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(54) Title: METHOD FOR WELDING WAFERS AND EQUIPMENT THEREFOR

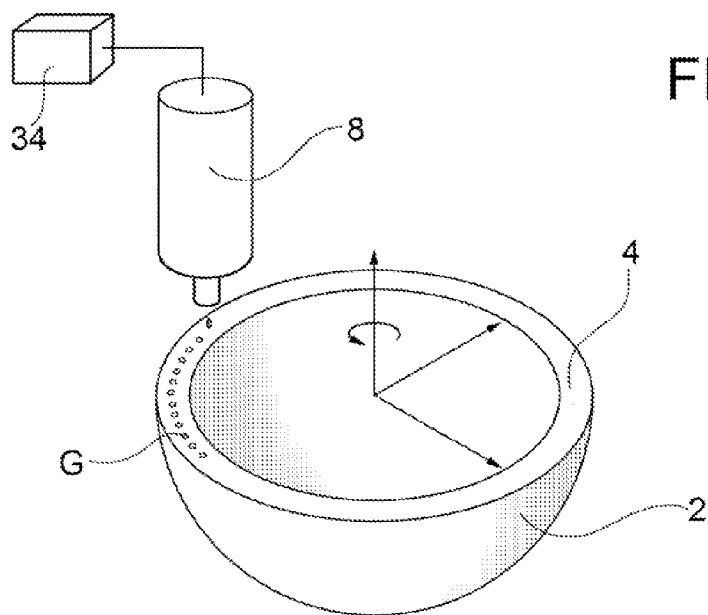


FIG.3

(57) Abstract: Method for producing a hollow body formed by a pair of wafers (2, 2a), welded together along respective mating annular surfaces (4), by applying an aqueous moistening liquid to at least one of the mating surfaces of the wafers, previously subjected to baking, and by adhesion by mutual contact of said surfaces, characterized in that the moistening liquid is applied to said at least one surface in the form of separate and distinct droplets (G) by pulsed-jet deposition means, creating a relative motion between said jet deposition means and said wafers along the annular profile of said surfaces.

**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

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Method for welding wafers and equipment therefor

The present invention relates to a method for welding together, along mutual joining surfaces, a pair of wafers produced by baking a wafer batter.

5

The invention also relates to equipment for the application of the welding method.

The invention was developed with particular regard to the production of sweet or savoury pastry or snack products, each comprising two half-shells of wafer, joined together at their mutually facing mouth parts, so as to form a hollow body, optionally including a body of filling within itself.

10

For a general description of products of this type and the production methods for them, reference may be made, for example, to European patents EP-B-0 083 324, EP-B-0 086 319 and EP-B-0 614 614.

15

In the methods described in these documents, an edible adhesive material having thermoplastic properties, such as chocolate, is used to join the wafer half-shells together.

EP-A-1 647 190 describes a method for producing hollow bodies of the aforesaid type, in which the welding between the wafers is carried out with the use of a moistening liquid, particularly water, which has no adhesive or cementing properties.

20

The method described therein includes the application of the moistening liquid by spraying onto the wafers which are housed in a compartmented support, with the optional application of a mask leaving only the annular surfaces of the mouth of the wafer exposed, these surfaces being used for the subsequent joining.

25

The method is advantageous in that it enables a heat-resistant weld to be obtained without the addition of edible cementing substances which may alter the organoleptic characteristics of the product.

30

However, it has been found that the general wetting of the adhesion surfaces by spraying, with the formation of a liquid film on these surfaces, may give rise to defects both in the appearance of the product and in the adhesive properties after the parts have been joined and made to adhere by contact.

5

Although the parts are joined by contact, either without any application of pressure or with the contact pressure reduced to a minimum, the general wetting of the contact surfaces gives rise to the formation of a thin layer in which the porous structure of the wafer includes collapsed cells, such that the end product resulting from the joining of the wafers has a structure resembling the rings of Saturn in its equatorial region, which, following the evaporation and drying of the moistening liquid, has a greater density than that of the adjacent wafer regions, and is also unappealing in terms of appearance. Furthermore, the wetting of the wafers can lead to the onset of microbiological deterioration.

10

One object of the present invention is to provide an improved method which overcomes the aforesaid drawbacks, thus making it possible to obtain a hollow body of wafer in which the welding region between the wafers is not substantially visible, while providing improved welding in terms of adhesion.

15

Another object of the invention is to provide a method which limits the contact of the wafer with water, thus preventing microbiological deterioration.

20

In view of these objects, the invention proposes a method having the characteristics defined in the claims below, together with equipment for the application of the method.

25

Further characteristics and advantages of the method and equipment according to the invention will be made clear by the following detailed description, which refers to the attached drawings provided by way of non-limiting example, in which:

- Figure 1 is a perspective view of a typical wafer to which the method according to the invention is applied;

30

- Figures 2 to 5 provide a schematic representation of the consecutive steps of operation of the method according to the invention; and

- Figure 6 is a schematic representation of the injection head for the jet deposition of the moistening liquid.

The main characteristic of the method according to the invention is that the aqueous moistening liquid is applied to at least one of the contact surfaces, and optionally to both of these surfaces, in the form of droplets (or preferably microdrops) which are discrete, that is to say separate and spaced apart from one another along the whole perimetric profile of these surfaces.

10 The moistening liquid used is preferably water, in particular demineralized water; however, it may be feasible to use aqueous solutions containing small amounts, for example up to 5%, of a solute such as sugar, salt, dextrin, maltodextrin or edible surfactants, provided that the content of solute is not such as to form a solution having adhesive or cementing properties which would make the jet deposition described below
15 unusable.

The wafers to be welded are generally in the shape of half-shells, with an annular mouth surface which is generally flat. These wafers are produced by using conventional batter recipes comprising a mixture of flour or flours in water, usually with the addition of
20 ingredients such as milk, emulsifiers such as lecithin, raising agents and food fats.

A recipe typical of these batters is given in EP-A-1 647 190 and comprises the following ingredients:

- water: 40-60% by weight
 - 25 - flour: 30-45% by weight
 - sugars: 0.5-2% by weight
 - cocoa solids: 1-2% by weight
 - food fats: 1.5-2.5% by weight
 - low-fat milk: 0.5-1.5% by weight
- 30 and further ingredients chosen from among sodium bicarbonate, salt, ammonium carbonate, and soya lecithin, each of which is used, for example, in concentrations not exceeding 0.5% by weight.

The method according to the invention is applied to wafers which have previously been baked in heated moulds. With regard to the morphological characteristics of the surfaces to be joined, it is preferable, within the scope of the invention, to use wafers or half-shells having what is known as a “finished edge” on their annular mouth surfaces, in other words an edge having a high degree of surface finish with a surface substantially free of macropores, that is to say a smooth surface with the appearance of a superficial skin, resulting from the baking of the batter in contact with the surfaces of the baking half-moulds.

Half-shells having these characteristics may be produced, for example, using the method described in US 2004/137123 or WO2011/067733.

However, the method according to the invention can be applied to open-cell porous surfaces or to surfaces with a crumbled structure in which the porous inner structure of the wafer is exposed to the outside. Structures of this type are, for example, present when the half-shells are separated by an interconnecting wafer web, using the horizontal cutting method described in EP-A-0 054 229 or EP-A-0 221 033.

The smooth adhesion surface (with a finished edge) is considered preferable in combination with the use of a batter containing small amounts of food fats, in the aforesaid fields for example; the presence of food fats results in a slightly hydrophobic surface in which the microdrops of the moistening liquid retain the typical meniscus shape for a certain period at least, and generally, in the industrial process, up to the point at which these surfaces are made to adhere to each other by mutual contact, thus preventing the diffusion of the moistening liquid inside the wafer structure.

A typical wafer structure, indicated as a whole by 2 and having a circular annular surface 4, preferably with a finished edge, is shown in Fig. 1; it is to be understood that the shape can vary considerably from what is shown.

In the method according to the invention, the steps of which are shown in Figs. 2 to 5, the wafers 2 are positioned in a compartmented support 6, in other words one having a

plurality of concave seats for housing the wafers, designed in such a way that the annular mouth surface 4 projects slightly above the plane of the support 18 in which the mouth profiles of the housing seats lie.

- 5 The equipment for the application of the method comprises droplet deposition means comprising, preferably, at least one jet injection head 8 for injection of the moistening liquid, at least one support 6, preferably compartmented, for housing the wafers, and movement means adapted to create a relative motion between the injection head and the support along the annular profile of the surface of the mouth 4 of the wafers, thus enabling
10 the moistening liquid to be deposited in droplets G along that profile.

According to the currently preferred technical solution, the compartmented support is fixed and motor means are provided for moving the deposition means, in other words the injection head or plurality of injection heads.

15

The injection head 8 is preferably a jet injection head, of the type used in ink jet printers, designed to create pulsed jets (known as a “drop-on-demand”).

A diagram of the head, in a currently preferred embodiment, is shown in Fig. 6.

20

The injection head comprises a casing 10, forming a chamber 12 adapted to receive the moistening liquid and keep it under pressure, and provided with a nozzle 14 for the jet dispensing of the liquid. The nozzle 14 is associated with a shutter with a stem 16, movable vertically between a closed position and an open position of the opening of the nozzle 14.

25

- Pulsed dispensing is obtained by using electromagnetic solenoid means 20 interacting with the shutter, these means, when energized, causing the translation of the shutter between the closed position and the open position of the nozzle against the action of resilient means 32 tending to keep the shutter in the closed position. It is to be understood that a dual solution,
30 in which the electromagnetic means cause the translation of the shutters to the closed position, is also feasible.

The moistening liquid is contained in a reservoir 22 and is fed from this to the chamber 12 of the injection head via a conduit 24 in which a filter 26 is interposed. The liquid is kept under pressure in the reservoir 22 by supplying pressurized air to the reservoir via a conduit 28.

Typically, the moistening liquid (particularly demineralized water) is kept under a pressure of 0.3 to 1 bar; the diameter of the spray nozzle is preferably of the order of 50 to 90 μm (for example, 60 μm).

In order to obtain optimal deposition of the moistening liquid on the adhesion surface of the wafer, it is preferable to keep the feed nozzle at a minimal distance from this surface; for example, distances of the order of 2 to 3 mm have been found to be optimal.

In any case, the injection pressure to which the moistening liquid is subjected and the distance of the nozzle from the surface of the wafer are preferably chosen so as to provide deposition which is only superficial, without any penetration of moisture into the inner structure of the wafer.

In Figures 1, 3 and 4, the letter G indicates the droplets deposited as a jet along the whole profile of the annular surface 4 of the wafer 2; the droplets are preferably equidistant from one another and are deposited, preferably, in the central region of the annular surface.

With reference to a typical wafer product, of the type shown in Fig. 1, the total quantity of water fed as a jet does not exceed a proportion of about 1-2% relative to the total weight of the wafer on which the deposition is carried out.

After the deposition of the moistening liquid in droplets, which as mentioned above may be applied to a single wafer or to the pair of wafers 2 and 2a to be joined, the wafers are welded by folding a pair of supports 6 and 6a, in which the moistened wafers (2, 2a) are housed, in a book-like manner (Figure 5). The joining is carried out by bringing the annular edge surfaces into contact with one another, with the application of a small amount of pressure, for a period of several minutes, between the two contact surfaces, care being

taken to avoid cracking the wafers.

The method is particularly intended for the production of hollow bodies including a filling, and in particular a substantially dry body of filling, or in any case one with a moisture
5 content generally not exceeding 2% by weight, which is not liable to damage the wafer structure.

The body of filling may be introduced into the wafers before the jet deposition of the moistening liquid, or optionally after its deposition and before joining, although this
10 solution is less preferable.

The final step of the production method may comprise a final drying stage, in which the joined supports, containing the wafers welded to one another, may be made to travel to an evaporation station, in order to remove the added moisture; however, because of the very
15 small amount of moistening liquid deposited in the method according to the invention, it is possible to omit any final drying step.

Thus the method according to the invention can be used to produce hollow bodies of wafer, formed by the joining and welding of wafers to one another, without the addition of added
20 cementing materials, while also substantially reducing the exposure of the wafers to the water, which, by being deposited in the form of discrete drops, affects the adhesion surface only, and cannot penetrate into the depth of the wafer structure.

This also makes it possible to avoid any deterioration of the wafer structure, not only in
25 terms of deformation and structure, but also in respect of microbiological action.

CLAIMS

1. Method for producing a hollow body formed by a pair of wafers (2, 2a), welded together along respective mating annular surfaces (4), by applying an aqueous moistening liquid to at least one of the mating surfaces of the wafers, previously subjected to baking, and by adhesion by mutual contact of said surfaces, characterized in that the moistening liquid is applied to said at least one surface in the form of droplets (G) by pulsed-jet deposition means, creating a relative motion between said jet deposition means and said at least one surface of said wafers so as to deposit separate and distinct droplets along the annular profile of said surface.
2. Method according to Claim 1, characterized in that said mating surfaces (4) have a smooth surface, obtained by baking a wafer batter in contact with the surface of baking half-moulds.
3. Method according to Claim 1, characterized in that said mating surfaces (4) have an open cell porous surface obtained by cutting a porous wall of wafer.
4. Method according to Claim 1, 2 or 3, characterized in that the jet deposition is carried out with an ejection pressure of the moistening liquid such as to cause only a superficial deposition of said liquid.
5. Method according to any one of Claims 1 to 4, characterized in that the moistening liquid is ejected through a nozzle having a size between 50 and 90 microns.
6. Method according to any of the preceding claims, characterized in that the moistening liquid is ejected under a pressure of less than 1 bar.
7. Method according to any of the preceding claims, characterized in that the total amount of moistening liquid deposited on the adhesion surface of one of said wafers is less than 2% by weight, and preferably less than 1% by weight relative to the weight of the wafer.

8. Method according to any of the preceding claims, characterized in that said wafers are obtained by baking a wafer batter including food fats, preferably in a quantity of less than 2.5% by weight relative to the weight of the batter.

9. Method according to any of the preceding claims, characterized in that the jet deposition is carried out through a jet injection head designed to generate pulsed jets of the moistening liquid with a volume of moistening liquid of less than 0.04 g for each pattern.

10. Method according to any of the preceding claims, characterized in that the moistening liquid is demineralized water.

11. Equipment for welding wafers by a method according to any one of Claims 1 to 10, characterized in that it comprises at least one jet injection head (8) for injection of the moistening liquid, at least one compartmented support (6, 6a) for housing said wafers (2, 2a), and motor means (34) adapted to create a relative motion between the injection head and the support along to the annular profile of the surface of the mouth (4) of the wafers, thus enabling the moistening liquid to be deposited in droplets (G) along that profile.

12. Equipment according to Claim 11, characterized in that said injection head (8) comprises a casing (10), defining a chamber (12) for receiving moistening liquid and keeping it under pressure, and fitted with a nozzle (14) for the jet dispensing of the liquid, shutter means (16) movable between a closed position and an open position of the nozzle, and electromagnetic means (20) interacting with the shutter, which, when energized, are adapted to cause the translation of the shutter between the closed position and the open position of the nozzle, against the action of resilient means (32) tending to keep the shutter in the closed position.

13. Equipment according to Claim 11 or 12, characterized in that said nozzle has an opening with a size in the range from 50 to 90 microns.

14. Equipment according to any one of Claims 11 to 13, characterized in that said injection head is associated with means for keeping the moistening liquid under pressure,

at a pressure of between 0.3 and 1 bar.

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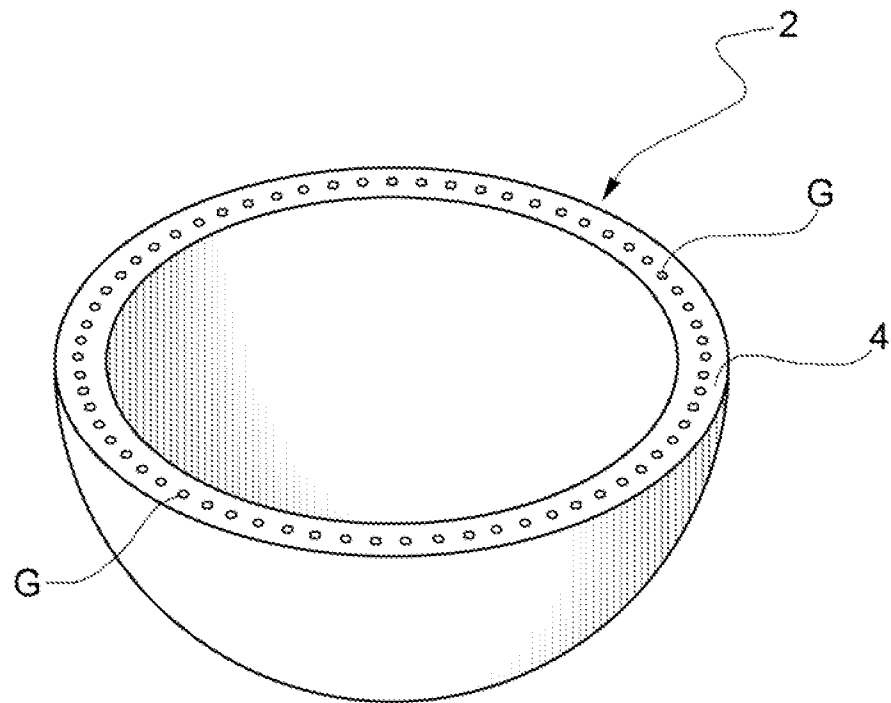


FIG.1

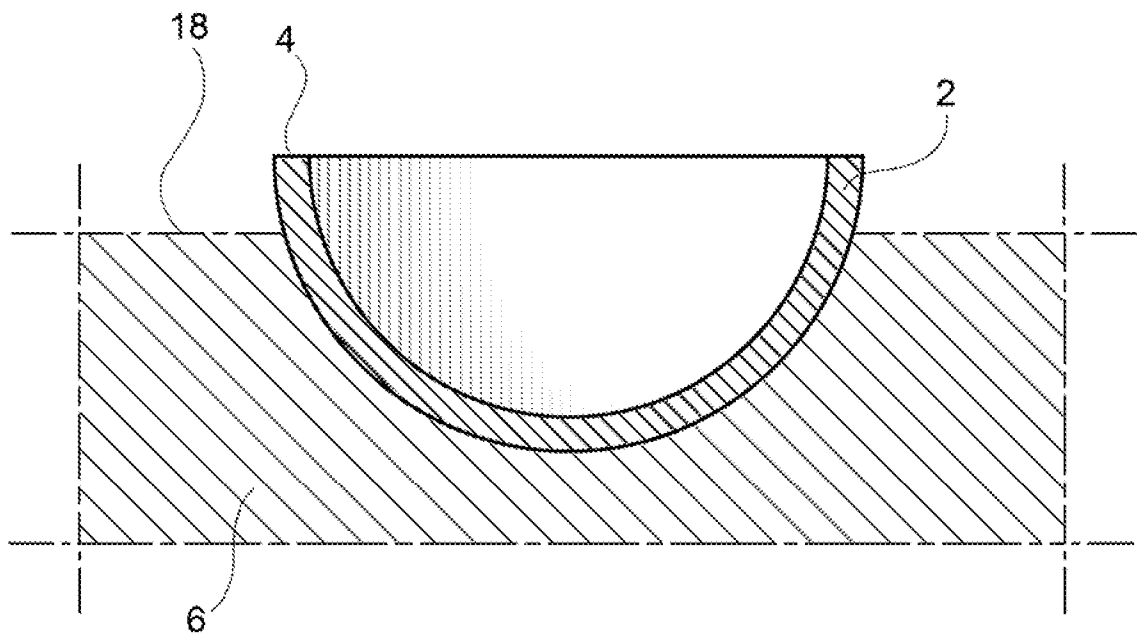


FIG.2

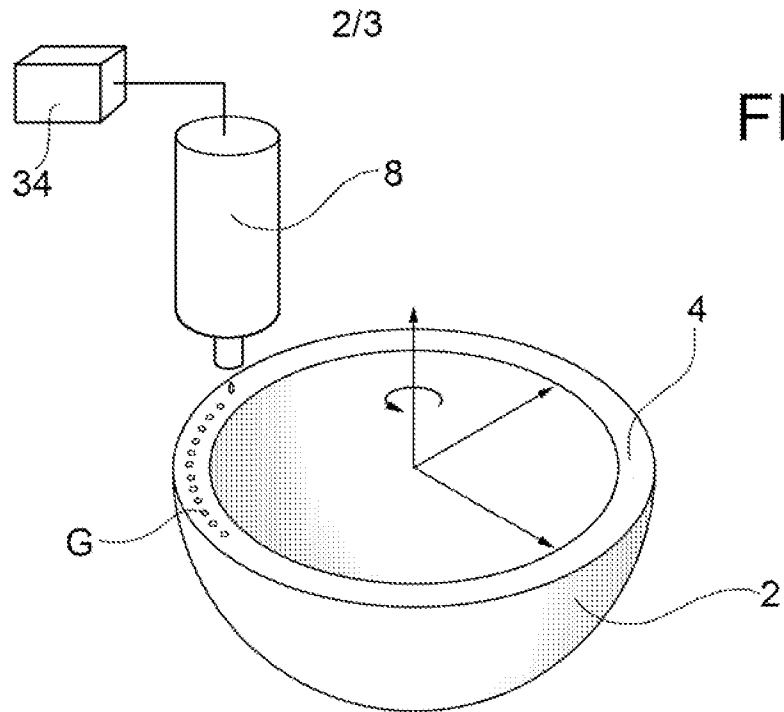


FIG. 3

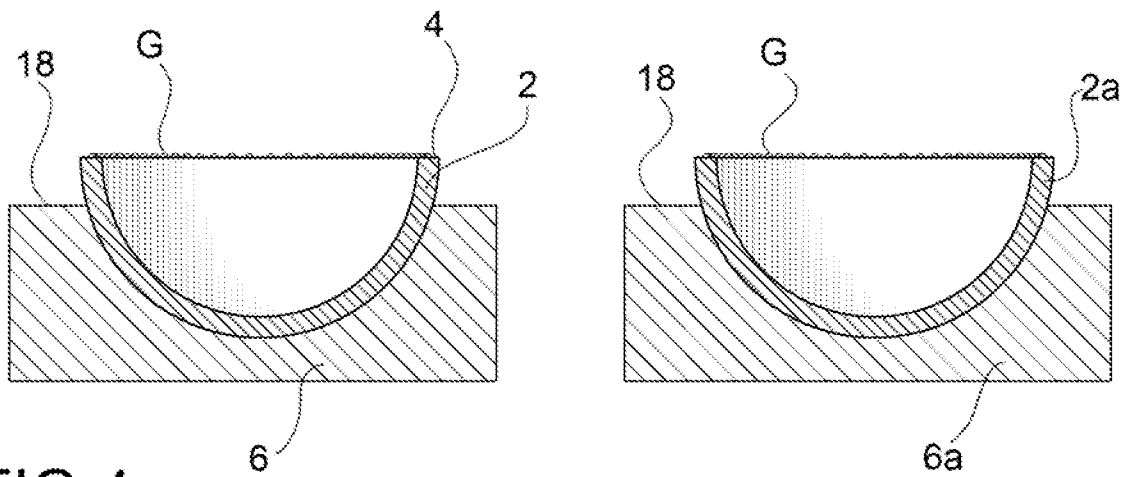


FIG. 4

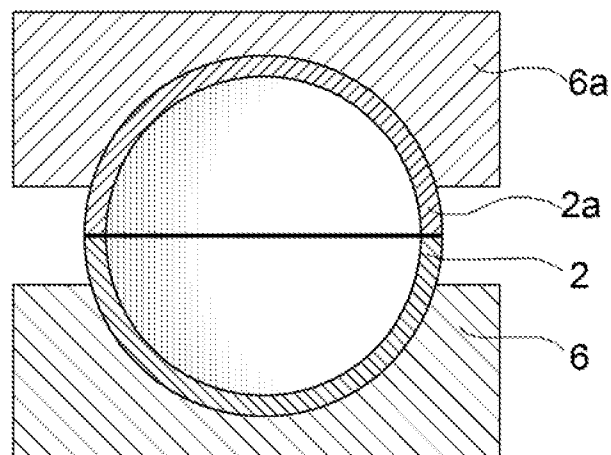
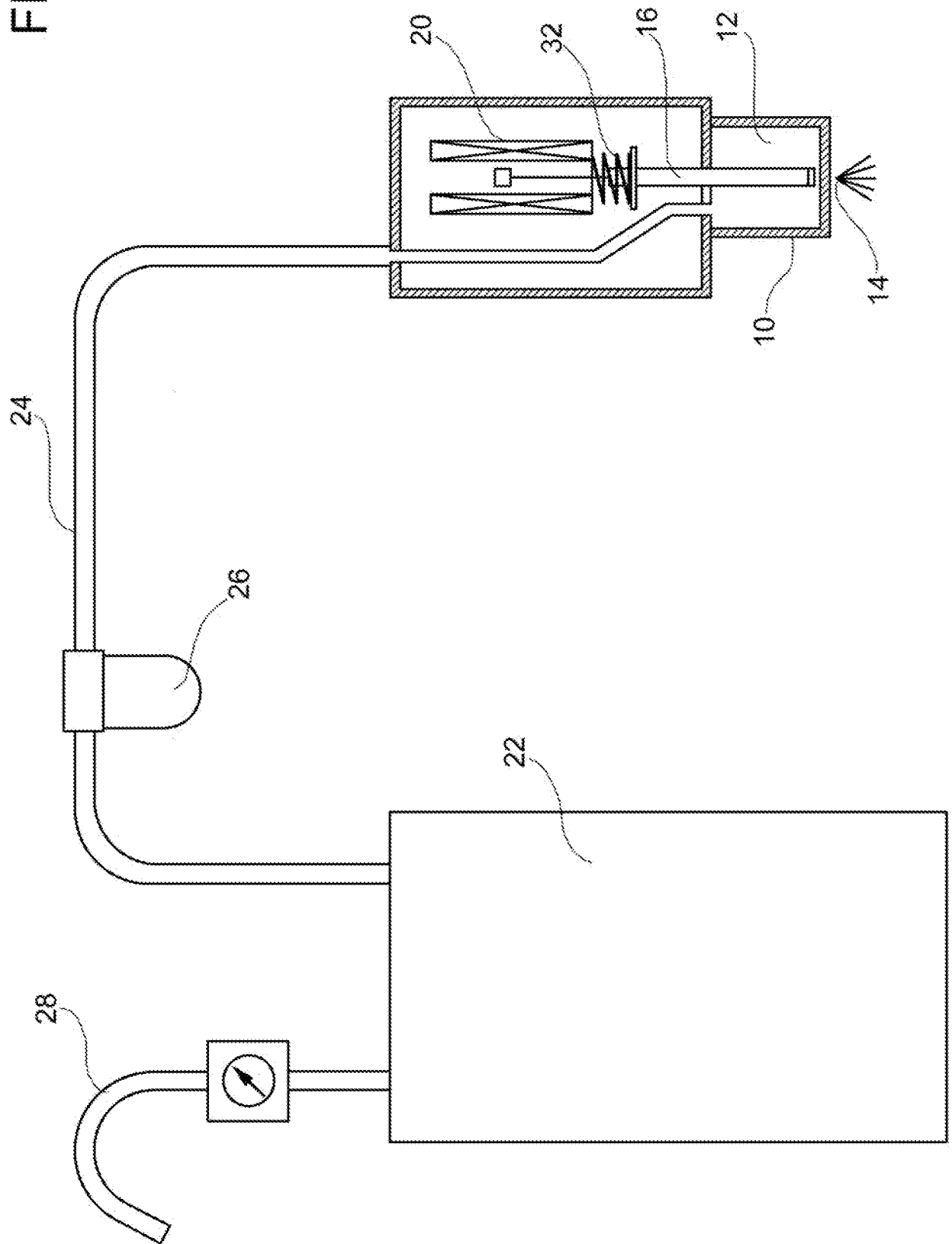


FIG. 5

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FIG.6



INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER INV. A21C15/02 A23G3/20 A23G3/34 A23G3/54 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A21C A23G		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 647 190 A1 (SOREMARTEC SA [BE]; FERRERO SPA [IT]; FERRERO OHG [DE]) 19 April 2006 (2006-04-19) cited in the application paragraph [0001] - paragraph [0002] paragraph [0004] paragraph [0019] - paragraph [0024] paragraph [0035]	1-10
A	----- US 5 063 068 A (CAVANAGH PAUL A [US]) 5 November 1991 (1991-11-05) figures 1, 2 column 1, line 33 - line 43 column 3, line 3 - line 23 ----- -/--	1,2,4-11
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search	Date of mailing of the international search report	
16 April 2013	26/04/2013	
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Etienne, Nicolas	

INTERNATIONAL SEARCH REPORT

International application No

PCT/IB2013/050433

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 3 685 744 A (LUDY WILLIAM F JR) 22 August 1972 (1972-08-22) figures 1-3 column 2, line 36 - column 4, line 21 -----	1,4-12
A	EP 0 614 614 A1 (SOREMARTEC SA [BE] SOREMARTEC SA [BE]; FERRERO SPA [IT]; FERRERO OHG [] 14 September 1994 (1994-09-14) cited in the application figures 1, 4, 10 column 3, line 5 - line 9 column 5, line 34 - line 54 -----	1,4,11, 12
A	EP 0 086 319 A2 (FERRERO SPA [IT]) 24 August 1983 (1983-08-24) cited in the application figures 1, 3 page 3, line 20 - page 4, line 5 -----	1,4,11
A	US 4 759 706 A (DAMIANAKOS GUS [CA] ET AL) 26 July 1988 (1988-07-26) figures 1-3, 7 column 1, line 6 - line 12 column 3, line 11 - line 30 -----	1,11
A	FR 2 643 228 A1 (PHILOT BERNARD [FR]) 24 August 1990 (1990-08-24) figures 1, 2 page 1, line 3 - line 4 page 3, line 26 - page 4, line 2 -----	12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/IB2013/050433

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP 1647190	A1	19-04-2006	AT 442046 T 15-09-2009
		AU 2005296839 A1 27-04-2006	
		BR PI0516361 A 02-09-2008	
		CA 2584807 A1 27-04-2006	
		CN 101080174 A 28-11-2007	
		EP 1647190 A1 19-04-2006	
		ES 2333325 T3 19-02-2010	
		NZ 554874 A 24-12-2010	
		US 2008095898 A1 24-04-2008	
		WO 2006042821 A1 27-04-2006	
		ZA 200703995 A 27-08-2008	
US 5063068	A	05-11-1991	AU 630812 B2 05-11-1992
			AU 7819291 A 12-12-1991
			CA 2044008 A1 08-12-1991
			GB 2247151 A 26-02-1992
			US 5063068 A 05-11-1991
US 3685744	A	22-08-1972	NONE
EP 0614614	A1	14-09-1994	AT 155962 T 15-08-1997
			CH 688808 A5 15-04-1998
			DE 69404506 D1 04-09-1997
			DE 69404506 T2 22-01-1998
			DK 0614614 T3 25-08-1997
			EP 0614614 A1 14-09-1994
			ES 2105373 T3 16-10-1997
			GR 3025033 T3 30-01-1998
			SG 44905 A1 19-12-1997
EP 0086319	A2	24-08-1983	AU 558990 B2 19-02-1987
			AU 1544283 A 13-12-1984
			CA 1184417 A1 26-03-1985
			DE 86319 T1 02-02-1984
			DE 3278068 D1 10-03-1988
			DK 578182 A 01-07-1983
			EP 0086319 A2 24-08-1983
			IE 54495 B1 25-10-1989
			IT 1205369 B 15-03-1989
			JP S609450 A 18-01-1985
			JP H0431656 B2 27-05-1992
US 4759706	A	26-07-1988	CA 1223481 A1 30-06-1987
			US 4759706 A 26-07-1988
FR 2643228	A1	24-08-1990	NONE