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(54) **CONTAINER WITH ANTI SPILLAGE DEVICE FOR COLLECTING CONDENSED WATER IN A CLOTHES DRYER AND CLOTHES DRYER EQUIPPED WITH THIS CONTAINER WITH ANTI SPILLAGE DEVICE**

(57) The present invention is related to a container (10) with anti spillage device for collecting condensed water in a clothes dryer (1). The container (10) is configured to be removably associated with a housing (A) in a frame (2) of the clothes dryer (1) and comprises: an open upper aperture (11) for supplying condensed water into the container (10) and for draining the condensed water

from the container (10); an anti-spillage device (12) protruding inside the container (10). The anti-spillage device (12) is placed at the open upper aperture (11) and it is provided with at least a wall (19A, 19B) delimiting through passages (14, 15, 16) for the water flowing in and out of said open upper aperture (11).

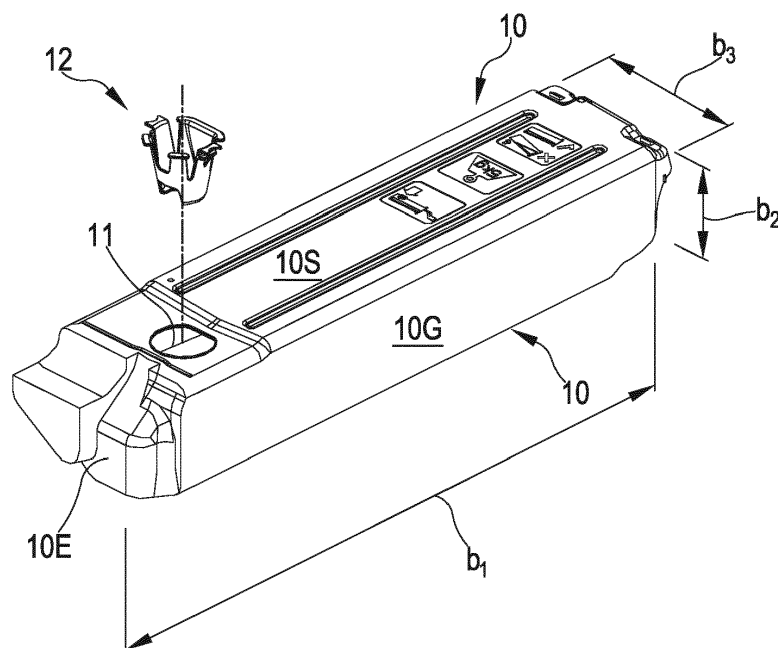


FIG.2

Description

Field of the art

[0001] The present invention relates to a container with anti spillage device for collecting condensed water in a clothes dryer. The present invention also relates to a clothes dryer equipped therewith. In particular, the invention is applicable to the field of condensation-type clothes dryers.

State of the art

[0002] Clothes dryers, in particular of the condensation type, are per se known and typically comprise a drum containing laundry to be dried by an air jet generated by a fan and heated by an electric resistor or by a condenser device in a machine fitted with a heat pump.

[0003] The hot air jet flows through the laundry in the drum, thereby subtracting moisture therefrom, and then flows through a filter that removes any lint and other impurities from the air jet.

[0004] Said air jet also flows through a heat exchanger, where it cools down through the effect of thermal exchange with colder environmental air, thus condensing and yielding water, which flows into a collection tank usually located in the lower part of the machine. From the collection tank, the water is conveyed by a pump into a removable container typically arranged in the upper part of the machine, in a position easily accessible to a user, who can then periodically remove and empty said container. It is clear that the clothes dryers known in the art may not include a collection tank; in such cases, they are only equipped with the container for collecting condensed water, said container being usually positioned in the lower part of the machine.

[0005] Usually, the removable container is provided with an open upper aperture for supplying condensed water into the container through a suitable pipe. The same aperture, once the container has been extracted, is used to drain the condensed water from the container in order to empty said container. The container is extracted and overturned in a proper location to drain the water.

[0006] Document EP2455539, in the name of the same applicant, discloses a container for collecting condensed water in a clothes dryer. The container is removably associated with a housing in a frame of the clothes dryer. The container comprises a first aperture, for supplying condensed water into the container and for quickly draining the condensed water from the container, and a second aperture for a precision drainage of the condensed water from said container. The first aperture closes automatically when the drawer is extracted from the housing and opens automatically when the drawer is inserted into the housing in the frame. Document US7251905 discloses a drawer structure for storing condensed water generated during the drying procedure. The drawer prevents the condensed water from being leaked out of the dryer

though the condensed water is fully filled in the drawer and overflowed from the drawer. An overflow controller is installed to an end of the drawer. The overflow controller includes a condensed water falling groove for receiving the condensed water fallen after flowing along a condensed water pipe, an overflow storage for receiving the condensed water overflowed after being fully filled in the drawer, and a siphon generator for making the overflowed condensed water be returned to the sump.

Object of the invention

[0007] The Applicant observed that the known condensed water containers suffer from some drawbacks.

[0008] Indeed, when the known condensed water containers are manually pulled out of the dryer, waves and turbulence in the water in the container are generated and spilling of water from the upper aperture may occur.

[0009] This drawback occurs also when the container is handled to reach the proper location where it may be emptied and it is particularly relevant if the container is full of water.

[0010] EP2455539 solve this problem through a cover of the self-closing type but such solution is structurally complex and expensive.

[0011] It is the main object of the present invention to overcome the above-mentioned drawback by providing a container for collecting condensed water in a clothes dryer and a clothes dryer equipped therewith, said container being so designed as to prevent spillage of water during extraction from the respective housing in said clothes dryer and transportation after the latter has been extracted.

[0012] Another object of the present invention is to prevent spillage through a simple, cheap and reliable technical solution.

Summary of the invention

[0013] The Applicant has found that such objective can be obtained by means of a device placed inside the container and located at or close to the upper aperture and configured to reduce the potential spillage of water from said upper aperture during handling of the container.

[0014] More specifically, according to one aspect, the present invention relates to container with anti spillage device for collecting condensed water in a clothes dryer, said container being configured to be removably associated with a housing in a frame of the clothes dryer, wherein said container comprises:

an open upper aperture for supplying condensed water into the container and for draining the condensed water from the container;

an anti-spillage device protruding inside the container, wherein said anti-spillage device is placed at the open upper aperture and it is provided with at least a wall delimiting through passages for the water flow-

ing in and out of said open upper aperture.

[0015] According to a different aspect, the present invention relates to a clothes dryer, in particular of the condensation type, comprising a container with anti spillage device for collecting condensed water in accordance with the present invention. The Applicant verified that said anti-spillage device allows the water to flow out of the container when the container is overturned to be emptied and at the same time said anti-spillage device breaks the flow and redirect said flow around the wall, causing the waves to lose their intensity. The anti-spillage device prevents a complete exposure of the opening of the container to spill out without losing the function of emptying the container.

[0016] The present invention, in at least one of the aforesaid aspects, can have one or more of the preferred characteristics that are described hereinbelow.

[0017] Preferably, said anti-spillage device is a cap inserted into the open upper aperture. This technical solution is simple, cheap and reliable.

[0018] Preferably, the cap is removably inserted into the open upper aperture.

[0019] Preferably, the cap is snap fitted into the open upper aperture.

[0020] Preferably, said cap comprise a cup shaped portion protruding inside the container.

[0021] Preferably, the cup shaped portion comprises a base.

[0022] Preferably, the base is substantially circular.

[0023] Preferably, the base is substantially flat.

[0024] Preferably, the cup shaped portion comprises a lateral wall.

[0025] Preferably, the lateral wall is shaped substantially like a truncated cone. Preferably, the cap comprises a rim configured to lean on top wall of the container. The rim is configured to join the cap to the container.

[0026] Preferably, the through passages comprises at least a window facing a back wall of the container.

[0027] Preferably, said at least a window comprises an upper window and a lower window.

[0028] Preferably, the upper window is cut in the rim and extend towards the base.

[0029] Preferably, the upper window tapers towards the base.

[0030] Preferably, the upper window has a trapezoidal shape.

[0031] Preferably, the lower window is at least partly fashioned in the base.

[0032] Preferably, the lower window extends towards the rim.

[0033] Preferably, the lower window tapers towards the rim.

[0034] Preferably, the through passages comprises a plurality of slots.

[0035] Preferably, the slots are placed on sides of said at least a window.

[0036] Preferably, the slots are cut in the rim and tapers

towards the base.

[0037] Preferably, the slots are triangular.

[0038] Preferably, the slots and the upper window divide the lateral wall in a plurality of flaps.

5 **[0039]** Preferably, each flap carries a portion of the rim.

[0040] Preferably, at least two flaps comprise seats configured to accommodate an inner ridge of the open upper aperture.

10 **[0041]** Preferably, said seats are delimited by a portion of the rim and by a lower protruding tab.

[0042] Preferably, at least the flaps carrying the seats are elastically yieldable, so as to snap fit said seats onto the inner ridge of the open upper aperture.

15 **[0043]** Preferably, the rims of at least the flaps carrying the seats have profiled edges to facilitate grabbing by a user and extraction of the cap out of the container. Preferably, said profiled edges are rounded and concave.

[0044] Preferably, a portion of the lateral wall of the cap opposite said at least a window is solid.

20 **[0045]** Preferably, said portion of the lateral wall of the cap opposite said at least a window is a substantially flat wall.

[0046] This shape breaks the waves and reduce the intensity of the flow.

25 **[0047]** Preferably, the inner ridge of the open upper aperture has a shape complementary to a shape of the cap.

[0048] Preferably, the inner ridge of the open upper aperture is not circular.

30 **[0049]** Preferably, the inner ridge of the open upper aperture has a straight part and a rounded part, preferably circular.

[0050] These shapes are poke-yoke and prevents the incorrect positioning of the cap in the container.

35 **[0051]** Preferably, the anti-spillage device and the open upper aperture are placed closer to a back wall of the container than to a front wall of said container.

[0052] Preferably, a length of the container 10 is comprised between about 400mm and 600mm.

40 **[0053]** Preferably, a height of the container is comprised between about 70mm and about 110mm.

[0054] Preferably, a width of the container is comprised between about 100mm and 150mm.

45 **[0055]** Preferably, the cap has a height comprised between about 40mm and about 60mm.

[0056] Preferably, a first average diameter of the rim is comprised between about 50mm and 70mm.

[0057] Preferably, a second average diameter of the base 19 is comprised between about 35mm and 45mm.

50 **[0058]** Preferably, a tapering angle of the truncated cone is comprised between about 7° and 13°.

[0059] Preferably, the base is spaced from the bottom wall of a first distance comprised between about 30mm and 50mm.

55 **[0060]** Preferably, a ratio between the first distance and the height of the cap is comprised between about 0.5 and 1.

[0061] Preferably, a second distance between a cen-

tral axis "Y-Y" of the anti-spilling device and the back wall of the container is comprised between about 80mm and 100mm.

[0062] Preferably, a ratio between the length of the container and the second distance is comprised between about 4 and about 8.

Brief description of the drawings

[0063] Further objects, features and advantages of the present invention will become apparent from the following detailed description and from the annexed drawings, which are supplied by way of non-limiting example, wherein:

Fig. 1 schematically shows a clothes dryer according to the present invention;

Fig. 2 is a perspective view of a container for collecting condensed water of the clothes dryer of Fig. 1, provided with an anti-spillage device in accordance with the present invention;

Fig. 3 is a side view of part of the container of Fig. 2 with some parts removed to better show the anti-spillage device;

Figs. 4 is a top view of the of the part of the container of Fig. 3;

Fig. 5 is a perspective view of the anti-spillage device according to the invention;

Fig. 6 is front view of the anti-spillage device of figure 5;

Fig. 7 is a side view of the anti-spillage device of figure 5;

Fig. 8 is a top view of the anti-spillage device of figure 5;

Fig. 9 is a bottom view of the anti-spillage device of figure 5.

Detailed description of the preferred embodiments of the invention

[0064] Referring now to the annexed drawings, in Fig. 1 reference numeral 1 designates as a whole a clothes dryer, in particular of the condensation type, according to the present invention.

[0065] The clothes dryer 1 comprises a frame 2 that houses a drum 3 adapted to contain laundry (not shown) to be dried, said drum 3 being accessible from the outside through a door 4 usually fitted with sealing gaskets (not shown).

[0066] In addition, the clothes dryer 1 comprises first means 5, 6 for blowing heated air into said drum 3, said first means 5, 6 comprising in particular an electric resistor 5 and a fan 6. As an alternative (not shown in the annexed drawings), in a clothes dryer equipped with a heat pump said first means may comprise a condenser device and a fan.

[0067] The clothes dryer 1 further comprises second means 7 for exchanging heat, said second means 7 being

crossed by the air coming from the drum 3. Preferably, said second means comprise an exchanger 7, where the humid air coming from the drum 3 condenses.

[0068] The clothes dryer 1 also comprises at least one container 10 for collecting the condensed water produced by said second means 7 for exchanging heat.

[0069] In particular, the humid air exiting the drum 3 flows through a filter 8 for removing any lint and/or other impurities from the air jet. In said second means 7 the hot humid air is then cooled through thermal exchange with fresh air (normally at ambient temperature) conveyed by a second fan 7A.

[0070] The condensed water present in a collection tank 9 is delivered by a pump 9A towards the container 10, wherein it is collected.

[0071] The one described above is a basic scheme of a clothes dryer, in particular of the condensation type, which is useful for understanding the operation thereof. In practice, however, the machine 1 may include additional components which have been omitted in the present description for simplicity.

[0072] The container 10 is removably associated with a housing "A" in the frame 2 of the clothes dryer 1. As a consequence, it can be removed for draining.

[0073] Preferably, the container 10 extends in said housing "A" substantially horizontally from a front portion 2F of the frame 2 towards a rear portion 2P of said frame 2. In particular, said container 10 is of the drawer type and can be extracted from the housing "A" and/or inserted into the housing "A" with a substantially horizontal movement ("X1" extraction; "X2" insertion in Fig. 1 and Fig.4).

[0074] Furthermore, the container 10 of the machine 1 shown in Fig. 1 is arranged in an upper part of the frame 2. This improves the ergonomics of the machine 1, since said container 10 can be easily reached by a user. It is however clear that the container 10 may also be arranged in a lower part of the machine 1 according to the present invention. In such a case, said machine 1 may even lack the collection tank 9 and/or the pump 9A.

[0075] Figs. 3 and 4 are a top view and a side view, respectively, of part of the container 10. As can be seen in Fig. in these drawings, the container 10 comprises an open upper aperture 11 for supplying condensed water into the container 10.

[0076] The container 10 is shaped substantially like a parallelepipedon. A length "b1" of the container 10 is of about 550mm. A height "b2" of the container 10 is of about 90mm. A width "b3" of the container 10 is of about 130mm.

[0077] It must be pointed out that the following references to the surfaces of the container 10 (i.e. the terms "top wall", "bottom wall", "side wall", etc.) are to be intended as referring to a container 10 inserted in the housing "A" in the frame 2.

[0078] The container 10 comprises a bottom wall 10B, a top wall 10S, a back wall 10E, a front wall 10F and two lateral walls 10G.

[0079] The upper aperture 11 for supplying condensed

water into the container 10 is positioned on the top wall 10S of said container 10. It is clear that said upper aperture 11 is also used for draining the container 10.

[0080] In accordance with the present invention, the container 10 comprises an anti-spillage device 12 which is inserted into the open upper aperture 11 and protrudes inside the container 10. The anti-spillage device 12 comprises a wall 13 provided with through passages 14, 15, 16.

[0081] As shown in the attached figures, the anti-spillage device 12 of the illustrated embodiment is a sort of cap inserted into the open upper aperture 11. Said cap 12 comprises a cup shaped portion 17 and a rim 18.

[0082] As shown in figures 2, 3 and 4, the cap 12 is inserted in the open upper aperture 11 until the rim 18 leans against an inner ridge of said open upper aperture 11. Once installed, the cup shaped portion 17 protrudes inside the container 10 and it is spaced from the bottom wall 10B.

[0083] The cup shaped portion 17 comprises a lateral wall 19A shaped like a truncated cone and a circular base 19B. The rim 18 is placed on a top of the cup shaped portion 17 and the circular base 19B on a bottom of said cup shaped portion 17. The cap 12 has a height "h1" of about 50mm, a first average diameter "d1" of the rim 18 of about 60mm and a second diameter "d2" of the base 19 of about 40mm. The truncated cone has a tapering angle " α " of about 10°.

[0084] The through passages 14, 15, 16 comprises an upper window 14 which is cut in the rim 18 and extends towards the base 19B. The upper window 14 has a trapezoidal shape tapering towards the base 19B.

[0085] The through passages 14, 15, 16 comprises a lower window 15 which is in part fashioned in the base 19B and part in the lateral wall 19A. The upper window 14 is vertically aligned with respect to the lower window 15. The upper window 14 is spaced with respect to the lower window 15. The lower window 15 has a trapezoidal shape tapering towards the rim 18.

[0086] The through passages 14, 15, 16 comprises a plurality of slots 16. The slots 16 are cut in the rim 18 and tapers towards the base 19B. Each slot 16 has a triangular shape. In the attached figures, two triangular slots 16 are placed on each side of the upper and lower windows 14, 15.

[0087] The slots 16 and the upper window 14 divide the lateral wall 19A in a plurality of flaps "F" and each carrying a portion of the rim 18. Two opposite flaps "F" comprise seats "S" (Fig. 5 and Fig. 6) configured to accommodate the inner ridge of the open upper aperture 11. Each seat "S" is delimited by a portion of the rim 18 and by a lower protruding tab "T". The flaps 16 carrying the seats "S" are elastically yieldable so as to snap fit said seats "S" onto the inner ridge of the open upper aperture 11.

[0088] Furthermore, as shown in Fig.5, the rim 18 of each flap 16 carrying the seats "S" has a rounded and concave edge to facilitate grabbing by a user and extrac-

tion of the cap 12 out of the container 10.

[0089] As shown in figure 4A, a portion 20 of the lateral wall 19A which is diametrically opposite with respect to the upper and lower windows 14, 15 is solid and flat. In other words, no passages are made through this portion 20. This portion 20 is limited by two adjacent triangular slots 16.

[0090] The inner ridge of the open upper aperture 11 has a straight part and a circular part. When the cap is snap fitted into the upper open aperture 11, the solid flat portion 20 leans against the straight part and the flaps "F" leans against the circular part.

[0091] The base 19B, once the device 12 is installed in the container 10, faces the bottom wall 10B of the container 10 (Fig. 3). The base 19B is spaced from the bottom wall 10b of a first distance "s1" of about 40mm. The ration between the first distance "s1" and the height "h1" is of about 0.8.

[0092] The open upper aperture 11 and the anti-spilling device 12 are close to the back wall 10E of the container 10. A second distance "s2" between a central axis "Y-Y" of the anti-spilling device 12 and the back wall 10E of the container 10 is of about 90mm. The ratio between the length "b1" of the container 10 and the second distance "s2" is of about 6.1.

[0093] Once the device 12 is installed in the container 10, the upper and lower windows 14, 15 faces the back wall 10E of the container 10 and the solid portion 20 points towards the front wall 10F.

[0094] The advantages of a container 10 for collecting condensed water in a clothes dryer and of a clothes dryer equipped therewith according to the present invention are apparent from the above description.

[0095] The extraction of the container 10 from the dryer is performed by grabbing an handle, not shown, usually placed at front wall 10F and pulling the container 10 in a pulling/extraction direction "X1". Said pulling direction "X1" is directed from the back wall 10E to the front wall 10F (from left to right in figure 4). The waves created in the container 10 due to pulling action travel towards the back wall 10E (see arrows "W"). The anti-spilling device redirects the flow and reduces the intensity of water hitting back wall 10E. This would decrease the chances of spilling action.

[0096] The container 10 for collecting condensed water in a clothes dryer and the clothes dryer 1 equipped therewith described herein by way of example may be subject to many possible variations without departing from the novelty spirit of the inventive idea. It is also clear that in the practical implementation of the invention the illustrated details may have different shapes or be replaced with other technically equivalent elements.

[0097] It can therefore be easily understood that the present invention is not limited to the above-described container for collecting condensed water in a clothes dryer and clothes dryer equipped therewith, but may be subject to many modifications, improvements or replacements of equivalent parts and elements without departing

from the inventive idea, as clearly specified in the following claims.

Claims

1. Container (10) with anti spillage device (12) for collecting condensed water in a clothes dryer (1), said container (10) being configured to be removably associated with a housing (A) in a frame (2) of the clothes dryer (1), wherein said container (10) comprises:
 - an open upper aperture (11) for supplying condensed water into the container (10) and for draining the condensed water from the container (10);
 - an anti-spillage device (12) protruding inside the container (10), wherein said anti-spillage device (12) is placed at the open upper aperture (11) and it is provided with at least a wall (19A, 19B) delimiting through passages (14, 15, 16) for the water flowing in and out of said open upper aperture (11).
2. The container of claim 1, wherein said anti-spillage device (12) is a cap inserted into the open upper aperture (11).
3. The container of claim 2, wherein said cap (12) comprise a cup shaped portion (17) protruding inside the container (10), wherein the cup shaped portion (17) comprises a base (19B) and a lateral wall (19A), optionally shaped like a truncated cone.
4. The container of claim 3, wherein the cap (12) comprises a rim (18) configured to lean on top wall (10S) of the container (10).
5. The container of claim 3 or 4, wherein the through passages (14, 15, 16) comprises at least a window (14, 15) facing a back wall (10E) of the container (10).
6. The container of claim 5, wherein said at least a window (14, 15) comprises an upper window (14) and a lower window (15).
7. The container of claim 6 when claim 5 depend on claim 4, wherein the upper window (14) is cut in the rim (18).
8. The container of claim 6 or 7, wherein the lower window (15) is at least partly fashioned in the base (19B).
9. The container of any of claims 3 to 8, wherein the through passages (14, 15, 16) comprises a plurality of slots (16).
10. The container of claim 9 when depending on claim 5, wherein the slots (16) are placed on sides of said at least a window (14, 15).
11. The container of claim 9 or 10, wherein the slots (16) are cut in the rim (18) and tapers towards the base (19B).
12. The container of claim 9, 10 or 11, wherein the slots (16) and the upper window (14) divide the lateral wall (19A) in a plurality of flaps (F).
13. The container of claim 12, wherein at least two flaps (F) comprise seats (S) configured to accommodate an inner ridge of the open upper aperture (11), wherein at least the flaps (16) carrying the seats (S) are elastically yieldable, so as to snap fit said seats (S) onto the inner ridge of the open upper aperture (11).
14. The container of any of claims 5, 6, 7 or 8, wherein a portion (20) of the lateral wall (19A) of the cap (12) opposite said at least a window (14, 15) is solid.
15. The container of one of the preceding claims, wherein the anti-spillage device (12) and the open upper aperture (11) are placed closer to a back wall (10E) of the container (10) than to a front wall (10F) of said container (10).

FIG.1

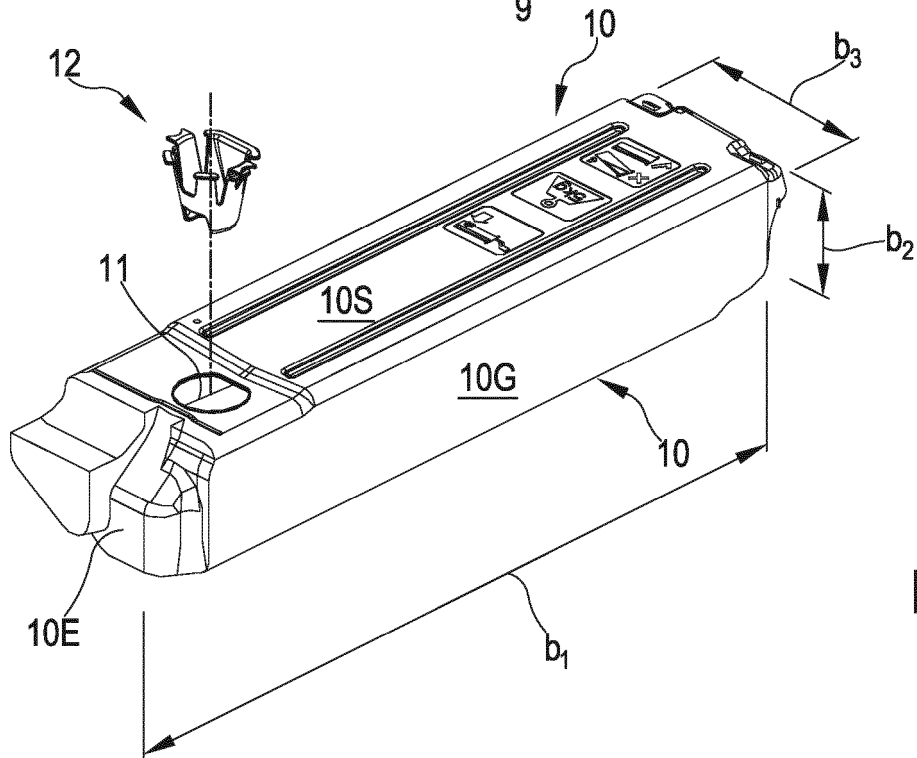
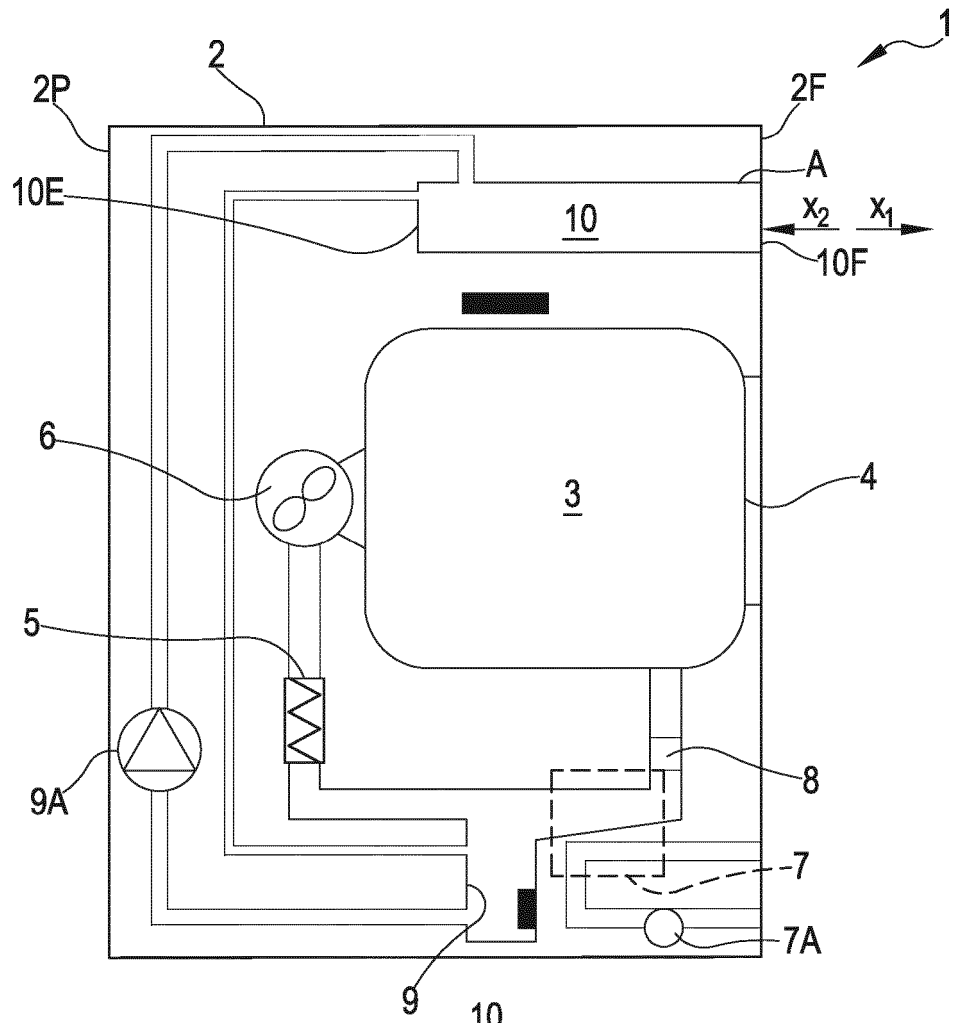


FIG.2

FIG.3

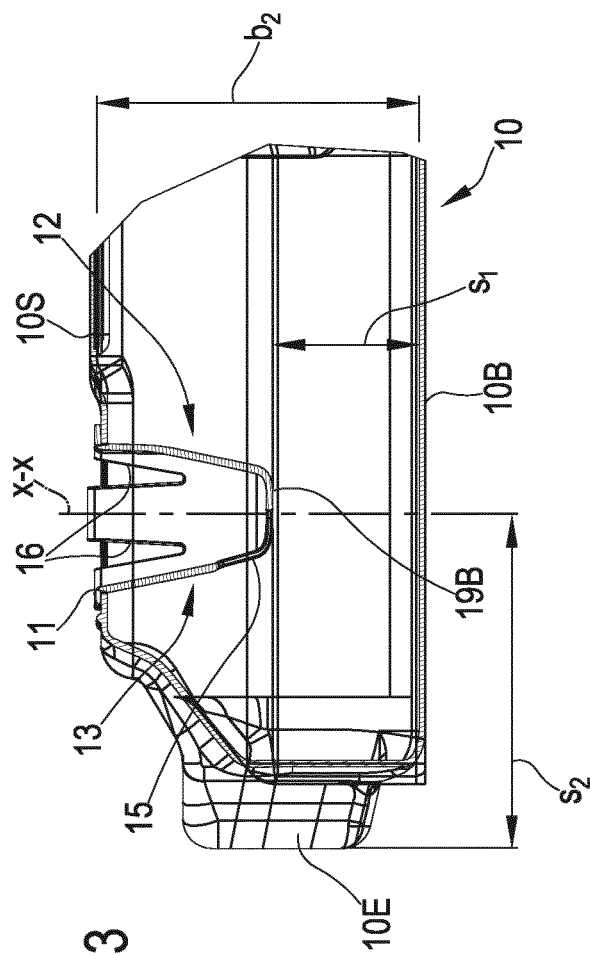


FIG.4

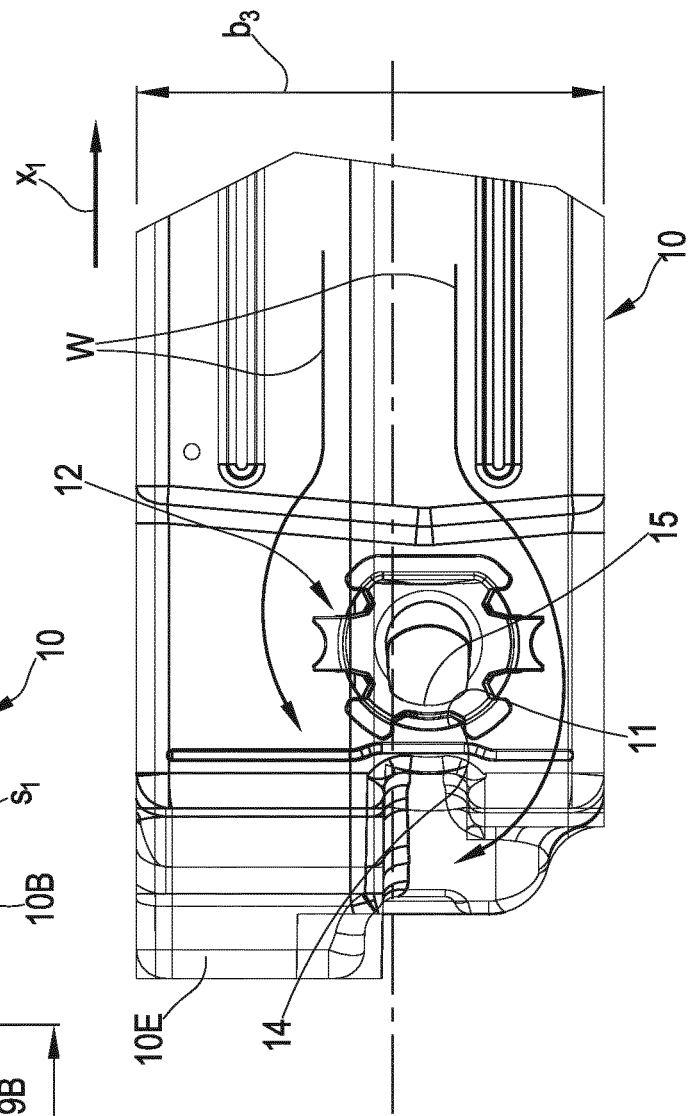


FIG.5

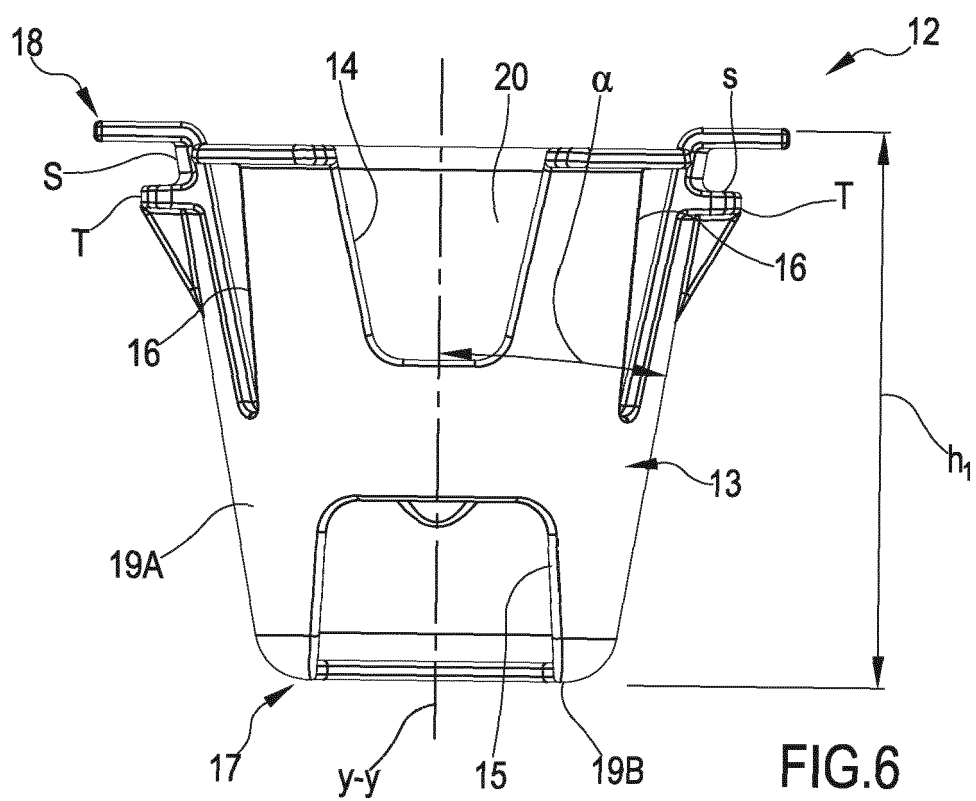
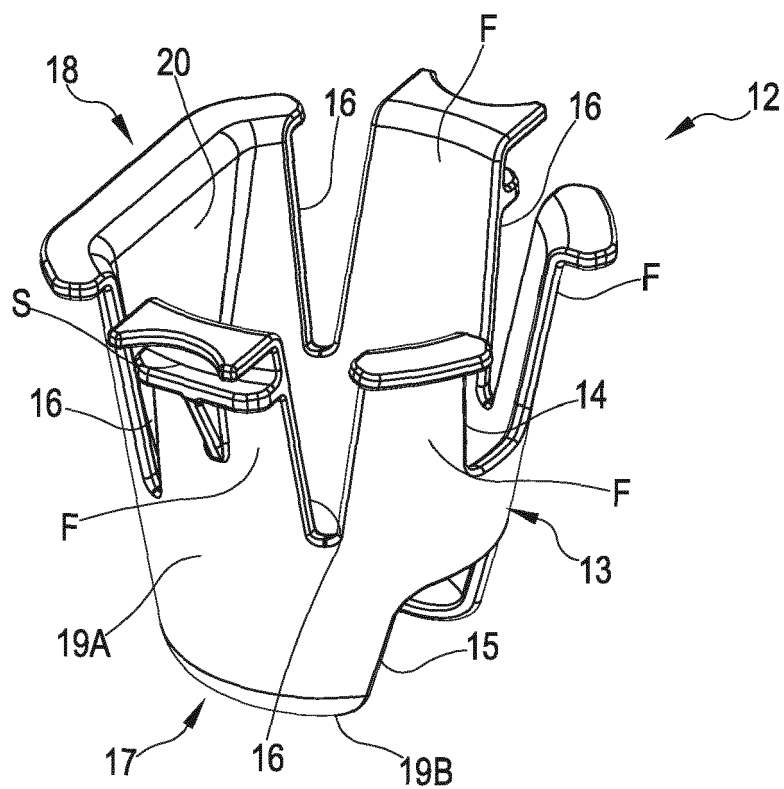


FIG.7

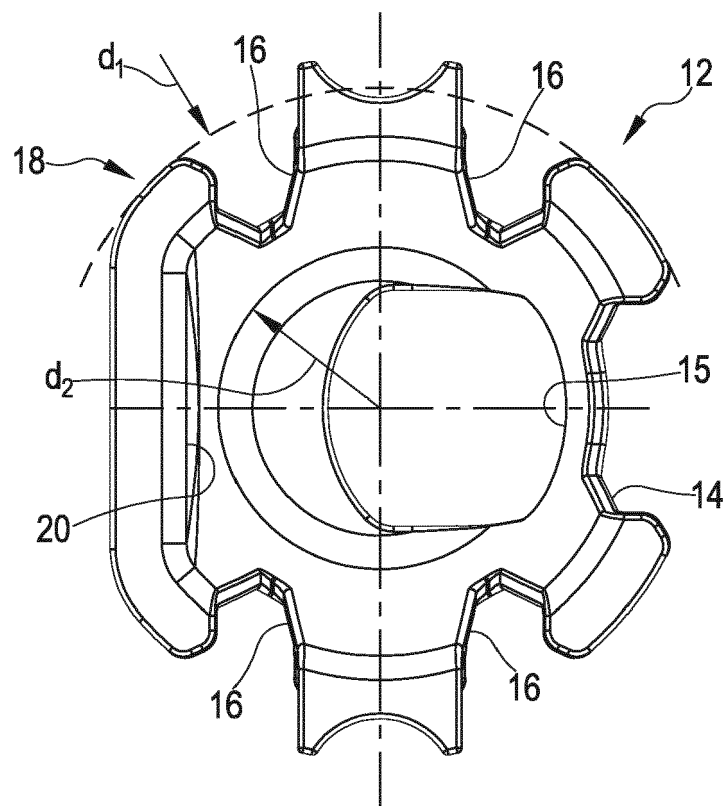
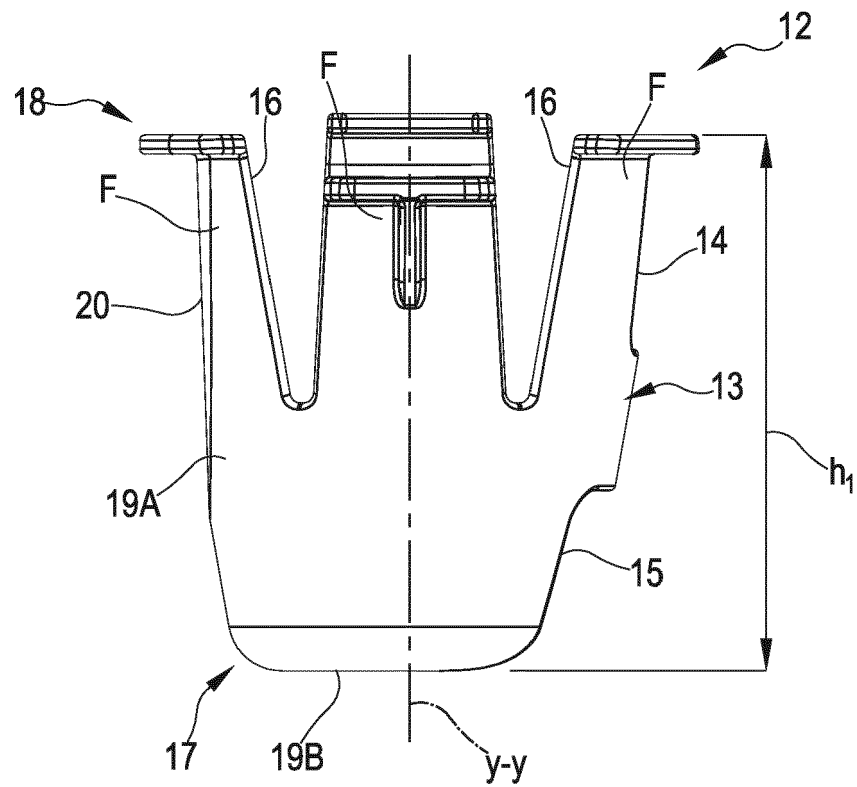


FIG.8

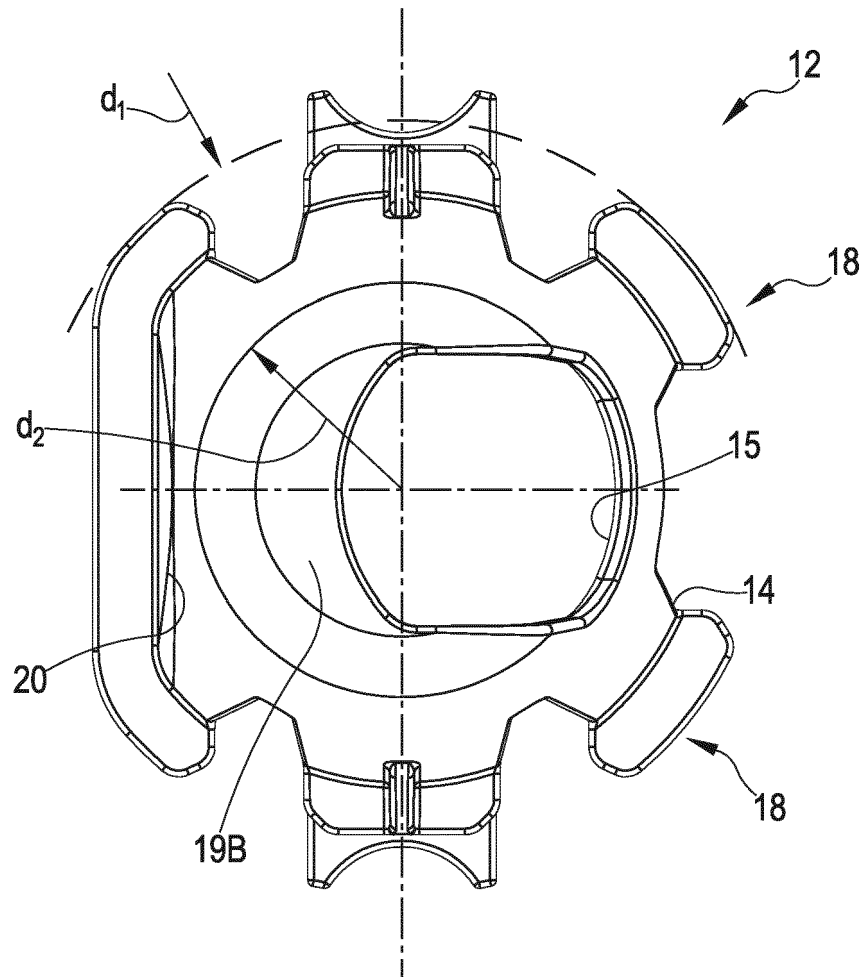


FIG.9



EUROPEAN SEARCH REPORT

 Application Number
 EP 16 20 0124

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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	DE 100 23 230 C1 (MIELE & CIE [DE]) 13 December 2001 (2001-12-13)	1,2,15	INV. D06F58/24
A	* paragraphs [0011], [0012]; figures 1,3 *	3-14	
X	DE 81 14 387 U1 (MIELE & CIE GMBH) 25 August 1983 (1983-08-25)	1,15	
A	* the whole document *	2-14	
X	EP 2 314 759 A1 (CANDY SPA [IT]) 27 April 2011 (2011-04-27)	1,3,15	D06F
A	* figure 2 *	2,4-14	
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	
Munich		22 May 2017	Stroppa, Giovanni
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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 EPO FORM 1503 03.02 (P04C01)

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

EP 16 20 0124

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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