

"Safety cap for medical devices"

Field of the invention

The present invention relates, in general, to
5 medical lines, and to containers for medicinal
substances, for example, chemotherapy and the like.

State of the art

In such applications, it is necessary to be able
to securely close the line or container so as to
10 prevent accidental openings and leakage of substances
that, if toxic, could lead to serious risks of
contamination.

The currently known closing systems are not free
from risks of accidental disengagement, which can also
15 be due to incorrect operation by the operators.

Summary of the invention

The object of the present invention is to provide
a safe and effective solution to this problem, whilst
at the same time being practical and functional.

20 According to the invention, this object is
achieved thanks to a safety cap for medical fluid lines
and the like, whose unique characteristic lies in the
fact that it comprises a hollow body within which a
connector is coaxially housed, accessible at one end of
25 the body and configured so as to obstruct the passage
through the body in an inviolable manner.
Unidirectional coupling means are provided to lock the
connector in rotation with respect to the body, in the
direction corresponding to the screwing of the
30 connector and a complementary connector to be coupled
therewith, and to allow the free rotation of said
connector in the opposite direction.

Thanks to this solution's idea, the invention
provides a closing cap having a very high degree of
35 safety against risks of undesired or accidental

openings, or due to incorrect operation.

The cap according to the invention may further comprise locking means designed to be positively operated to lock the connector in rotation with respect
5 to the body in the opposite direction of rotation, i.e. in the direction of unscrewing.

In a first embodiment of the invention, the connector of the cap is a male connector of the luer lock type or the like, having an internally threaded
10 outer hollow element of a known manner, and an inner hollow element. The latter has a transverse partition for closing the flow through the fitting.

In a second embodiment of the invention, the connector of the cap is a female connector of the luer
15 lock or the like, having an externally threaded hollow element, which has a transverse partition for closing the flow through the fitting.

Brief description of the drawings

The invention will now be described in detail with
20 reference to the accompanying drawings, provided purely by way of non-limiting example, in which:

- Figure 1 is a schematic elevational side view of a safety cap according to a first embodiment of the invention,
- 25 - Figure 2 is an axial section view according to the line C-C of Figure 1,
- Figure 3 is a cross sectional view according to the line B-B of Figure 1,
- Figure 4 is a cross sectional view according to
30 the line A-A of Figure 1,
- Figure 5 is a cross sectional view according to the line D-D of Figure 2,
- Figure 6 is a cross sectional view according to the line E-E of Figure 2,
- 35 - Figure 7 is an elevational side view of a second

embodiment of the cap according to the invention,

- Figure 8 is an axial section view according to the line C-C of Figure 7,

5 - Figure 9 is a cross sectional view along line B-B of Figure 7,

- Figure 10 is a cross sectional view along line A-A of Figure 7,

- Figure 11 is a cross sectional view along line D-D of Figure 8,

10 - Figure 12 is a cross sectional view along line E-E of Figure 8,

- Figure 13 is an elevational side view of a third embodiment of the cap according to the invention,

15 - Figure 14 is an axial section view according to the line C-C of Figure 13,

- Figure 15 is a cross sectional view along line B-B of Figure 14,

- Figure 16 is a cross sectional view along line A-A of Figure 13,

20 - Figure 17 is a cross sectional view along line D-D of Figure 14,

- Figure 18 is a cross sectional view along line E-E of Figure 14,

25 - Figure 19 is an elevational side view of a fourth embodiment of the cap according to the invention,

- Figure 20 is an axial section view according to the line C-C of Figure 19,

30 - Figure 21 is a cross sectional view along line B-B of Figure 19,

- Figure 22 is a cross sectional view along line A-A of Figure 19,

- Figure 23 is a cross sectional view along line D-D of Figure 20, and

35 - Figure 24 is a cross sectional view along line

E-E of Figure 20.

Detailed description of the invention

Referring initially to Figures 1 to 6, the safety cap according to a first embodiment of the invention is indicated with I and comprises an outer hollow body 1 of a generally cylindrical shape, within which a male connector 2 of the luer lock type and analogues is coaxially housed.

The male connector 2 is rotatably mounted relative to the body 1, with the limitations which will be discussed, and has a partly conventional structure. In detail, the male connector 2 comprises an inner tubular element 4 with a conical outer surface protruding from one end of the body 1, and an internally threaded outer hollow element 5, which extends towards the inside of the body 1 with a integral hollow sleeve-shaped appendage 6, locked axially within the body 1, which is conveniently formed from two half-shells joined together in an interlocking manner.

During use, the male connector 2 is intended to be coupled to a complementary female connector of the luer lock type or the like and, according to a first aspect of the invention, the inner tubular element 4 is closed at its free end by a transverse wall 7. Consequently, the flow passage through the cap I is permanently obstructed in an inviolable manner.

According to another aspect of the invention, the composite formed by the male connector 2 and the sleeve 6 is coupled in rotation in one direction with the body 1, and is freely rotatable in the opposite direction. However, as will become evident, the rotation in the opposite direction may also possibly be locked, but only following a positive command imparted manually.

In detail, and referring now to Figure 6, the hollow body 1 is internally formed, on the side of the

male connector 2, of a crown of elastically yielding ratchet teeth 12, cooperating by unidirectional coupling with corresponding projecting teeth 13 formed on the outside of the hollow element 5 of the male connector 2. The arrangement is such so that the hollow element 5, and therefore the entire male connector 2, is coupled in rotation with the hollow body 1 in the direction indicated by the arrow F in Figure 6, due to the effect of the engagement between the teeth 12 and 13. The direction of rotation F corresponds to the screwing of the male connector 2 and a complementary female connector, assuming the hollow body 1 is kept stationary, and then the complementary female connector is rotated to screw it into the male connector 2. In the opposite direction of rotation, or rather, the unscrewing direction, the male connector 2 is freely rotatable with respect to the hollow body 1, due to the bounce of the yielding teeth 12 on the teeth 13, so that the complementary female connector cannot unscrew itself.

Obviously, in the case in which the hollow body 1 rotates and the complementary female connector is kept stationary, the situation is reversed, i.e. the direction of screwing is opposite to that of the arrow F, and the unscrewing direction is that of the arrow F.

In this way, during use, an accidental disengagement or due to incorrect operation, between the male connector 2 and the complementary female connector is prevented.

The variant of the safety cap represented in Figures 7 to 12, indicated by II, is analogous to the embodiment shown previously, and only the differences will now be described in detail, using the same numerical references for identical or similar parts.

This variant is configured to allow rotation of

the male connector 2 corresponding to the unscrewing direction with respect to the complementary female connector but, as mentioned, only following a positive, or rather, voluntary operation. To this effect, the
5 wall of the hollow body 1 is formed with a pair of elastically yielding locking segments 14, whose free ends 15 are suitable for engaging, as a result of a thrust applied to the segments 14, respective
10 peripheral teeth formations 16 of the hollow appendage 6 (Figure 10), so as to lock the rotation of the male connector 2 with respect to the body 1.

The variants of the cap according to the invention illustrated in Figures 13-18 and in Figures 19-24, and indicated with III and IV, respectively, correspond to
15 the embodiments previously described with reference to Figures 1-6 and 7-12, respectively, with the only difference that the connector consists of a female connector 3, also of the luer-lock type and the like, instead of the male connector 2.

20 The female connector 3 is formed, in the usual manner, by an externally threaded tubular element with a conical inner surface, protruding from one end of the body 1 and, during use, is intended to be coupled to a complementary male connector of the luer-lock type or
25 the like.

The female connector 3 is internally closed by a transverse wall 7, so that the flow passage through the cap III is, in this case as well, permanently obstructed in an inviolable manner. Moreover, the
30 female connector 3 is integrally formed with a sleeve 9, analogous to the sleeve 6 of the preceding embodiments, locked axially in the body 1.

In a completely analogous manner to the embodiment already described, the composite formed by the female
35 connector 2 and the sleeve 9 is coupled in rotation in

one direction with the body 1 and is freely rotatable in the opposite direction. However, as will become evident, the rotation in the opposite direction may also possibly be locked, but only following a positive
5 command imparted manually.

In detail, and with reference to Figure 17, the female connector 3 is coupled in rotation with the hollow body 1 in the direction indicated by the arrow F, corresponding to the screwing of this female
10 connector 3 with a complementary male connector, rotating the hollow body 1, while it is normally freely rotatable in the opposite direction, or rather, in the unscrewing direction. To this effect, the hollow body 1, as for the embodiments previously described, is
15 formed with a series of elastically yielding ratchet teeth 12, cooperating by unidirectional coupling with corresponding projecting teeth 13 formed outside the female connector 3.

The variant illustrated in Figures 19 to 24 is
20 configured, in a manner corresponding to the embodiment of Figures 7 to 12, for possibly locking in rotation the female connector 3, with respect to the hollow body 1, in the direction opposite to that indicated by the arrow F, in this case as well, by a positive command
25 imparted manually. To this effect, the hollow body 1 of the cap IV is therefore formed with one or two pairs of elastically yielding locking segments 19, analogous to the yielding locking sectors 14, the free ends 20 of which are suitable for engaging respective peripheral
30 teeth formations 21 of the sleeve 9 (Figures 21 and 22).

Of course, the details of construction and the embodiments may be widely varied with respect to those described and illustrated, without departing from the
35 scope of the present invention as defined in the following claims.

Claims

1. Cap for medical fluid lines, comprising a hollow body (1) within which a connector (2; 3) accessible at one end of the body (1) is coaxially housed, and unidirectional coupling means (12, 13) to lock the connector (2; 3) in rotation with respect to the body (1) in the direction (F) corresponding to the screwing of said connector (2; 3) and a complementary connector to be coupled therewith, and to enable free rotation of said connector (2; 3) in the opposite direction, characterized in that said connector (2; 3) is configured so as to inviolably obstruct the passage through said body (1) permanently,

characterized in that it also comprises locking means (14, 16; 19, 21) designed to be positively operated to lock said connector (2; 3) in rotation with respect to the body (1) in said opposite direction,

characterized in that said locking means (14, 16; 19, 21) comprise one or two pairs of elastically yielding locking segments (14; 19) formed in a wall of the body (1), suitable for engaging the teeth (16; 21) formed on periphery of a sleeve (6; 9) of said connector (2; 3), and free ends (15; 20) of yielding locking segments (14; 19) are suitable for engaging the teeth (16; 21), as a result of a thrust applied to yielding locking segments (14; 19).

2. A cap according to claim 1, characterized in that said unidirectional coupling means comprise ratchet teeth (12, 13).

3. A cap according to claim 1 or 2, characterized in that the connector is a male connector (2) of the luer lock type or the like, having an internally threaded outer hollow element (5) and an inner hollow element (4) having a transverse partition (7) for

closing the flow through the cap (I; II).

4. A cap according to any one of claims 1 to 3,
characterized in that the connector is a female
connector (3) of the luer lock or the like having an
5 externally threaded hollow element and a transverse
partition (8) for closing the flow through the cap
(III; IV).

5. A cap according to any one of claims 1 to 4,
characterized in that the connector (2; 3) is
10 integrally formed with a sleeve (6; 9), axially locked
within said body (1).