



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
04.08.2010 Bulletin 2010/31

(51) Int Cl.:
B01L 3/14 (2006.01) B65D 51/00 (2006.01)

(21) Application number: **09150608.9**

(22) Date of filing: **15.01.2009**

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

(72) Inventor: **Rinaldo, Ruggero**
c/o Syntesys sas
35020, Masera' (PD) (IT)

(74) Representative: **Vinci, Marcello**
Ufficio Veneto Brevetti
Via Sorio 116
35141 Padova (IT)

(71) Applicant: **Syntesys sas**
35020 Masera' (PD) (IT)

(54) **Cap for repeated closing of test-tubes**

(57) A new external cap for repeated closing of preliminary test tubes (P) and/or other sample containers in general, comprising a single body with substantially cylindrical lateral wall (T1) suitable for containing the inlet (P1) of the test tube (P), with lower end (T2) open for insertion of said inlet (P1) and upper end (T3) closed by

a recessed wall (T4), said lateral wall (T1) and said upper closing wall (T4) having at least external shape and dimensions corresponding to the external shape and dimensions of the known piercable external caps, and wherein said cap (T) is suitable for being gripped and moved by the known equipment and instruments.

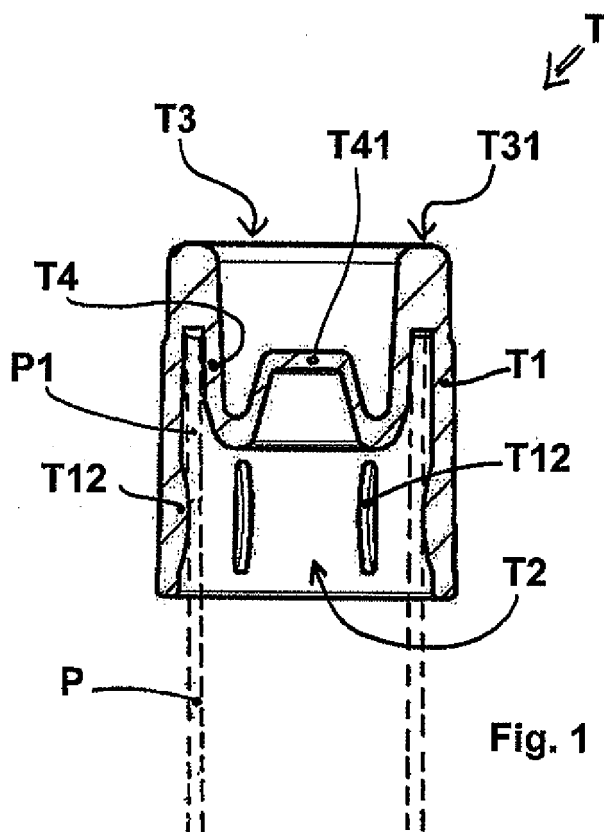


Fig. 1

Description

[0001] The present patent relates to caps for test tubes and containers in general for analysis laboratories and in particular concerns a new external cap for repeated closing of preliminary sample taking vacuum test tubes.

[0002] Preliminary sample taking test tubes are known, commonly used in numerous environments for the collection of samples of any type for analysis, for example in a medical-hospital, pharmaceutical or chemical context or in analysis laboratories in general.

[0003] Said sample taking test tubes comprise a glass or plastic tube with closed bottom and opposite upper end having an inlet for introduction of the sample.

[0004] Samples taken using a predetermined vacuum system are known, in which caps are used for closing said preliminary test tubes, said caps being of the type that can be pierced with ordinary injection needles to fill the test tube with the sample.

[0005] Piercable caps for vacuum test tubes of the so-called external type are known, said caps consisting substantially of two parts: a substantially cylindrical external part open at both ends, suitable for containing the inlet of the test tube and suitable for being connected to the inlet itself, for example by screw-tightening or pressing in, and an internal part which closes and seals said inlet; said internal part is made of rubber and can be easily pierced by the needle via which the sample to be analysed is introduced into said test tube.

[0006] Said rubber internal part has a surface which is recessed with respect to said external part of the cap and concave towards the inside of the test tube. This prevents the user from accidentally coming into contact with any sample that may have leaked out of the test tube.

[0007] The shape and external dimensions of said external caps are standardised so that the test tubes provided with said caps can be used in equipment and instruments for laboratory pre-analysis, archiving, etc. such as, but not limited to, the known instruments produced by companies such as Roche, Olympus, PVT, etc.

[0008] Said equipment and instruments comprise devices for gripping and moving said test tubes, said devices being programmed to grip closed test tubes having precisely predefined dimensions and shape.

[0009] If the dimensions or the shape of said test tubes and/or caps with which they are closed do not correspond to said predefined dimensions and shape, the equipment cannot grip and move said cap and/or test tube, which can therefore not be processed.

[0010] The requirement of analysis laboratories to provide for repeated closing of the preliminary sample taking test tubes with predetermined vacuum system, or vacuum test tubes, for example after the removal of said piercable external caps, is known.

[0011] Said requirement is established by the standards currently in force, such as the standards concerning safety at work, which prescribe the obligation to take all necessary measures to prevent possible contaminations

of the samples contained in the test tubes, which can occur for example by using unsuitable closing devices or caps, and to prevent the operator coming accidentally into contact with the substances contained in the test tubes.

[0012] External caps used for repeatedly closing preliminary sample taking vacuum test tubes are known, in which said external caps for repeated closing comprise one single substantially cylindrically shaped body, suitable for containing the inlet of the test tube, open at one end for insertion of the test tube inlet and closed at the opposite end by a circular wall which is flat or even slightly convex towards the outside.

[0013] Said external caps for repeated closing are generally also provided with easy opening, for example tabs protruding radially from the cylindrical wall and used for gripping and removal of the cap by the user.

[0014] Said caps for repeated closing do not have standardised shape and dimensions with respect to the at least external shape and dimensions of said piercable external caps of the known type, and therefore the test tubes provided with said caps cannot be inserted and processed in the known preanalytical or archiving equipment and instruments, which are sized according to the known piercable external caps, for example of the widely used Vacutainer type.

[0015] To remedy all the above-mentioned drawbacks, a new external cap for repeated closing of vacuum test tubes has been developed and produced.

[0016] The main aim of the present invention consists in the fact that it can be used on test tubes of the standard type so that they can be correctly processed in standard laboratory pre-analysis and/or archiving and/or analytical re-run equipment and instruments.

[0017] Said caps have external dimensions and shape substantially corresponding to those of the known piercable external caps, for example of the Vacutainer type.

[0018] The new external cap for repeated closing can have a diameter of 16 mm or a diameter of 13 mm or other dimensions compatible with sample taking test tubes of the known type, which can therefore be gripped and moved in the most common and widespread types of equipment and instruments.

[0019] The new cap is therefore compatible with said equipment and instruments and each test tube closed with said new cap can therefore be processed in said equipment and instruments.

[0020] A further advantage of the present invention is that it can be produced in any of the standard colours used for recognition of the type of sample contained and/or analysis to be performed or performed on said samples.

[0021] The test tubes closed with said new caps can therefore also be directed along automated paths with automatic recognition of the colour of the cap.

[0022] These and further objects, direct and complementary, are achieved by the new external cap for repeated closing of vacuum test tubes, comprising one sin-

gle body with a substantially cylindrical lateral wall suitable for containing the inlet of the test tube, with lower end open for the insertion of said inlet and opposite upper end closed by a wall, said wall being at least partially recessed with respect to the edge of said upper end, and in which said cap has at least external shape and dimensions corresponding to the at least external shape and dimensions of the first-use piercable external caps for test tubes, for example of the Vacutainer type.

[0023] The new cap is preferably made in one single body, in non-toxic plastic material in compliance with the FDA standards and correlated standards, including UNI CEI ISO, UNI CEI EN ISO, UNI EN.

[0024] The new cap, as mentioned, can be produced in any of the possible standard colours commonly used to identify the contents and/or the procedures to be performed, so that the test tubes with said new caps can also be used for example in automated processes with automatic recognition of the colour of the cap.

[0025] Said new caps therefore effectively ensure repeated closing of the test tubes, as required by the safety standards, and furthermore allow said test tubes to be used by standard equipment and instruments, of the most common and widespread type, sized to process test tubes provided with piercable external closing caps of the standard type, for example Vacutainer.

[0026] Said equipment and instruments for laboratory pre-analysis, archiving etc. can for example be used in the known instruments and equipment produced by manufacturers such as Roche, Olympus, PVT, etc.

[0027] The characteristics of the new cap will be better clarified by the following description with reference to the drawing attached by way of non-limiting example.

[0028] Figure 1 shows a section of the new cap (T), where the test tube (P) is shown by a broken line, while figure 2 shows a lateral view of the cap (T).

[0029] The new cap (T) for repeated closing of sample taking test tubes (P) is of the external type, i.e. comprising one single body with substantially cylindrical lateral wall (T1), suitable for externally enveloping the inlet (P1) of the test tube (P), with lower end (T2) open and upper end (T3) closed by a wall (T4).

[0030] Said wall (T4) is recessed with respect to the edges (T31) of said upper end and, in the preferred solution shown in figure 1, said wall (T4) is substantially concave with a raised central part (T41), i.e. it has a profile substantially reproducing the profile of the piercable part of the known piercable external caps of the Vacutainer type.

[0031] Said cylindrical lateral wall (T1) and said upper closing wall (T4) therefore have at least external shape and dimensions corresponding to the shape and dimensions of said known piercable external caps of the Vacutainer type.

[0032] Said cylindrical lateral wall (T1) can comprise external ribs (T11) to facilitate gripping by the operator and/or by equipment and instruments, and/or internal ribs or protrusions (T12) to increase the seal of the cap (T)

on the walls of the inlet (P1) of the test tube (P).

[0033] According to one possible embodiment, said cylindrical lateral wall (T1) of said new cap (T) has a diameter of 16 mm, i.e. is equal to the diameter of the known 16 mm piercable caps of the external type.

[0034] The new cap (T) therefore has dimensions compatible with the known test tubes (P) and with the most common and widespread equipment and instruments, such as those cited above.

[0035] According to a possible further embodiment, said cylindrical lateral wall (T1) of said new cap (T) has a diameter of 13 mm, i.e. equal to the diameter of the 13 mm known piercable caps of external type.

[0036] The new cap (T) therefore has dimensions compatible with the known test tubes (P) and with the most common and widespread equipment and instruments, such as those cited above.

[0037] Therefore with reference to the preceding description and to the accompanying drawing, the following claims are made.

Claims

1. External cap for repeated closing of preliminary sample taking test tubes (P) and/or other sample containers in general, comprising one single body with substantially cylindrical lateral wall (T1) suitable for containing the inlet (P1) of the test tube (P) and lower end (T2) open for the insertion of said inlet (P1) of the test tube (P), **characterised in that** the upper end (T3) of said cap (T) is closed by a wall (T4) substantially recessed with respect to the edge (T31) of said upper end (T3), said lateral wall (T1) and said upper closing wall (T4) having at least external shape and dimensions corresponding to the shape and dimensions of the known piercable external caps for test tubes (P) and wherein said cap (T), alone or combined with the relative test tube (P), is suitable for being gripped and moved by the equipment and instruments used with said known piercable external caps.
2. External cap for repeated closing of preliminary test tubes (P) and/or other sample containers in general, according to claim 1, **characterised in that** said cylindrical lateral wall (T1) of said new cap (T) has a diameter of 13 mm, i.e. equal to the diameter of the known 13 mm external piercable caps.
3. External cap for repeated closing of preliminary test tubes (P) and/or other sample containers in general, according to claim 1, **characterised in that** said cylindrical lateral wall (T1) of said new cap (T) has a diameter of 16 mm, i.e. equal to the diameter of the known 16 mm external piercable caps.
4. External cap for repeated closing of preliminary test

tubes (P) and/or other sample containers in general,
according to claim 1, 2 or 3,

characterised in that it comprises said wall (T4)
which is substantially concave with a raised convex
central part (T41).

5

5. External cap for repeated closing of preliminary test
tubes (P) and/or other sample containers in general,
according to claims 1, 2 or 3, 4, **characterised in**
that said cylindrical lateral wall (T1) comprises ex-
ternal ribs (T11) to facilitate gripping by the operator
and/or the equipment and instruments, and/or inter-
nal ribs or protrusions (T12) to increase the seal of
the cap (T) on the walls of the inlet (P1) of said test
tube (P).

10

15

20

25

30

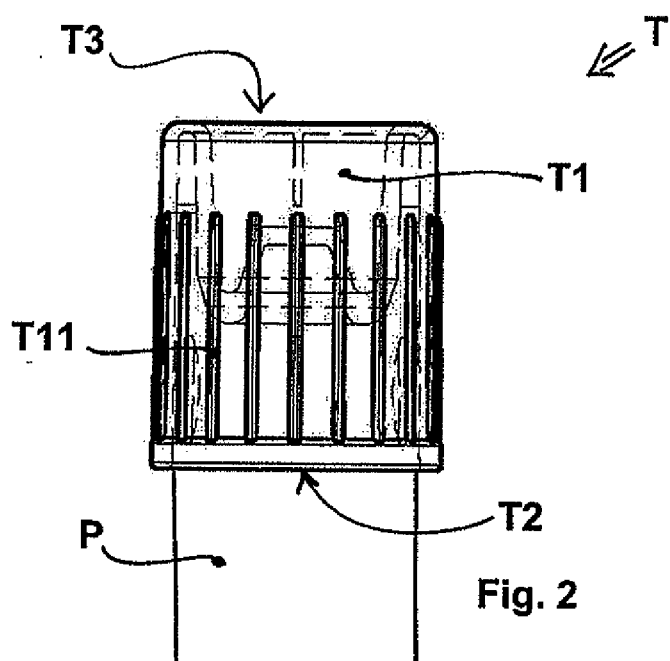
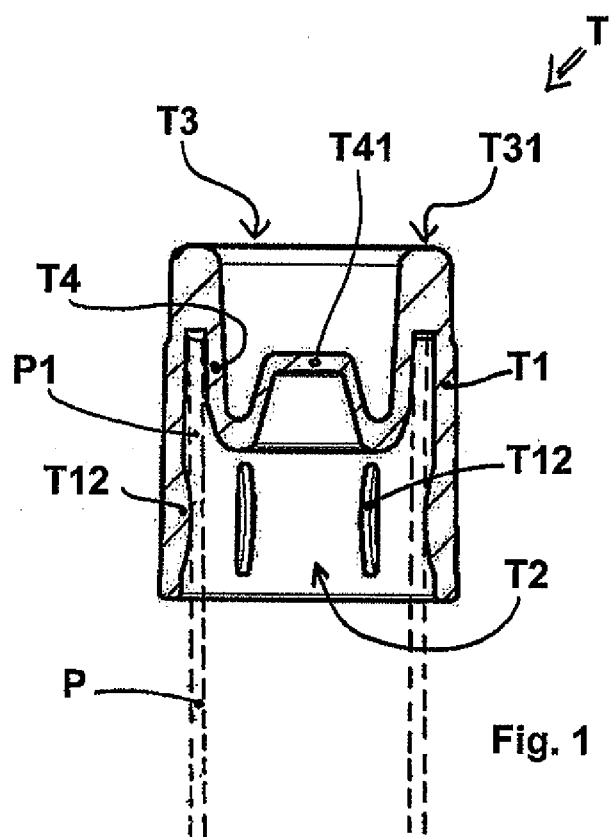
35

40

45

50

55





EUROPEAN SEARCH REPORT

Application Number
EP 09 15 0608

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	EP 1 082 998 A2 (BECTON DICKINSON CO [US]) 14 March 2001 (2001-03-14) * figure 5 *	1-5	INV. B01L3/14 B65D51/00
A	DE 195 19 886 A1 (BECTON DICKINSON CO [US]) 7 December 1995 (1995-12-07) * the whole document *	1-5	
A	DE 14 98 600 B1 (BECTON DICKINSON CO [US]) 26 March 1970 (1970-03-26) * the whole document *	1-5	
A	US 5 232 109 A (TIRRELL JOSEPH V [US] ET AL) 3 August 1993 (1993-08-03) * the whole document *	1-5	
A	US 4 664 274 A (KONRAD FRANZ [AT]) 12 May 1987 (1987-05-12) * the whole document *	1-5	
A	US 2007/187353 A1 (FOX WILLIAM A [US] ET AL) 16 August 2007 (2007-08-16) * the whole document *	1-5	
A	US 4 204 606 A (MICHELI ANTOINE [CH]) 27 May 1980 (1980-05-27) * the whole document *	1-5	B01L B65D
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 10 June 2009	Examiner Skowronski, Maik
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			

3
EPO FORM 1503 03.82 (P04C01)

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

EP 09 15 0608

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.

10-06-2009

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1082998	A2	14-03-2001	JP 2001057969 A	06-03-2001
			US 6426049 B1	30-07-2002
DE 19519886	A1	07-12-1995	FR 2722090 A1	12-01-1996
			JP 2648292 B2	27-08-1997
			JP 7333216 A	22-12-1995
			US 5511558 A	30-04-1996
DE 1498600	B1	26-03-1970	CH 410298 A	31-03-1966
			GB 984149 A	24-02-1965
			US 3136440 A	09-06-1964
US 5232109	A	03-08-1993	AT 142971 T	15-10-1996
			AU 669169 B2	30-05-1996
			AU 3993593 A	09-12-1993
			CA 2094565 A1	03-12-1993
			CZ 9301039 A3	15-12-1993
			DE 69304797 D1	24-10-1996
			DE 69304797 T2	03-04-1997
			DK 573102 T3	10-03-1997
			EP 0573102 A1	08-12-1993
			ES 2093913 T3	01-01-1997
			FI 932514 A	03-12-1993
			GR 3021977 T3	31-03-1997
			HU 3775 A1	28-02-1996
			IL 105868 A	18-03-1997
			JP 3549907 B2	04-08-2004
			JP 6099997 A	12-04-1994
			MX 9303240 A1	31-01-1994
			NO 931985 A	03-12-1993
			NZ 247767 A	26-09-1995
			RU 2118280 C1	27-08-1998
			SG 48121 A1	17-04-1998
			SK 55793 A3	12-01-1994
US 4664274	A	12-05-1987	AT 380392 B	12-05-1986
			AU 573418 B2	09-06-1988
			AU 5262186 A	31-07-1986
			EP 0189391 A2	30-07-1986
			JP 61170437 A	01-08-1986
			ZA 8600233 A	24-09-1986
US 2007187353	A1	16-08-2007	AU 2007214503 A1	23-08-2007
			CA 2642139 A1	23-08-2007
			CN 101415615 A	22-04-2009
			EP 1991472 A2	19-11-2008

EPO FORM P0459

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

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

EP 09 15 0608

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.

10-06-2009

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 2007187353 A1		KR 20080096822 A WO 2007095539 A2	03-11-2008 23-08-2007
US 4204606 A	27-05-1980	NONE	

EPO FORM P0459

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