line connector and the conduit of the complementary connector when the bayonet pin slides axially into the proximal end of the first segment of the slot and the projection is axially received by the recess of the complementary connector.

11. The medical fluid line connector according to claim 10, wherein the bayonet pin and the projection are arranged such that the projection abuts a distal end

of a sidewall portion adjacent the recess of the non-complementary connector when the bayonet pin slides toward an end of the first axially extending segment of the slot.

12. The medical fluid line connector according to claim 10, wherein the bayonet pin and the projection are arranged such that the bayonet pin cannot enter a second circumferentially extending segment of the slot of the non-complementary connector.

13. The medical fluid line connector according to claim 10, wherein the bayonet pin and the projection are positioned on a collar coupled to the cylindrical neck such that the collar is coaxial with the cylindrical neck.

14. The medical fluid line connector according to claim 13, wherein the collar is removably coupled to the cylindrical neck.

15. The medical fluid line connector according to claim 10, wherein the neck further comprises a tapered tab extending circumferentially along an outer wall of the cylindrical neck and the collar comprises a tapered slot extending circumferentially through the collar to receive the tapered tab.

16. The medical fluid line connector according to claim 10, wherein the base is fluidly coupled to a medical fluid bag.

17. A medical fluid line connector assembly comprising:

a first medical fluid line connector comprising:

a first base having a cylindrical neck encircling a cylindrical space;

a septum coupled to the cylindrical neck to seal the cylindrical space at a first end;

a bayonet pin extending radially outward from the cylindrical neck; and

a projection extending radially outward from the cylindrical neck, the projection being axially and circumferentially spaced from the bayonet pin; and

a second medical fluid line connector configured to be releasably coupled to the first medical fluid line connector, the second medical fluid line connector comprising:

a second base;

a conduit portion having a peripheral sidewall axially extending from the second base; and

a shroud extending axially from the second base, the shroud positioned circumferentially about the peripheral sidewall of the conduit portion, the shroud defining:

a slot configured to receive the bayonet pin, the slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends in an axial direction from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and

a recess configured to axially receive the projection and to allow the projection to slide circumferentially within the recess, the recess extending circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot,

wherein the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess,

wherein the slot and the recess are arranged such that a projection of a non-complementary connector is circumferentially offset from the recess when a bayonet pin of the non-complementary connector is disposed in the slot

such that the projection cannot be received in the recess as the bayonet pin slides axially within the first segment of the slot, and

wherein the conduit portion of the second medical fluid line connector is configured to move axially through the septum of the first medical fluid line connector upon sliding the bayonet pin into the proximal end of the first segment of the slot and sliding the projection axially into the recess, and the conduit portion is configured to generate a fluid path between the first and second medical fluid line connectors upon movement of the conduit portion through the septum.

18. The medical fluid line connector according to claim 17, wherein the slot and the recess are arranged such that the projection of the non-complementary connector abuts a distal end of the sidewall portion adjacent the recess when the bayonet pin slides toward the distal end of the first segment of the slot.

19. The medical fluid line connector according to claim 17, wherein the slot and the recess are arranged such that the bayonet pin of the non-complementary connector cannot enter the second segment of the slot.

20. The medical fluid line connector according to claim 17, wherein at least one of the first base and the second base are fluidly coupled to a medical fluid bag.

21. A medical fluid line connector comprising:

a base;

a conduit portion having a peripheral sidewall extending axially from the base; and

a shroud extending axially from the base, the shroud positioned circumferentially about the peripheral sidewall of the conduit portion, the shroud defining:

a slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends axially from a distal end of

the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and

a recess that extends circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot,

wherein the slot is configured to receive a radially extending bayonet pin of any of multiple different medical fluid line connectors, the recess is configured to axially receive a radially extending projection of any of the multiple different medical fluid line connectors and to allow the projection to slide circumferentially within the recess, and the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess, the projections of the multiple different medical fluid line connectors being located at different circumferential positions along those connectors,

wherein the conduit portion is configured to move axially through a septum of one of the multiple different medical fluid line connectors upon sliding the bayonet pin of the one of the multiple different medical fluid line connectors into the proximal end of the first segment of the slot and sliding the projection of the one of the multiple different medical fluid line connectors axially into the recess, and the conduit portion is configured to generate a fluid path between the base and the one of the multiple different medical fluid line connectors upon movement of the conduit portion through the septum.

22. A method comprising:

connecting a first medical fluid line connector, configured for coupling to each of multiple different second medical fluid line connectors, to one of the second medical fluid line connectors, the first medical fluid line connector comprising a shroud defining:

a slot extending radially through a sidewall portion of the shroud, the slot having a first segment that extends axially from a distal end of the shroud toward a proximal end of the shroud, and a second segment that extends circumferentially from the first segment of the slot, and

a recess that extends circumferentially along an inner surface of the sidewall portion of the shroud, the recess extending proximally from the distal end of the shroud, the recess being distal to the second segment of the slot,

wherein the slot is configured to receive a radially extending bayonet pin of any one of the multiple different second medical fluid line connectors, the recess is configured to axially receive a radially extending projection of any one of the multiple different second medical fluid line connectors and to allow the projection to slide circumferentially within the recess, and the slot and the recess are arranged such that the bayonet pin slides axially into a proximal end of the first segment of the slot as the projection is axially received by the recess, and the bayonet pin slides circumferentially within the second segment of the slot as the projection slides circumferentially within the recess,

wherein the projections of the multiple different second medical fluid line connectors are located at different circumferential positions along those connectors, and connecting the first medical fluid line connector to one of the multiple different second medical fluid line connectors comprises sliding the bayonet pin of the one of the multiple different second medical fluid line connectors into the slot of the first medical fluid line connector and rotating the first medical fluid line connector with respect to the one of the multiple different second medical fluid line connectors such that the projection slides circumferentially within the recess.

FIG. 1

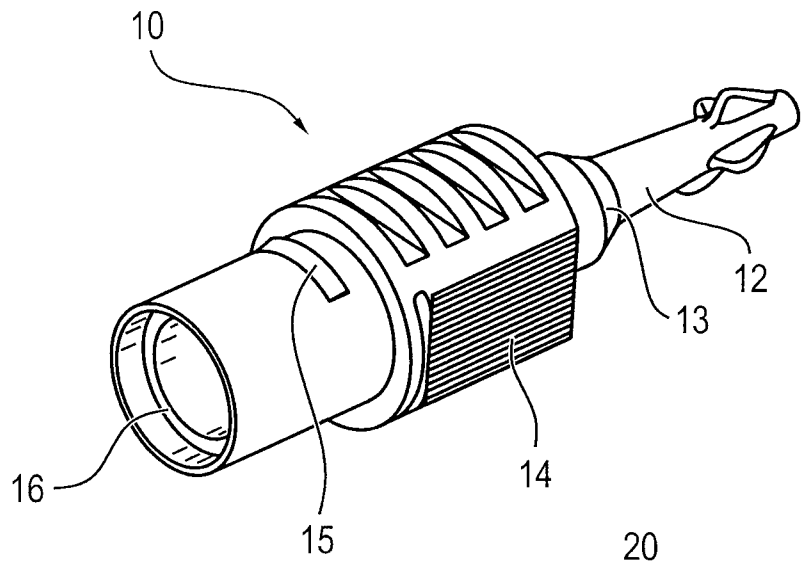


FIG. 2

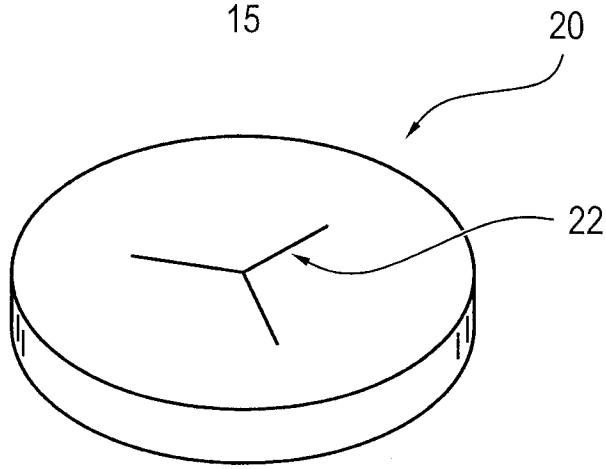


FIG. 3

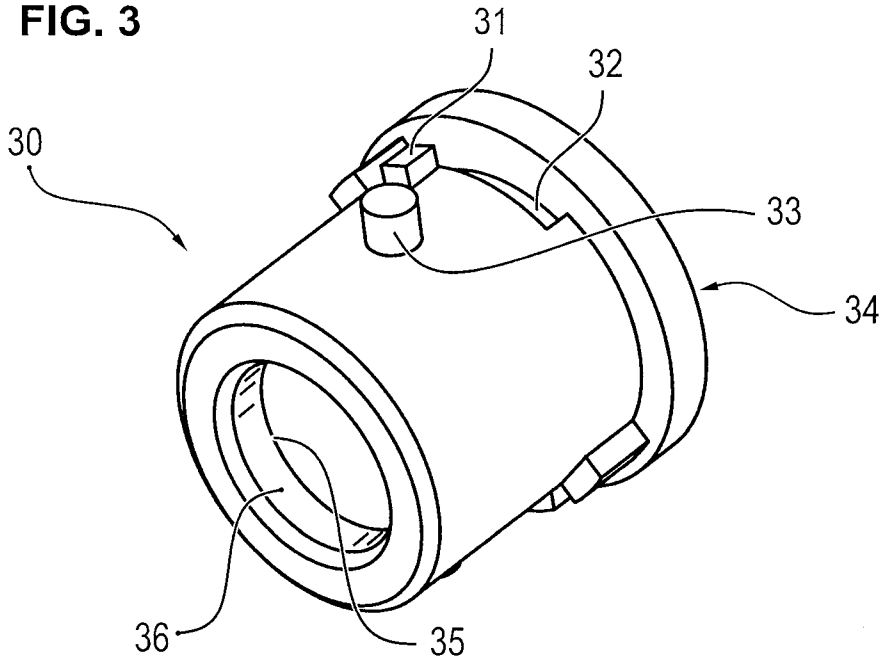
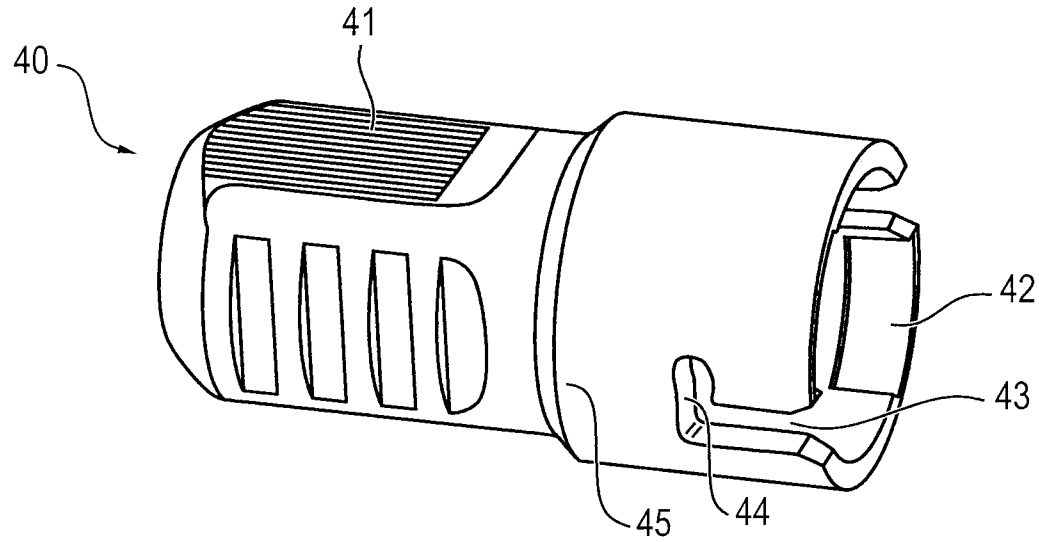


FIG. 4



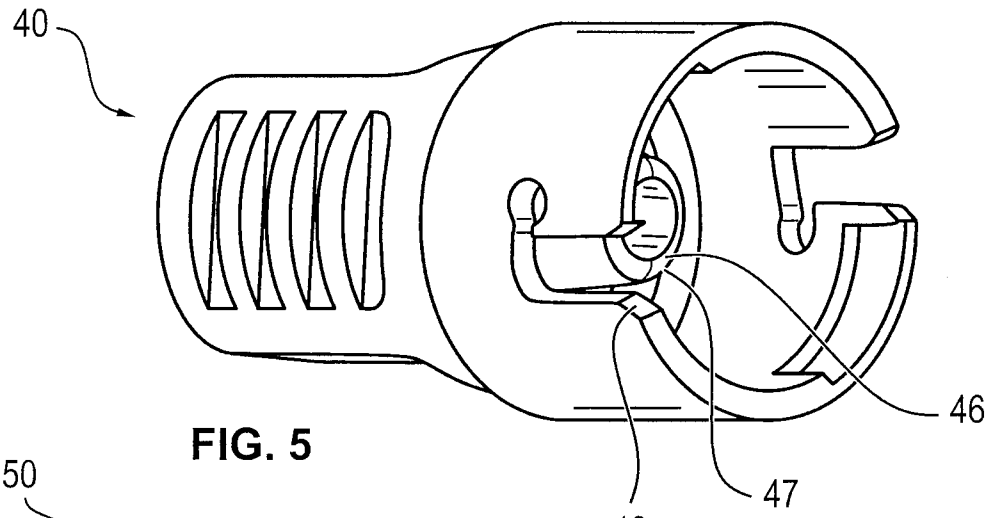


FIG. 5

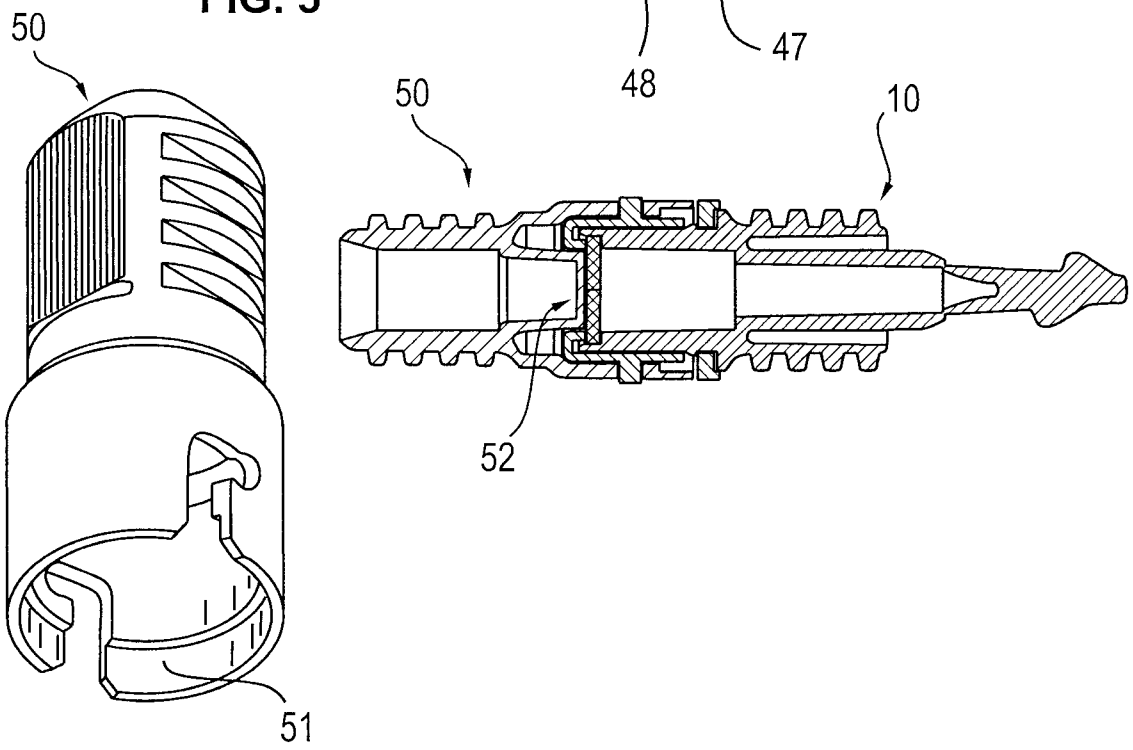


FIG. 6

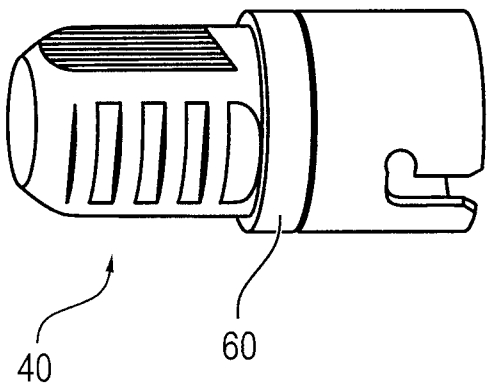


FIG. 7

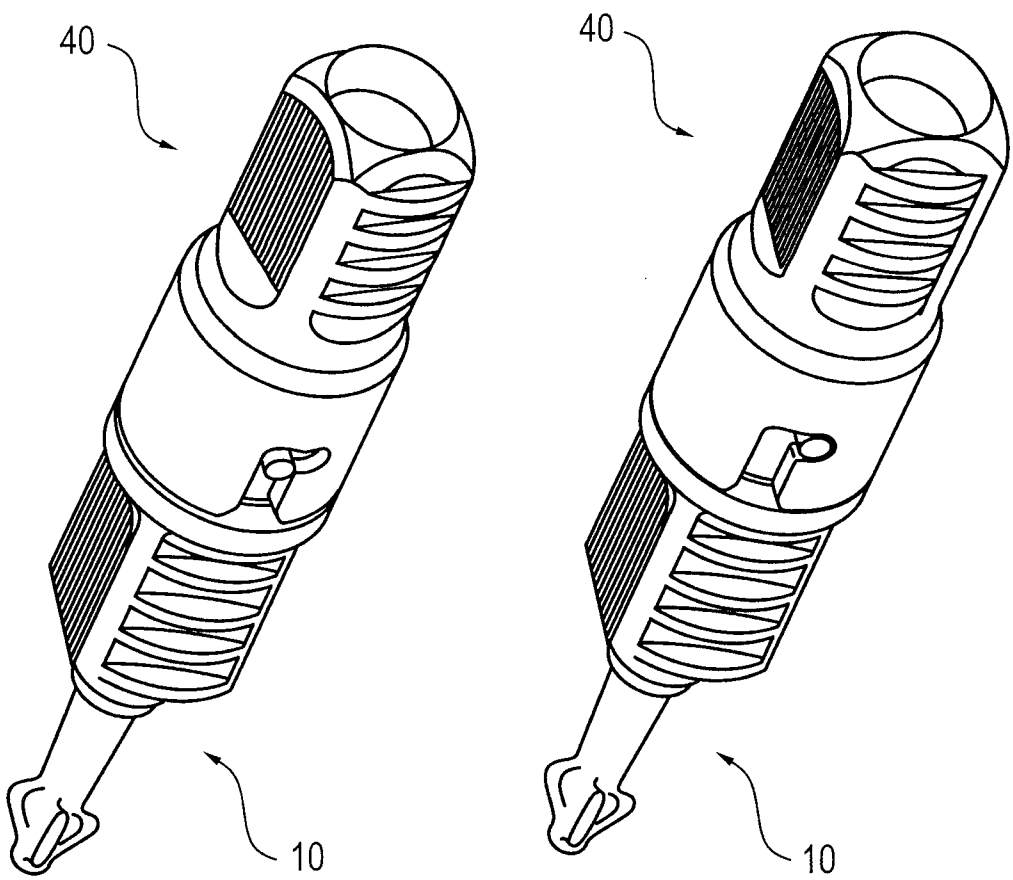


FIG. 8

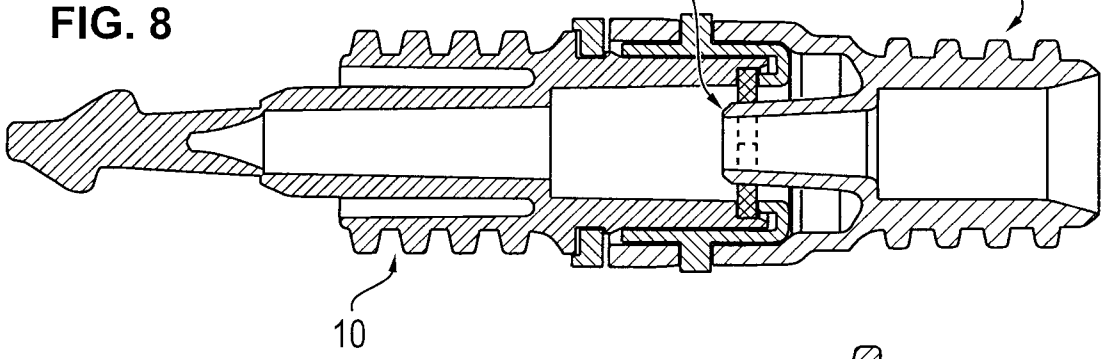


FIG. 9a

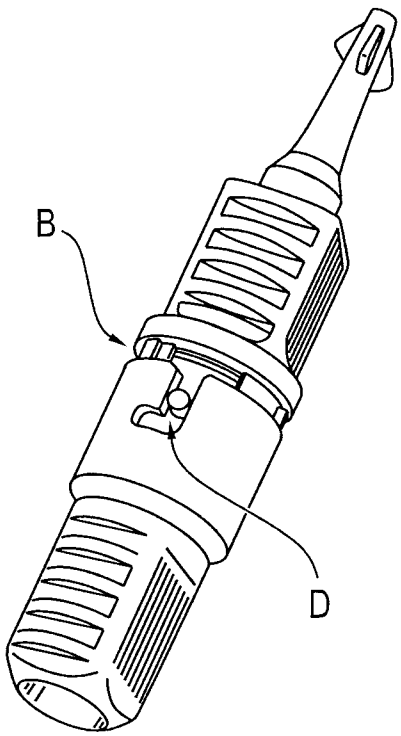


FIG. 9b

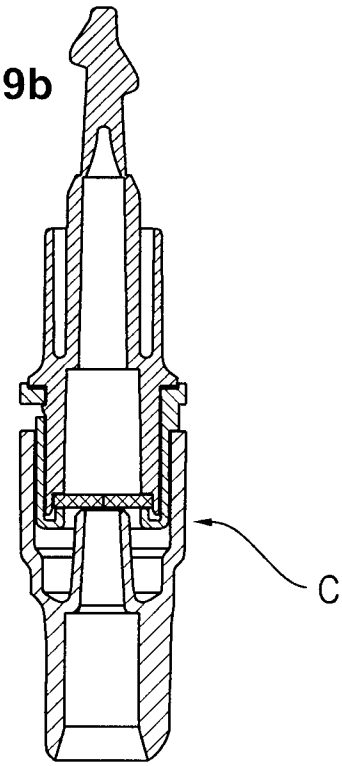


FIG. 9c

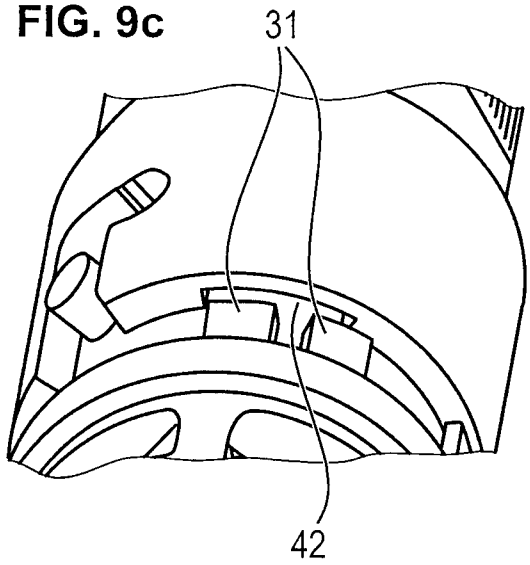
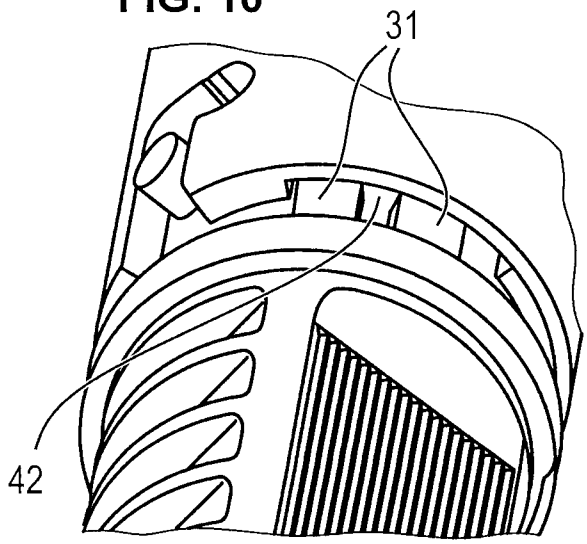
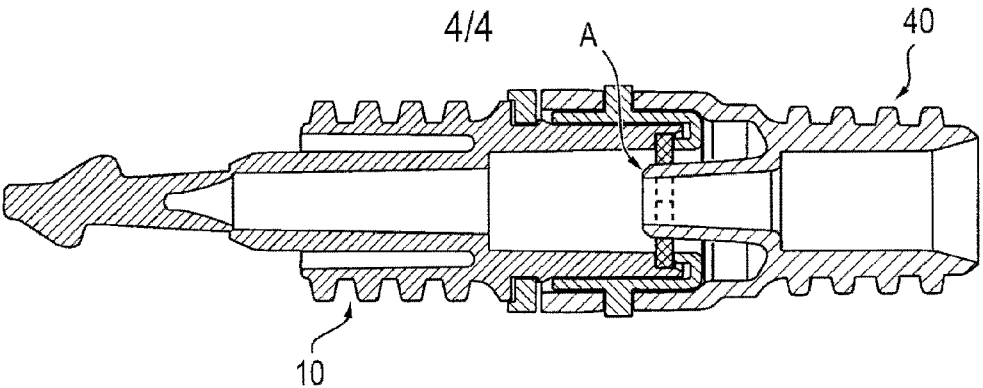


FIG. 10

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