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(54) Method for filling containers with liquid or semi-liquid products and automatic filling machine

(57) An automatic machine for filling containers (1) with liquid or semiliquid / semi-solid products, provided with a plurality of filling valves (3) with substantially vertical axis of emission of the product, comprises means for temporarily inclining the containers (1) during the filling operation, in such a way that the product is injected

into the container (1) directed along an inner lateral wall thereof; said means comprising a plurality of shaped guides (4) which interfere with the containers (1) during their transit in the filling machine (2), inclining them. A method for filling containers, providing for temporarily inclining the containers during the filling operation, for rotary or linear automatic filling machines.

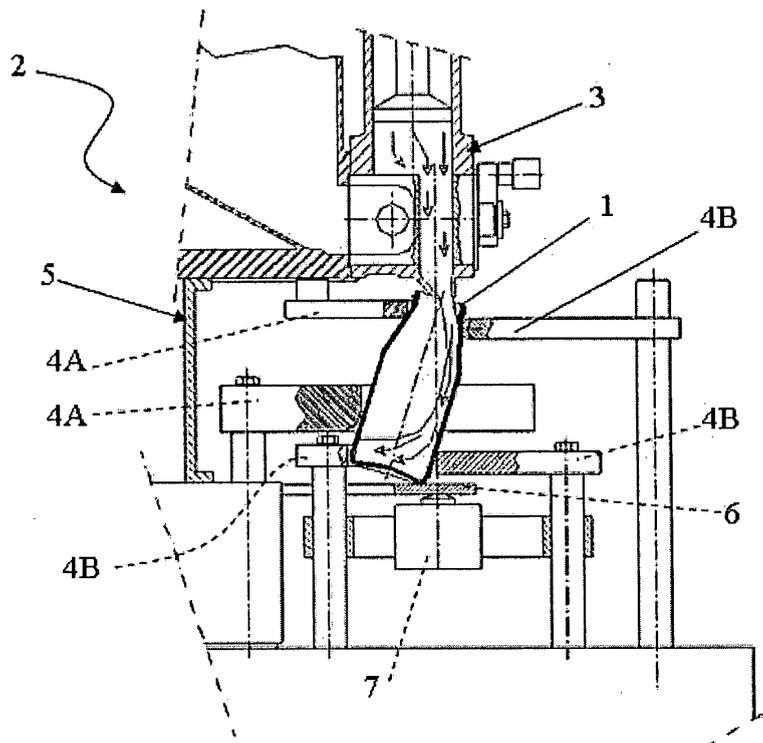


FIG. 2

Description

[0001] The present invention relates to a method for filling containers with liquid or semi-liquid products.

[0002] The present invention also relates to an automatic filling machine.

[0003] In industrial processes for filling containers with semi-dense liquid products, e.g. derived from processing tomatoes, air bubbles tend to be formed inside the packaged product; the presence of air bubble entailing two orders of problems.

[0004] In the first place, the air trapped inside the product causes a particularly rapid degradation of the product itself, by effect of oxidation processes. Said degradation is aggravated by the fact that it is quite difficult (if not impossible) to control the greater or lesser presence of air bubbles within a package, with the consequence that the extent of the degradation is not predictable.

[0005] In the second place, the presence of air bubbles compromises the dosage of the product in the containers. The presence of the air bubbles makes the density of the product inconsistent (in uncontrolled fashion). Therefore, the filling of different containers with the same quantity of product (in terms of mass / weight) leads to the presence of different masses of product in the containers; vice versa, in the case of volumetric dosage, there are differences in the volumes of the packages. Moreover, when containers are filled with predetermined quantities of product, the formation of bubbles inside the containers often causes the leakage of product from the containers themselves, leading to production wastage.

[0006] The formation of the bubbles depends, in addition to the semi-dense nature of the product, on the speed the product has at the time when it comes in contact with the inner surface of the container. The higher said speed, the more a whirling motion of the product inside the container will be favoured, with consequent increase in the formation air bubbles. The formation of air bubble depends also on the angle of impact of the jet with the surface of the container.

[0007] To limit the formation of air bubbles inside the products, technical solutions are known which provide for the use of diffusers /deflectors, i.e. tubular bodies, able to be inserted into the containers, at whose ends are fastened nozzles, in such a way that the products are sprayed against the inner lateral surface of the containers. In this way, the speed with which the product impacts the surface of the container is actually reduced, with the consequent reduction in the formation of bubbles.

[0008] However, such technical solutions entail some drawbacks. First of all, said diffusers are usable only for filling with liquid products, but not in case of semi-liquid / semi-solid products. Note that the expression "semi-liquid / semi-solid" refers to liquid products characterised by a medium / high degree of viscosity, e.g. tomato paste or purée, or also products constituted by the mixture of a liquid component and of a solid one, in pieces or in grains (e.g., syrups with fruit in pieces).

[0009] Moreover, the product ejected by a diffuser, in falling from the lateral surface to the bottom of the container tends to form a cone, which prevents the air inside the container from escaping through the neck of the container. In this case, the filling process ends when the air return is shut off (by shutting a tube inserted in the container and comprised in the filling valve), instead of upon reaching a predetermined quantity / volume of product inside the container. Therefore, the technical solutions that provide for the use of diffusers are not suitable for dense or semi-dense products or for mixtures of liquids and pieces.

[0010] It should also be noted that known solutions provide, in many cases, for direct contact between the filling machine and the mouth of the container to be filled. This contact promotes the depositing of product on the mouth, entailing hygienic / sanitary problems for certain products.

[0011] An object of the present invention is to eliminate the aforesaid drawbacks and to make available a method for filling containers, which is practical and efficient and which prevents the formation of bubbles, even in case of filling with semi-liquid / semi-solid products, or products in pieces.

[0012] Said objects are fully achieved by the method of the present invention, which is characterised by the content of the claims set out below and in particular in that it comprises a temporary tilting of the containers during the filling operation, so that the product is inserted into the container directed along an internal lateral wall thereof.

[0013] Another object of the present invention is to make available a rotary container filling machine, which is simple and efficient and which prevents the formation of bubbles, even in case of filling with semi-liquid / semi-solid products, or products in pieces.

[0014] Said object is fully achieved by the filling machine of the present invention, which is characterised by the content of the claims set out below and in particular in that it comprises means for temporarily tilting the containers during the filling operation, so that the product is inserted into the container directed along an internal lateral wall thereof.

[0015] This and other characteristics shall become more readily apparent in the description that follows of two preferred embodiments, illustrated purely by way of non limiting example in the accompanying drawing tables, in which:

Figure 1 schematically shows the technical solution according to the present invention, compared with a known solution.

Figure 2 shows a section view of a filling machine according to the present invention.

Figure 3 shows a filling machine as in Figure 2, according to a different embodiment.

[0016] Figure 1 provides a comparison between two

different techniques for filling a container 1 through a jet of products having substantially vertical axis of emission; said filling techniques being suitable for use in the bottling industry. The portion A of Figure 1 illustrates a filling process according to the prior art, with substantially vertical container. Within said process the products, entering the container, undergo an impact when hitting the bottom thereof, creating a turbulent motion which favours the formation of air bubble. Said turbulent motion is due to the fact that the products come in contact with the surface of the container at high speed and according to a substantially right angle (90°).

[0017] The portion B of Figure 1 schematically illustrates a filling process according to the present invention, whereby the container is kept inclined during the filling operation. In this way, the products lap the inner surface of the container 1 at a reduced speed (substantially halved), because the filling valve is at reduced distance from the point of impact of the product with the surface of the container with respect to the known process. Moreover, the contact of the product with the surface of the container takes place according to an angle of about 15°, considerably smaller than 90°, without causing turbulence of the product itself.

[0018] In Figures 2 and 3, the reference number 2 designates a rotary filler according to the present invention, illustrated in section view, limited to a portion relating to the filling of a container 1 by means of a filling valve 3. The filler 2 comprises a plurality of valves 3, able to fill a plurality of containers 1. The filling valve 3 has a substantially vertical axis of emission of the product.

[0019] In Figure 2, the reference number 4 designates originally shaped guides, which interfere with the containers 1 during their transit in the filling machine, inclining them (the containers 1 transit inside the filling machine 2 in known fashion). In particular, within said guides 4, there are movable guides or stars 4A, able to actuate the containers 1 (according to a substantially known manner), and fixed guides 4B, shaped in original fashion to incline the containers 1.

[0020] The containers 1, during said transit in the filling machine 2, are taken in by the movable guides or stars 4A, whose path they are forced to follow. It should be observed that, in the embodiment shown in Figure 2, the filling machine 2 comprises a rotary carousel 5, whereto are integral the filling valves 3 and the movable guides or stars 4A. The containers 1, in their motion, slide on a chute 6, which is fixed and in contact with their base, and on the fixed guides 4B, which are in contact with their lateral surface. The profile of the fixed guides 4B varies, within the filling machine 2, in such a way as to cause an inclination and a subsequent straightening of the containers. Note that the fixed guides 4B and the movable guides or stars 4A are positioned at different heights, to facilitate the inclination of the containers 1. During the step in which the containers 1 are inclined, the filling valves 3 are activated. Said inclination causes the products emitted by the filling valves 3 to come in contact with

the inner surface of the containers 1 according to a small angle (about 15°), i.e. in a substantially tangential direction relative to the inner lateral surface of the containers, in the absence of impacts and at low speed. Said inclination of the containers also favours a laminar motion of the products in contact with the inner surface of the containers 1; i.e. the products form a thin layer, thereby hampering the formation of air bubbles and allowing the escape of any bubbles present in the product.

[0021] It should be observed that, when the containers 1 are inclined, their contact surface with the chute 6 is substantially reduced to one point, so that the containers roll on the chute 6. Therefore, during the filling operation the containers 1 rotate around their longitudinal axis, in addition to being inclined. This natural rotation further favours a uniform filling, characterised by a laminar motion of the products injected into the containers 1 (particularly advantageous in the case of semi-liquid / semi-solid products).

[0022] The filling machine 2 further comprises a vibrating element 7, able to set in vibration the container 1. Said vibratory motion favours the compacting of the mixed products and the escape of the air bubbles from the containers 1.

[0023] Figure 3 illustrates a rotary filling machine 2 which comprises a plurality of pincers 8, integral with the filling valves, operatively active on the containers 1 to support them, actuate them and incline them temporarily, during the filling step. Each pincer 8 is connected to the filling valves 3 in such a way as to be able to rotate around a fulcrum 9. Said pincers 8 may be associated to mechanical abutments or cams 10, substantially known, which mechanically synchronise the inclination of the containers 1, rotating around the fulcrum 9, and activate the filling valve 3. It is noteworthy to observe that the pincers (8) are so shaped as to straighten the containers again once filling is completed.

[0024] Said embodiment variant, with respect to the variant characterised by the presence of the guides or stars 4, entails a higher cost, but it enables to maintain the containers 1 suspended in overhang with respect to the filling machine 2, without contact with mechanical members (stars or guides), with a considerable advantage in terms of hygiene. Moreover, said embodiment enables to adapt the filling machine 2 in particularly simple fashion to the filling of containers 1 with different dimensions.

[0025] The present invention provides teachings to fill containers in very simple and effective fashion, preventing the formation of air bubbles, originally inclining the containers at the time of filling. It should be observed that such teachings are applicable to filling machines having filling valves 3 of any kind, e.g. mechanical, pneumatic or electronic, with means for inclining the containers.

[0026] Thus, the filling machine according to the present invention originally allows to prevent the formation of air bubbles inside the containers, within industrial filling processes with liquid or semi-solid products, by the

inclination of the containers during the filling step.

[0027] It should be observed that the present invention applies to filling machines of the rotary type, but also of the linear type, indifferently.

[0028] The present invention also makes available a method for filling containers with liquid or semi-liquid / semi-solid products in a rotary filling machine 2 provided with a plurality of filling valves 3 with substantially vertical axis of emission of the product. Said method provides a temporary inclination of the containers 1 during the filling step, in such a way that the product is injected into the container directed along an internal lateral wall thereof. Said method further comprises a step of rotating containers 1 around a longitudinal axis thereof, to favour a laminar motion of the products along the inner surface of the containers 1. Moreover, said method comprises a step of vibrating the containers 1, to favour the sliding of the products along the inner surface of the containers 1; it should be observed that said vibrating step is the more useful the greater the tendency of the products to adhere to the walls of the containers.

[0029] The method of the present invention enables to fill containers with liquid or semi-solid products, originally preventing the formation of air bubbles, thanks to a step of temporarily inclining the containers during the filling operation.

Claims

1. A method for filling containers (1) with liquid or semi-liquid / semi-solid products in an automatic rotary filling machine (2) provided with a plurality of filling valves (3) with substantially vertical axis of emission of the product, **characterised in that** it comprises a temporary inclination of the containers (1) during the filling operation in such a way that the product is injected into the container (1) directed along an inner lateral wall thereof.
2. Method as claimed in claim 1, wherein during the filling operation the containers (1) rotate around their longitudinal axis.
3. A filling machine for automatically filling containers (1) with liquid or semi-liquid / semi-solid products, provided with a plurality of filling valves (3) with substantially vertical axis of emission of the product, **characterised in that** it comprises a temporary inclination of the containers (1) during the filling step in such a way that the product is injected into the container (1) directed along an inner lateral wall thereof.
4. A filling machine as claimed in claim 3, wherein said means contain a plurality of shaped guides (4) which interfere with the containers (1) during their transit in the filling machine (2) inclining them.
5. Filling machine as claimed in claim 4, wherein the guides (4) are so shaped as to straighten the containers (1) again once filling is completed.
6. Filling machine as claimed in claim 4, wherein the shaped guides (4) are so shaped as to produce an automatic rotation of the containers (1) around their longitudinal axis during their transit in the filling machine (2).
7. Filling axis as claimed in any of the claims 4 through 6, wherein said guides (4) are positioned at different heights to facilitate the inclination of the containers (1).
8. Filling machine as claimed in any of the previous claims 4 through 7, **characterised in that** it comprises means for setting the containers (1) in vibration.
9. Filling machine as claimed in claim 3, wherein said means for temporarily inclining the containers (1) during the filling operation comprise a plurality of pincers (8) which manipulate the containers inclining them during the filling operation.
10. Filling machine as claimed in claim 9, wherein the pincers (8) are so shaped as to straighten the containers again once filling is completed.

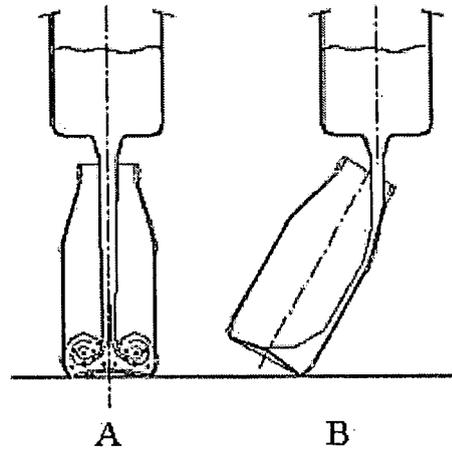


FIG. 1

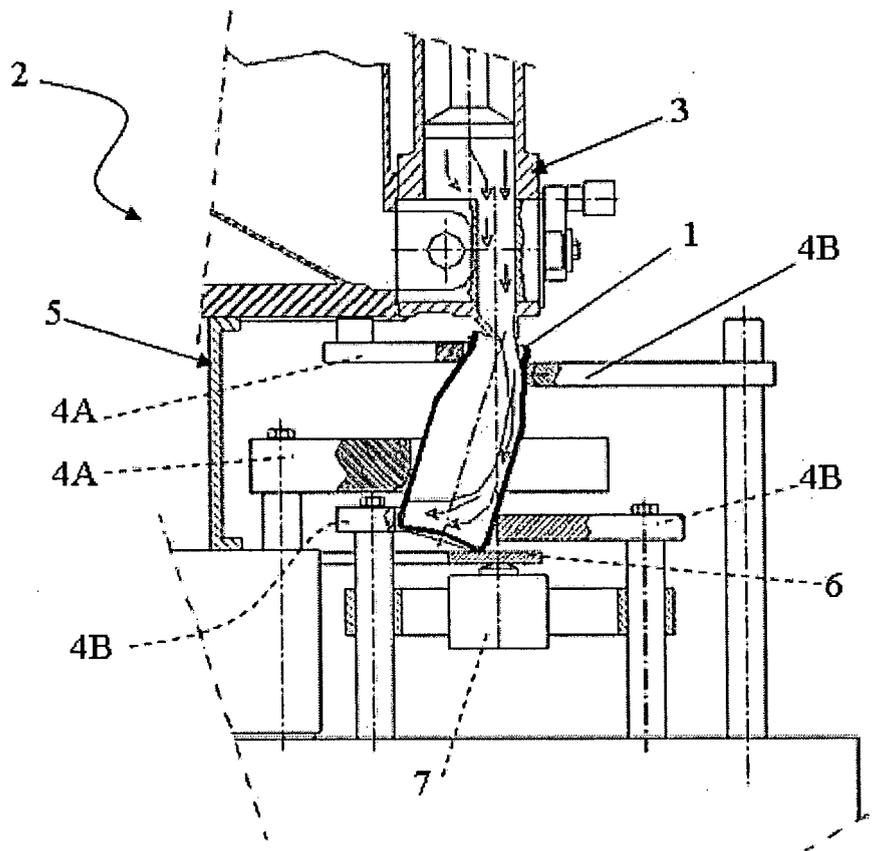


FIG. 2

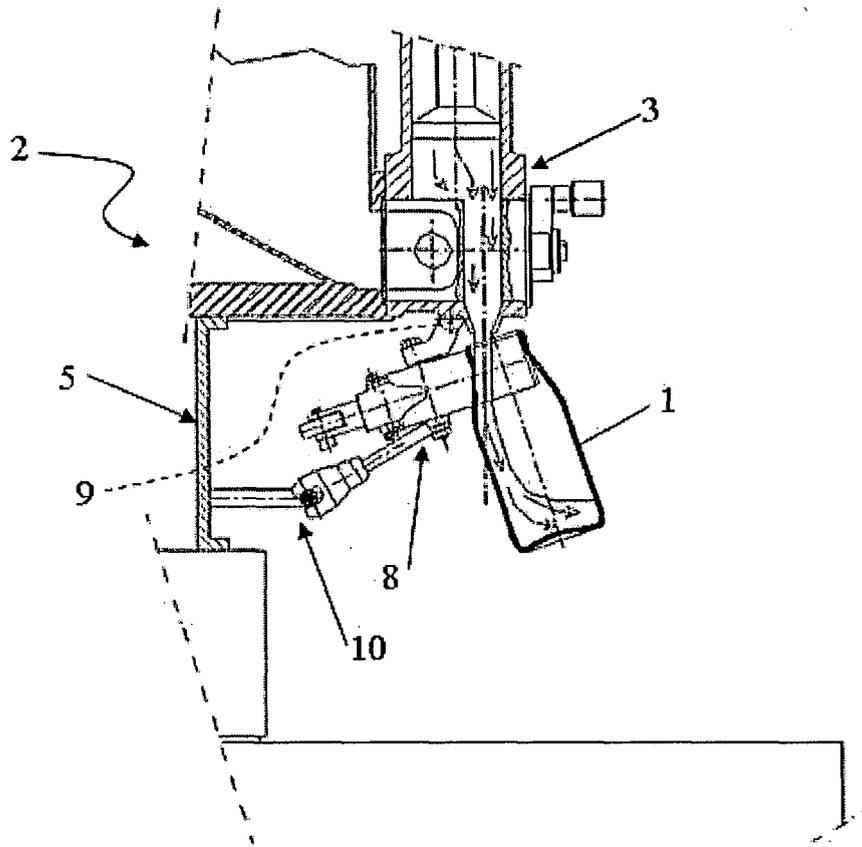


FIG. 3



DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
P,X	EP 1 632 455 A (KHS MASCHINEN- UND ANLAGENBAU AKTIENGESELLSCHAFT) 8 March 2006 (2006-03-08) * paragraphs [0006], [0008], [0013]; figures *	1,3,9,10	INV. B67C3/24
X	----- US 5 791 385 A (STAHLECKER ET AL) 11 August 1998 (1998-08-11)	1,3,9,10	
Y	* column 2, lines 21-38 * * column 3, lines 46-51 * * column 4, lines 42-54 * * column 5, lines 1,2 * * figures 4-7 *	4,5,7	
Y	----- US 3 780 847 A (FAESSLER A,US ET AL) 25 December 1973 (1973-12-25) * column 1, lines 8-36; figures 10-12 *	4,5,7	
X	----- WO 98/47770 A (GRAHAM PACKAGING CORPORATION; BETTLE, GRISCOM) 29 October 1998 (1998-10-29) * page 10, line 14 - page 11, line 8; figure 3 *	1,3,9	TECHNICAL FIELDS SEARCHED (IPC) B67C B65B
X	----- US 3 630 242 A (WARREN J. SCHIESER ET AL) 28 December 1971 (1971-12-28) * figures 9,11 *	1	
A	----- US 3 105 526 A (HURTIG ROY E) 1 October 1963 (1963-10-01) -----		
The present search report has been drawn up for all claims			
Place of search The Hague		Date of completion of the search 14 August 2006	Examiner Martínez Navarro, A.
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	

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

EP 06 00 8266

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
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14-08-2006

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 1632455	A	08-03-2006	DE 102004042516 A1	23-03-2006
US 5791385	A	11-08-1998	DE 19533462 A1	13-03-1997
			IN 189658 A1	05-04-2003
			JP 9104403 A	22-04-1997
US 3780847	A	25-12-1973	BE 790992 A1	01-03-1973
			DE 2301620 A1	19-07-1973
			GB 1396527 A	04-06-1975
			NL 7213385 A	17-07-1973
WO 9847770	A	29-10-1998	AT 257451 T	15-01-2004
			BR 9809264 A	27-06-2000
			CA 2287383 A1	29-10-1998
			DE 69821008 D1	12-02-2004
			DE 69821008 T2	11-11-2004
			EP 1012047 A1	28-06-2000
			ES 2213278 T3	16-08-2004
			PT 1012047 T	30-04-2004
US 3630242	A	28-12-1971	NONE	
US 3105526	A	01-10-1963	GB 956019 A	22-04-1964