US009714161B2

(12) **United States Patent**
Riggio

(10) **Patent No.: US 9,714,161 B2**
(45) **Date of Patent: Jul. 25, 2017**

(54) **FILLING DEVICE**

(71) Applicant: **SMI S.p.A.**, Bergamo (IT)

(72) Inventor: **Antonio Riggio**, Bergamo (IT)

(73) Assignee: **SMI S.p.A.**, Bergamo (IT)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 196 days.

(21) Appl. No.: **14/314,230**

(22) Filed: **Jun. 25, 2014**

(65) **Prior Publication Data**

US 2015/0013832 A1 Jan. 15, 2015

(30) **Foreign Application Priority Data**

Jul. 10, 2013 (IT) MI2013A001163

(51) **Int. Cl.**

B65B 31/00	(2006.01)
B67C 7/00	(2006.01)
B67C 3/00	(2006.01)
B67C 3/26	(2006.01)
B67C 3/28	(2006.01)
B67C 3/22	(2006.01)

(52) **U.S. Cl.**

CPC ***B67C 7/0073*** (2013.01); ***B67C 3/002*** (2013.01); ***B67C 3/26*** (2013.01); ***B67C 3/282*** (2013.01); ***B67C 3/286*** (2013.01); *B67C 2003/228* (2013.01)

(58) **Field of Classification Search**

CPC B67C 7/0073; B67C 3/282; B67C 3/002; B67C 3/286–3/288; B67C 3/26; B67C 2003/228; B67C 3/001–3/004; B65B 55/10

See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

1,364,555	A *	1/1921	Hunt	B65B 39/003 137/862
3,350,839	A *	11/1967	Carter	B67B 3/24 53/510
3,356,510	A *	12/1967	Barnby	B65B 55/02 141/11
3,498,508	A	3/1970	Francisoud et al.	
3,635,263	A *	1/1972	Jordon	B67C 3/2614 141/286
3,830,265	A *	8/1974	Matejek	B67C 3/08 137/170.1
4,976,295	A *	12/1990	Clusserath	B67C 3/06 141/39
4,982,768	A *	1/1991	Ahlers	B67C 3/10 141/301
4,989,650	A *	2/1991	Weiss	B67C 3/06 141/198

(Continued)

FOREIGN PATENT DOCUMENTS

DE	39 37 630 A1	6/1990
DE	42 19 082 A1	12/1993

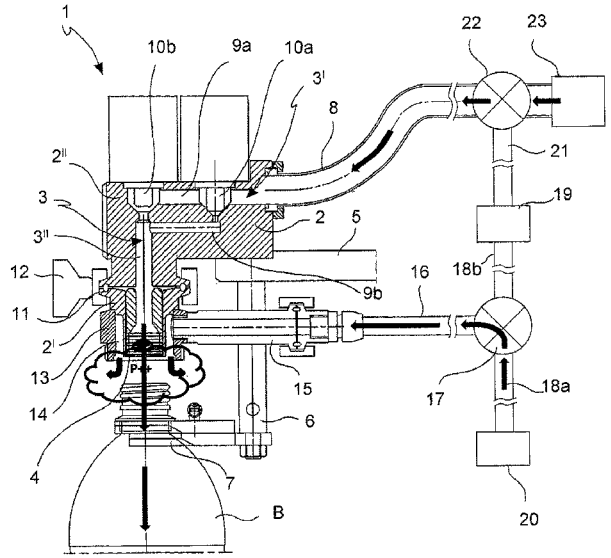
(Continued)

Primary Examiner — Timothy L Maust
Assistant Examiner — Randall Gruby
(74) *Attorney, Agent, or Firm* — Blank Rome LLP

(57) **ABSTRACT**

The present invention relates to a filling device for food product packaging plants in special containers. Particularly, the invention relates to a filling device of the electronic type, in which a contact between the valve and the container to be filled does not occur.

7 Claims, 3 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

5,377,726	A *	1/1995	Clusserath	B67C 3/286 141/261
5,558,135	A *	9/1996	Kronseder	B67C 3/10 141/39
6,082,418	A *	7/2000	Naecker	B65B 31/022 141/145
7,308,917	B2 *	12/2007	Krulitsch	B67C 3/26 141/198
7,469,726	B2 *	12/2008	Clusserath	B67C 3/04 141/144
7,571,749	B2 *	8/2009	Stocchi	B67C 3/004 141/105
7,650,916	B2 *	1/2010	Clusserath	B67C 3/002 141/198
8,590,581	B2 *	11/2013	Clusserath	B67C 3/001 141/9
8,833,407	B2 *	9/2014	Clusserath	B67C 3/2608 141/115
9,193,574	B2 *	11/2015	Krulitsch	B67C 3/26
9,205,937	B2 *	12/2015	Krulitsch	B67C 3/26
2003/0150517	A1 *	8/2003	Decarne	B67C 3/26 141/286
2005/0103399	A1 *	5/2005	Till	B65G 47/846 141/85
2005/0126118	A1 *	6/2005	Till	B67C 7/0086 53/167
2005/0241726	A1 *	11/2005	Clusserath	B67C 3/04 141/144
2007/0074783	A1 *	4/2007	Stocchi	B67C 3/004 141/264
2008/0223477	A1 *	9/2008	Stocchi	B67C 3/242 141/1
2009/0095370	A1 *	4/2009	Krulitsch	B67C 3/004 141/6
2009/0236007	A1 *	9/2009	Clusserath	B65B 3/26 141/9
2010/0037983	A1	2/2010	Hiroya et al.	
2010/0065150	A1 *	3/2010	Conforti	B67C 3/10 141/100
2010/0108180	A1 *	5/2010	Clusserath	B67C 3/004 141/1
2010/0132834	A1 *	6/2010	Cusserath	B67C 3/045 141/115
2010/0313959	A1 *	12/2010	Termansen	B65B 39/004 137/1
2011/0030843	A1 *	2/2011	Krulitsch	B67C 3/2614 141/311 R
2011/0039044	A1 *	2/2011	Clusserath	B67C 3/001 428/34.1
2011/0303325	A1 *	12/2011	Gras	B67C 3/007 141/105
2012/0186695	A1 *	7/2012	Clusserath	B67C 3/2608 141/115
2014/0366982	A1 *	12/2014	Clusserath	B67C 3/26 141/104
2016/0090290	A1 *	3/2016	Chapron	A01M 7/0085 141/65

FOREIGN PATENT DOCUMENTS

DE	10 2010 012 577	A1	9/2011
EP	2 439 169	A1	4/2012
WO	WO 2005/003018	A1	1/2005
WO	WO 2008/006446	A1	1/2008

* cited by examiner

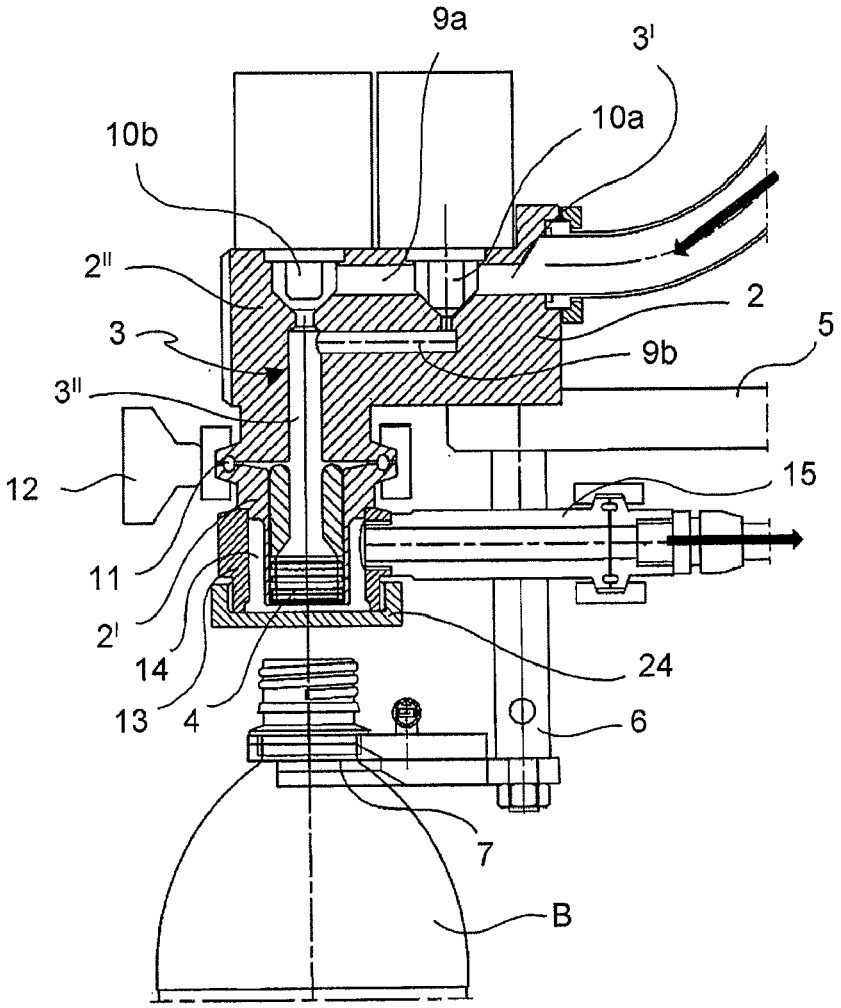


FIG. 1

PRIOR ART

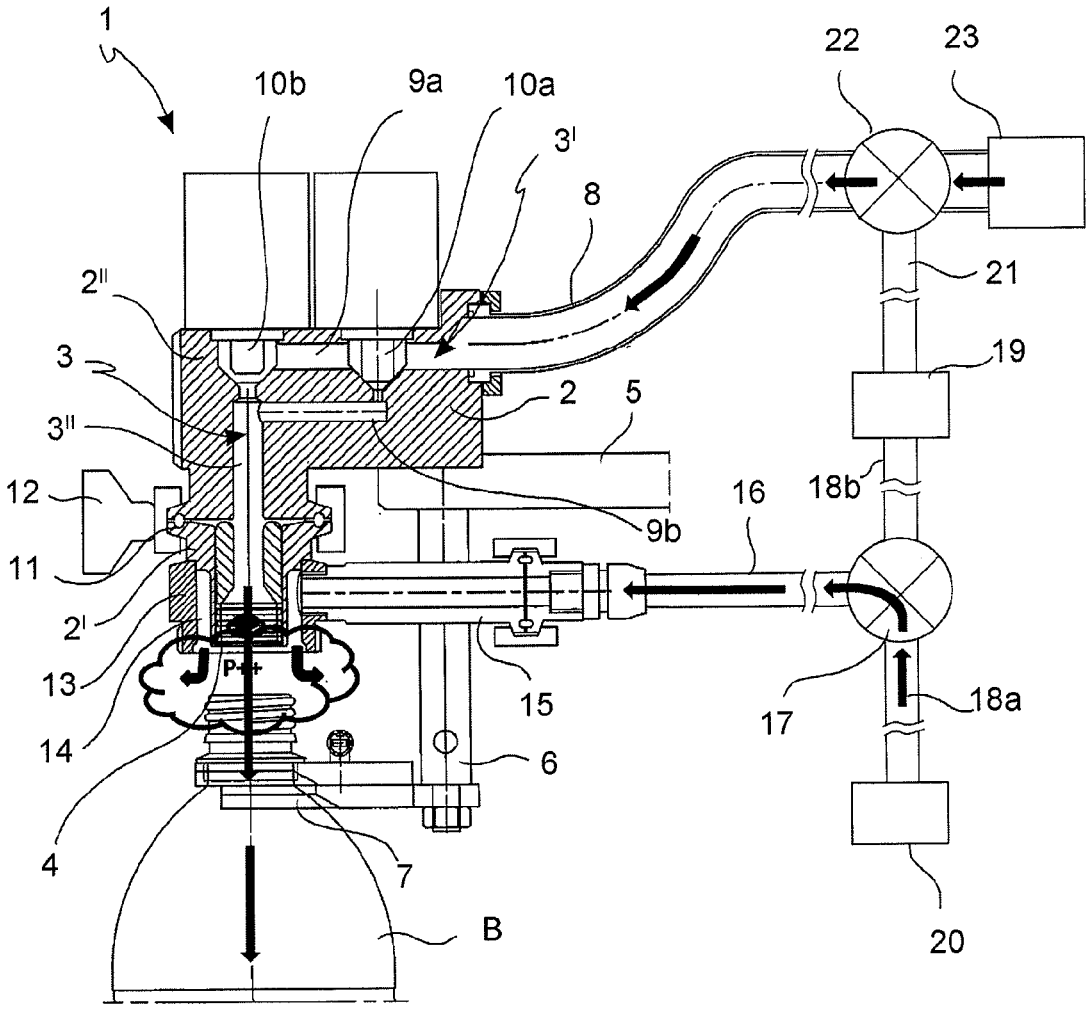

1
10b
9a
10a
3I
8
22
23
2II
21
3
19
2
5
3II
12
9b
16
18b
11
2I
13
P++
15
17
18a
14
6
4
7
B
20

FIG. 2

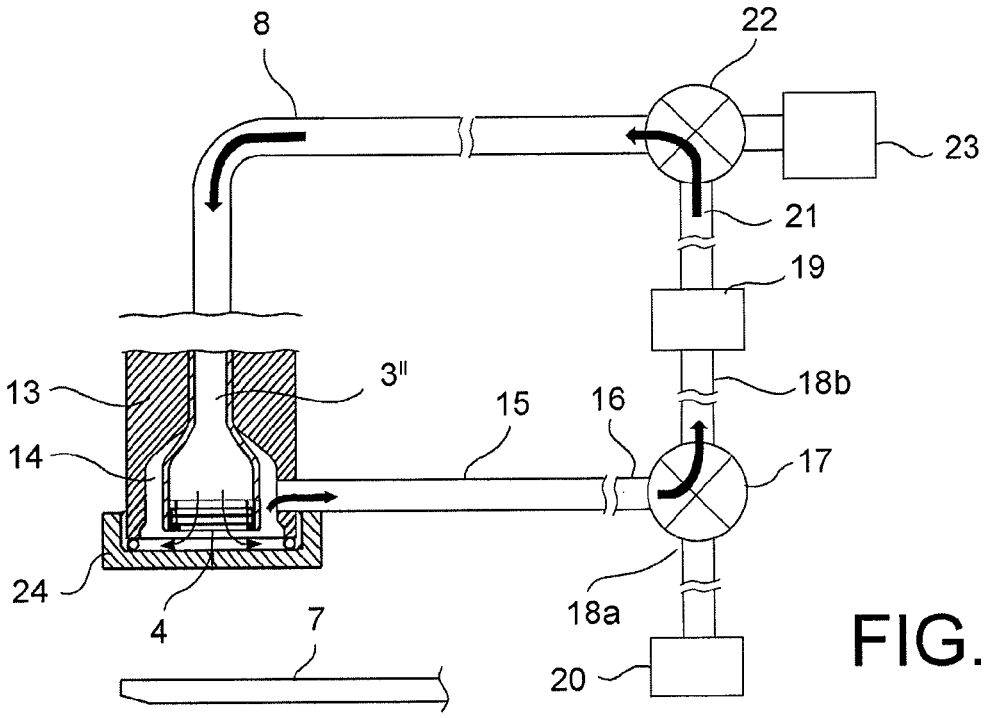

8
22
23
21
19
18b
3II
13
15
16
14
17
24
4
7
18a
20

FIG. 3

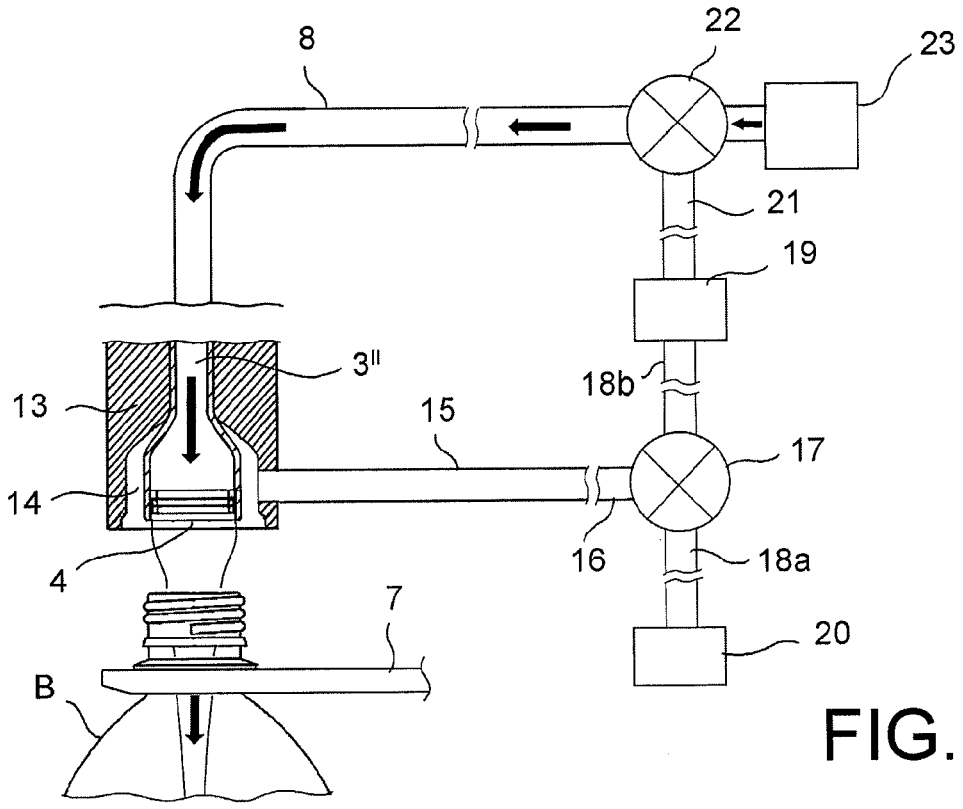

8
22
23
21
19
3II
18b
13
15
17
14
16
18a
4
7
20
B

FIG. 4

FILLING DEVICE

The present invention relates to a filling device for food product packaging plants in suitable containers. Particularly, the invention relates to a filling device of the electronic type, in which a contact between the valve and the container to be filled does not occur. Specifically, the invention relates to the beverage bottling field.

The filling valves of the state of the art may belong to two different types: mechanical valves and electronically controlled valves.

The former ones always provide a contact between the filling fluid dispensing nozzle and the bottle neck, necessary to be able to determine the bottle filling level and to stop the dispensed flow. A drawback of this type of valves is that, for example, in the case that a bottle should be contaminated for any reasons, such contamination could be transmitted to the valve itself, hence to the next containers. This is a severe problem, since the sanitization of valves, containers, and all the surrounding thereof is a considerably relevant aspect in the field.

Vice versa, the electronic valves do not provide for any direct contact with the bottle, thus eliminating the problem of the transmission of a possible contamination. However, this type of valves is also exposed to the risk of embedding into the dispensed flow entering the container possible corpuscles that are present in the environment.

In order to obviate this drawback, which may be present in all the types of filling machines, both mechanical and electronic ones, it is known to enclose the machine working area in a controlled atmosphere environment, in which a sterile air overpressure is created, so as to prevent air contaminated from the outside from accessing the working area. However, this solution, even if it is widely used, is burdensome due to the considerable volume that has to be kept under control, and in any case it does not ensure the complete absence of contaminations under many operative circumstances, such as, for example, an operator access into the filling machine operative area.

The attention for the sanitization of the working place and in particular of the filling device is a prominent aspect. An example of a prior art electronic valve is shown In FIG. **1**, in which a side duct connecting an annular chamber surrounding the dispensing nozzle is visible. Such duct, known as a CIP (Clean-In-Place) return duct, is common to all the filling valves in order to clean and disinfect all those parts contacting the product. Basically, during the cleaning and sanitization step the valve is plugged inferiorly, and a sanitizing liquid is inserted through the product supply duct. The liquid runs along the valve dispensing duct, exits the nozzle, fills the annular chamber surrounding it, and exits the side duct as shown by the arrows.

The problem addressed by the present invention is to provide a filling device allowing overcoming one or more of the drawbacks set forth above, and particularly allowing avoiding external contaminations of the container undergoing a filling operation.

Such a problem is solved by a filling device as set forth in the appended claims, the definitions of which are an integral part of the present description.

Therefore, an object of the invention is a filling valve and a filling machine including it, capable of avoiding external contaminations of the container undergoing a filling operation.

A further object of the invention is a method of using a filling device capable of avoiding external contaminations of the container undergoing a filling operation.

Further characteristics and advantages of the present invention will be more apparent from the description of some embodiment examples, given herein below by way of illustrative, non-limiting example, with reference to the following figures:

FIG. **1** represents a sectional side view of a filling device according to the state of the art, in a sanitization step;

FIG. **2** represents a sectional side view of a filling device according to the invention, in an operative condition;

FIG. **3** represents a schematic view of the device of FIG. **2**, during the sanitization step;

FIG. **4** represents a schematic view of the device of FIG. **2**, in a different operative condition.

With reference to the figures, the filling device according to the invention, indicated on the whole with the number **1**, comprises a body **2** in which a dispensing duct **3** for a filling fluid is obtained. The dispensing duct **3** ends inferiorly with a dispensing nozzle **4**.

The body **3** is secured to a filling machine (not shown) by a support bar **5**. A support arm **6** for a bottle B is also secured to the support bar **5**. The support arm **6** is L-shaped and ends with a fork **7** capable of engaging the neck of the bottle B.

The dispensing duct **3** is connected to a filling fluid supply pipe **8**.

In certain embodiments, the dispensing duct **3** comprises a substantially horizontal first length **3'** and a second vertical length **3"** opening into the dispensing nozzle **4**. In some embodiments, the first length **3'** comprises two substantially parallel branches **9***a*, **9***b*, intercepted by two valve means **10***a*, **10***b*. The two branches **9***a*, **9***b* have different diameters. In this manner, it is possible to direct the filling fluid flow through the first branch **9***a* having a larger diameter or through the second branch **9***b* having a smaller diameter, modifying the dispensed fluid flow rate.

In the embodiment shown in FIG. **2**, the lower portion **2'** of the body **2**, comprising the end portion of the dispensing duct **3** and the dispensing nozzle **4**, is detachable from the remaining fixed portion **2"**, so as to allow the maintenance or replacement thereof according to the different dispensing needs. To this aim, the joining surface of the two portions **2'**, **2"** comprises a gasket **11** (typically, an O-ring) and suitable securing means **12**.

However, it is apparent that, in other embodiments, the lower portion **2'** and the fixed portion **2"** of the body **2** may form a single piece.

The lower portion **2'** of the body **2** comprises a sleeve **13** surrounding the dispensing nozzle **4**, so as to create an interspace forming an annular chamber **14** between the outer surface of the nozzle **4** and the inner surface of the sleeve **13**.

The sleeve **13** is connected to a sanitization duct **15**. The sanitization duct **15** is, in turn, connected to a tube **16** that separates, with the interposition of a suitable valve means **17**, for example, a three-way valve or the like, into a first line **18***a* connected to a source **20** of a gaseous sanitization fluid, and a second line **18***b* connected to a collection tank **19** of a liquid sanitization fluid, from which the liquid sanitization fluid will be able to be recirculated into the dispensing duct **3** of the valve body **2**, by the tube **21** and the valve means **22**, or discarded. Therefore, in this manner it is possible to put the annular chamber **14** in communication with said source **20** of gaseous sanitization fluid, as it will be explained herein below.

The product for filling the bottles B is withdrawn from a special tank **23** and inserted into the supply pipe **8** through the valve means **22**. Thus the valve means **22** allow selecting the operative filling step or the sanitization step.

In preferred embodiments, the sanitization duct **15** is the CIP duct already present in the prior art filling devices, from which the device of the invention distinguishes itself for the presence of both a recirculation duct for the liquid sanitization fluid that is typical of the CIP (Clean-In-Place) treatment, and a connection to a gaseous sanitization fluid, the function of which will be explained further below.

In alternative embodiments, separate sanitization ducts will be able to be provided for the liquid fluid and the gaseous fluid.

In preferred embodiments, the filling device **1** is an electronically controlled device, whereby it is operatively connected to a driving and control unit that drives the operation of the valve means **10***a*, **10***b*, **17**, and **22**.

The operation of the filling device of the invention is as follows.

In the operative condition, the filling fluid is withdrawn from the tank **23** and it is inserted, through the valve means **22** and the supply duct **8**, into the dispensing duct **3**, from which it is then dispensed through the dispensing nozzle **4** into the bottle B. Concomitantly, the valve means **17** put the source **20** of a gaseous sanitization fluid in flow communication with the annular chamber **14**. Then the gaseous sanitization fluid, typically sterile air or a sterile inert gas exits the annular chamber **14** surrounding the filling liquid flow dispensed by the filling device **1**, thereby ensuring its insulation from the external environment.

The overpressure with which the gaseous sanitization fluid exits the annular chamber **14**, indicated with "P++", is above the overpressure that is usually present in the filling machine working area with respect to the external environment (indicated with "P++"), whereby a gaseous fluid flow is efficiently created, which from the neck of the bottle B irradiates outwardly. Thus, the penetration of dust or other pollutants into the bottle B is prevented.

On the contrary, in a non-operative maintenance step (FIG. **3**), the filling device **1** opening will be sealed by a suitable closure **24**, and a liquid sanitization fluid will be inserted through the valve means **22** and the supply duct **8**, it will circulate in the dispensing duct **3** and the annular chamber **14**, then it will be removed through the sanitization duct **15**. In this case, the valve means **17** will direct the exiting liquid fluid into the tank **19**.

In a different operative condition, shown in FIG. **4**, a conventional filling of a container with a filling liquid withdrawn from the tank **23** will be able to be carried out. In this case, which can be applied to types of products that do not require a specific sanitization, the sanitizing gas will be excluded.

Therefore, a further object of the present invention is a method for filling a container B, providing for:

a) providing a filling machine comprising at least one filling device **1** as defined above, said filling machine comprising a confined operative environment having an overpressure of a substantially sterile fluid with respect to the external environment,

b) connecting the sanitization duct **15** of said at least one filling device **1** with a source **20** of a gaseous sanitization fluid,

c) dispensing a filling fluid through the dispensing nozzle **4** of said at least one filling device **1**,

d) concomitantly with said step c), dispensing said gaseous sanitization fluid through said sanitization duct **15** and said annular chamber **14**, so as to create a substantially sterile surrounding around the flow of dispensed filling fluid and around the neck of said container B, in which said sanitization fluid has an overpressure with respect to the confined operative environment of the filling machine **1**.

The confined operative environment of a filling machine is usually obtained by arranging a series of side and upper panels that enclose the machine. Sterile air with a slight overpressure with respect to the external environment is typically inserted into such confined environment, so as to avoid the inlet of air possibly contaminated from the outside.

The advantages of the present invention are apparent from what has been described above.

In fact, the filling device of the invention solves the problem of avoiding the contamination of the containers to be filled and the filling fluid, creating a substantially sterile surrounding in the proximity of the filling fluid dispensing point.

This result is achieved without substantially modifying the valve structure, since a conventional filling device will be able to be used, connecting the CIP duct also to a source of a gaseous sanitization fluid as described above. Therefore, the same CIP duct will have the double function of a discharge duct for a liquid sanitization fluid during the non-operative maintenance step of the valve, and an inlet duct for a gaseous sanitization fluid during the operative step of the filling machine.

It is apparent that only some particular embodiments of the present invention have been described, to which those skilled in the art will be able to make all those modifications that are necessary for the adaptation thereof to particular applications, without anyhow departing from the protection scope of the present invention.

The invention claimed is:

1. A filling device comprising a body in which a dispensing duct for a filling fluid is obtained, the dispensing duct ending inferiorly with a dispensing nozzle, wherein the lower portion of the body comprises a sleeve surrounding the dispensing nozzle, so as to create an annular chamber between the outer surface of the dispensing nozzle and the inner surface of the sleeve, wherein said sleeve is connected to a sanitization duct which is arranged in flow communication with a source of a gaseous sanitization fluid, wherein the sanitization duct is connected to a tube that separates, with the interposition of a first valve, into a first line connected to said source of gaseous sanitization fluid, and a second line connected to a collection tank of a liquid sanitization fluid, from which the liquid sanitization fluid can be recirculated into the dispensing duct, by a tube and a second valve, during a maintenance step.

2. The filling device according to claim **1**, wherein said dispensing duct is connected to a filling fluid supply pipe and comprises a substantially horizontal first length and a second vertical length opening into the dispensing nozzle, wherein the first length comprises two substantially parallel branches intercepted by two valve means and having different diameters.

3. The filling device according to claim **1**, wherein the lower portion of the body comprises the end portion of the dispensing duct and the dispensing nozzle, and it is detachable from a remaining fixed portion.

4. The filling device according to claim **1**, wherein said filling device is an electronically controlled device operatively connected to a driving and control unit that drives the operation of the first valve.

5. A filling machine comprising at least one filling device according to claim **1**.

6. The filling machine according to claim 5, further comprising a confined operative environment having an overpressure of a substantially sterile fluid with respect to the external environment.

7. The filling machine according to claim 6, wherein said confined operative environment comprises a series of side and upper panels that enclose the filling machine, a sterile gaseous fluid having an overpressure with respect to the external environment being inserted into such confined environment.

* * * * *