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(54) **A COOLING APPLIANCE HAVING AN IMPROVED ICE MAKING ASSEMBLY**

(57) The present invention relates to a cooling appliance comprising; a cold air vent configured to guide the cold air to be introduced into an ice making assembly (1), the ice making assembly (1) comprising; an ice mold (2) including cavities wherein the water to be frozen are filled; a container (3) placed underneath the ice mold (2) and

configured to store ice; a guide (4) comprising a duct (5) and an outlet (6) that is provided in the ice making assembly (1) and is configured to guide a first part of the cold air entering the ice making assembly (1) toward the ice mold (2) via the outlet (6).

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Description

[0001] The present invention relates to a cooling appliance, in particular to a cooling appliance having an improved ice making assembly.

[0002] Most of the modern cooling devices are provided with ice making assemblies. The ice making assembly can be a manual or an automated system configured to freeze water and supply the user with ice. In manual systems, the user needs to rotate the ice mold in order to free ice produced inside the ice mold on regular intervals. The automated systems work similarly with the difference that the ice making assembly rotates the ice mold on predetermined time intervals in order to free ice produced inside the ice mold. The ice is then stored inside a container located underneath or in close vicinity of the ice mold. Even though the ice is stored below freezing point of water, after a certain storage time, ice pieces partly melt or sublimate which causes ice pieces to form an ice bridge or to shrink in size. In order to overcome this effect, cold air is directed into the container. However, the cold air is also required to form the ice itself. Therefore, it is essential to direct the cold air onto the ice mold and onto the ice stored inside the container proportional to the need.

[0003] A prior art publication in the technical field of the present invention may be referred to as US2010313594A1 among others, the document disclosing a cooling appliance having an ice making assembly provided on a rear surface of the door wherein the ice making assembly comprises a cold air guide utilized to direct the flow of cold air onto the ice mold.

[0004] A prior art publication in the technical field of the present invention may be referred to as US2017314832A1 among others, the document disclosing a cooling appliance having an ice making assembly provided on a rear surface of the door wherein the ice making assembly comprises a cold air guide.

[0005] A prior art publication in the technical field of the present invention may be referred to as US7243512B2 among others, the document relates to a cooling appliance having an ice making assembly wherein the ice making assembly comprises a fan provided on a rear surface thereof, wherein the fan is configured to transmit cold air onto the ice mold.

[0006] An objective of the present invention is to provide a cooling appliance with an ice making assembly wherein the ice production is accelerated.

[0007] Another objective of the present invention is to provide a cooling appliance with an ice making assembly having means to prevent formation of ice bridges inside the container which in turn causes a high noise level as the user requests ice from the cooling appliance. Therefore, noise level of the ice making assembly is improved. Additionally, ice is stored for a longer period and larger ice can be achieved.

[0008] The method realized to achieve the aim of the present invention and disclosed in the first claim and the

dependent claims comprises a cooling appliance. The cooling appliance comprises a body and a door pivotably attached onto the body between a closed and an open position. A cold air vent is provided on the door or on the body. The cooling appliance further comprises an ice making assembly wherein the ice making assembly comprises plurality of parts. One of the said parts is an ice mold, wherein the ice mold comprises plurality of cavities used to store water. A container is provided below the ice mold and stores ice produced by the ice mold. The ice making assembly comprises a guide that is used to transfer a part of the cold air entering the ice making assembly via the cold air vent towards the ice mold to freeze the water stored therein. The guide comprises a duct that is used to transfer cold air and an outlet via which the cold air is blown onto the ice mold. The guide further comprises an opening located on the duct via which a certain part of the cold air is blown onto the container. The container stores ice which tend to sublimate even under zero Celsius. The cold air blown onto the container by means of the opening helps keep ice larger for a longer period. Another advantageous effect provided by means of the opening is that the ice pieces are prevented to melt and stick together. As a result, and by means of the guide, the water is frozen faster which increases the production efficiency of the ice making assembly. Additionally, ice inside the container is stored longer, increasing the quality of the ice delivered to the user.

[0009] In an embodiment of the invention, the guide comprises an inlet for letting in the cold air into the duct and a fan in close vicinity of the inlet for forcing the air flow through the duct faster and in larger amounts. The fan increases the ice making efficiency of the ice making assembly. In an embodiment, the fan stands alone on the duct next to the inlet. In another embodiment, the fan stands adherent to the inlet. In either case, the fan creates vacuum, letting in more air via the inlet and cold air vent.

[0010] In an embodiment of the invention, the duct comprises an inclined part. The inclined part is between the inlet and outlet and forms an upward inclination from inlet to the outlet. The inclination is curvilinear in shape and helps the cold air passing through the duct reach the ice mold with minimum friction and back pressure.

[0011] In an embodiment of the invention, the opening is provided on the inclined part of the duct. As a result, cold air is transferred to the container in larger amounts.

[0012] In an embodiment of the invention, the opening is in the form a slit and the length of the slit is equal or less than the length of the inclined part. The length of the opening along the inclined part can be decreased or increased in order to control the flow air towards the container. This is especially advantageous as a single ice making assembly can be used in different cooling appliances with a very small change. The length of the opening can also be changed according to the different container volumes. As a result, a single type ice making assembly can be used for all cooling appliances, decreasing the

manufacturing costs of the ice making assembly and therefore that of the cooling appliance.

[0013] In an embodiment of the invention, the guide and therefore the duct comprises an inlet duct and an outlet duct. The said ducts are separated by the inclined part. As the cold air enters the ice making assembly via the inlet, it passes through the inlet duct, inclined part and the outlet duct respectively. The depth of the outlet duct (a) has to be smaller than that of the inlet duct (b). In fact, the ratio of the depth of the outlet duct divided by the depth of the inlet duct lies between 0.5 and 1. It is observed that the said range is the optimal condition for transferring cold air towards the ice mold and the container.

[0014] In an embodiment of the invention, the ice making assembly comprises a cover, covering the upper surface of the ice making assembly. The cover helps keep the cold air flowing inside the duct. It is also possible that an upper surface of cooling appliance can be used as a cover. An upper surface can be the inner line of the cooling appliance.

[0015] In an embodiment of the invention, the inclined part has an inclination between 15 and 25 degrees. In a preferred embodiment, the inclination is around 20 degrees. The said range of 15 to 25 degrees helps cold air to flow through the guide at a surprisingly good rate.

[0016] In an embodiment of the invention, the guide comprises at least a wing provided on the outlet that is used to direct the cold air towards the center point of the ice mold. As a result, the water is homogeneously cooled. This helps prevent the water close to the edges of the ice mold to remain in liquid state whereas the water at the middle of the ice mold is frozen. By means of the wings, the water is frozen all along the ice mold which in turn decreases the time required to freeze water. As a result, the ice making assembly produces ice faster.

[0017] In an embodiment of the invention, the ice making assembly is provided inside a freezing compartment of the cooling appliance.

[0018] An advantageous effect provided by means of the guide is that the water is cooled faster which helps increase the ice output of the ice making assembly.

[0019] Another advantageous effect provided by means of the guide is that the ice inside the container is stored longer thanks to the opening provided on the duct.

[0020] The drawings are not meant to delimit the scope of protection as identified in the claims nor should they be referred to alone in an effort to interpret the scope identified in the claims without recourse to the technical disclosure in the description of the present invention.

Figure 1 - is a perspective view of the ice making assembly

Figure 2 - is a cross sectional view of the ice making assembly along the dashed A-A lines in Figure 1

Figure 3 - is an exploded view of the ice making assembly

Figure 4 - is a perspective view of the ice making as-

sembly

Figure 5 - is a perspective view of the ice making assembly

[0021] The following numerals are assigned to different parts demonstrated in the drawings and referred to in the present detailed description of the invention:

1. Ice making assembly
2. Ice mold
3. Container
4. Guide
5. Duct
6. Outlet
7. Opening
8. Inlet
9. Fan
10. Inclined part
11. Inlet duct
12. Outlet duct
13. Cover
14. Wing
- a. depth of the inlet duct
- b. depth of the outlet duct

[0022] The present invention relates to a cooling appliance comprising; a cold air vent configured to guide the cold air to be introduced into an ice making assembly (1), the ice making assembly (1) comprising; an ice mold (2) including cavities wherein the water to be frozen are filled; a container (3) placed underneath the ice mold (2) and configured to store ice; a guide (4) comprising a duct (5) and an outlet (6) that is provided in the ice making assembly (1) and is configured to guide a first part of the cold air entering the ice making assembly (1) toward the ice mold (2) via the outlet (6).

[0023] In the preferred embodiment of the invention, the guide (4) comprises an opening (7) along the duct (5) that is configured to guide a second part of the cold air onto the container (3). The cold air vent is provided on an inner surface of the cooling appliance and transfers cold air coming from the evaporator towards the ice making assembly (1). The ice making assembly (1) comprises the ice mold (2), wherein the ice mold (2) comprises a pattern of cavities into where the water to be frozen is filled. The container (3), which is located underneath the ice mold (2) is used to store ice. The ice making assembly (1) further comprises the guide (4) provided on an upper surface thereof. The guide (4) is in connection with the cold air vent and is used to transfer the cold air towards the ice mold (2) and the container (3). The guide (4) comprises the duct (5) that is used to transfer the cold air. The duct (5) lies between the cold air vent and the outlet (6) and cold air passes through it. The guide (4) comprises an opening (7) allowing the cold air to be blown onto the ice mold (2). The cold air entering the ice making assembly (1) via the cold air vent passes through the

duct (5) of the guide (4) and a portion of the cold air is forwarded to the external environment of the guide (4) via the outlet (6) and towards the ice mold (2). Another portion of the cold air exits the guide (4) through the opening (7) and is blown onto the container (3) where the ice is stored. By means of the guide (4) having the opening (7), the cold air is divided between the ice mold (2) and the container (3) which helps optimize the ice making capacity of the ice making assembly (1), meanwhile prolonging the storage time of the ice inside the container (3). Another advantageous effect provided by means of the opening (7) is that the ice pieces are prevented to stick to each other inside the container (3).

[0024] In an embodiment of the invention, the guide (4) comprises an inlet (8) via which the cold air is introduced into the ice making assembly (1) and that that a fan (9) is provided in close vicinity of the inlet (8) for increasing the flow of cold air. The guide (4) comprises the inlet (8) wherein the inlet (8) is located next to the cold air vent. A seal is provided between the inlet (8) and the cold air vent so as to prevent air leakages. The guide (4) further comprises the fan (9) in close vicinity of the inlet (8) but more preferably adjacent to the inlet (8). In a preferred embodiment, the only way cold air may enter into the guide is through the fan (9). The fan is utilized to create a vacuum thereby increasing the flow of cold air into the guide (4).

[0025] In an embodiment of the invention, the duct (5) is configured to incline upwards from the inlet (8) to the outlet (6) via an inclined part (10). The inclined part (10) is curvilinear in shape and provides the cold air to flow through the guide (4) smoothly. As a result of the inclined part (10), the outlet (6) is placed at a higher altitude than the inlet (8). This helps create extra storage volume for the container (3).

[0026] In an embodiment of the invention, the opening (7) is arranged on the inclined part (10) of the duct (5). By means of providing the opening (7) on the inclined part (10), more cold air can be introduced into the container (3). The cold air entering the ice making assembly (1) is guided upwards and towards the outlet (6). Meanwhile, a part of the cold air entering the ice making assembly (1) collides with the inclined part (10), releasing a certain amount of the cold air through the opening (7), which in turn will reach the container (3) cooling down the ice stored therein. The vertical and horizontal projections (with respect to the standard Cartesian coordinates) of the opening (7) can be adjusted so as to meet the cooling demands of ice making assemblies having varying dimensions. By means of which, a single ice making assembly (1) can be used with a slight variation of the inclined parts (10) dimensions.

[0027] In an embodiment of the invention, the opening (7) is in the form of a slit and that the slit extends along at most half of the length of the inclined part (10). The opening (7) is in the form of a slit and extends parallel to the extension direction of the inclined part (10). The length of the opening (7) along the inclined part (10) is

equal or less than half the length of the inclined part (10). Likewise, the length of the opening (7) along the inclined part (10) can be adjusted so as to meet the cooling demands of ice making assemblies having varying dimensions.

[0028] In an embodiment of the invention, the duct (5) comprises an inlet duct (11) and an outlet duct (12) along the flow direction of the cold air and are connected via the inclined part (10), wherein the depth of the inlet duct (b) and that of the outlet duct (a) are related with the disequilibrium of; $1/2 < a/b < 1$. The duct (5) comprises the inlet duct (11) and the outlet duct (12), wherein the said ducts (11,12) are connected to each other by means of the inclined part (10). As a result, the depth of the inlet duct (11) is bigger than that of the outlet duct (12). Some of the cold air is expelled from the duct (5) by means of the opening (7). On the other hand, as the duct (5) gets narrower, the velocity of the cold air passing through it increases. This helps cold air to reach the ice mold (2) as it emerges from the outlet (6). In addition to this, the main advantageous effect provided by means of the outlet duct (12) having a smaller depth than that of the inlet duct (11) is that the cooling of water inside the ice mold (2) is accelerated at a surprising rate.

[0029] In an embodiment of the invention, the ice making assembly (1) comprises a cover (13) covering the duct (5). The cover (13) covers the upper surface of the ice making assembly (1) and therefore the duct (5). The cover (13) helps limit the flow of the cold air along the duct (5). The ice making assembly (1) can also be placed adjacent to an inner and upper surface of the cooling appliance which may function as a cover (13).

[0030] In an embodiment of the invention, the inclination of the inclined part (10) is between 15 and 25 degrees. The said range of angles are proven to be surprisingly efficient in terms of transmission of the cold air both towards the container (3) and to the ice mold (2). In an embodiment, the inclination of the inclined part (10) is around 20 degrees.

[0031] In an embodiment of the invention, the guide (4) comprises a wing (14) at the outlet (6) to direct the cold air onto the ice mold (2). The wing (14) is inclined with respect to the flow direction of the cold air and directs the cold air towards the middle section of the ice mold (2) which helps optimize ice making procedure.

[0032] In an embodiment of the invention, the ice making assembly (1) is placed into a freezing chamber of the cooling appliance. The freezer compartments have an inner temperature lower than freezing point of the water. This helps increase ice making efficiency.

[0033] It is to be understood that the ice making assembly (1) can also be placed inside a fresh food compartment of a cooling appliance. In such cases necessary technical means have to be provided in order to make the cold air reach the ice making assembly (1). However, the embodiment of the ice making assembly (1) is to be remained the same.

[0034] An advantageous effect provided by means of

the invention is that the ice production of the ice making assembly (1) is increased thanks to the guide (4). Meanwhile, a predetermined portion of the cold air is transferred to the container (3) which helps prevent formation of ice bridges and also sublimation of the ice pieces. As a result, the quality and size of the ice delivered to the user is improved.

Claims

1. A cooling appliance comprising;

a cold air vent configured to guide the cold air to be introduced into an ice making assembly (1), the ice making assembly (1) comprising;
an ice mold (2) including cavities wherein the water to be frozen are filled;
a container (3) placed underneath the ice mold (2) and configured to store ice; a guide (4) comprising a duct (5) and an outlet (6) that is provided in the ice making assembly (1) and is configured to guide a first part of the cold air entering the ice making assembly (1) toward the ice mold (2) via the outlet (6); **characterized in that** the guide (4) comprises an opening (7) along the duct (5) that is configured to guide a second part of the cold air onto the container (3).

2. A cooling appliance according to claim 1, **characterized in that** the guide (4) comprises an inlet (8) via which the cold air is introduced into the ice making assembly (1) and that that a fan (9) is provided in close vicinity of the inlet (8) for increasing the flow of cold air.

3. A cooling appliance according to any preceding claim, **characterized in that** the duct (5) is configured to incline upwards from the inlet (8) to the outlet (6) via an inclined part (10).

4. A cooling appliance according to claim 4, **characterized in that** the opening (7) is arranged on the inclined part (10) of the duct (5).

5. A cooling appliance according to claims 3 to 4, **characterized in that** the opening (7) is in the form of a slit and that the slit extends along at most half of the length of the inclined part (10).

6. A cooling appliance according to claims 3 to 5, **characterized in that** the duct (5) comprises an inlet duct (11) and an outlet duct (12) along the flow direction of the cold air and are connected via the inclined part (10), wherein the depth of the inlet duct (b) and that of the outlet duct (a) are related with the disequilibrium of;

$$\frac{1}{2} < \frac{a}{b} < 1$$

7. A cooling appliance according to any preceding claim, **characterized in that** the ice making assembly (1) comprises a cover (13) covering the duct (5).

8. A cooling appliance according to claims 3 to 7, **characterized in that** the inclination of the inclined part (10) is between 15 and 25 degrees.

9. A cooling appliance according to any preceding claim, **characterized in that** the guide (4) comprises a wing (14) at the outlet (6) to direct the cold air onto the ice mold (2).

10. A cooling appliance according to any preceding claim, wherein the ice making assembly (1) is placed into a freezing chamber of the cooling appliance.

Figure 1

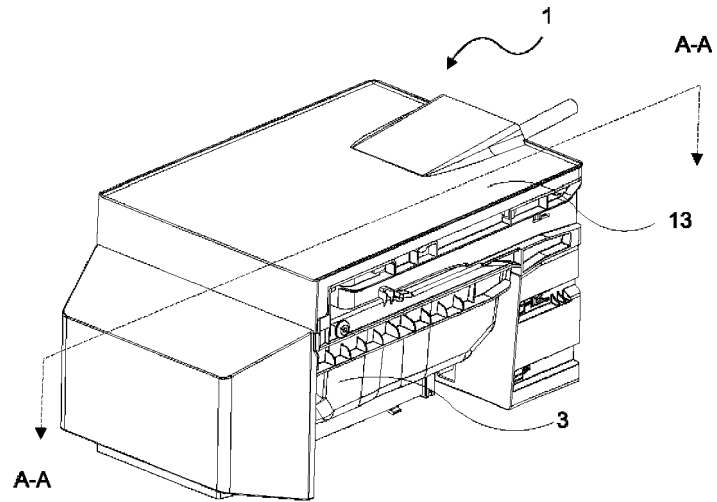


Figure 2

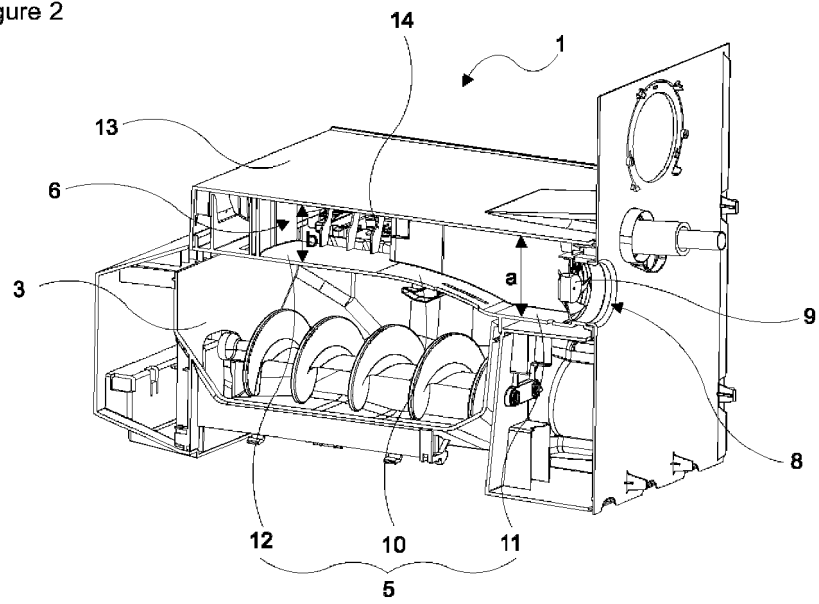


Figure 3

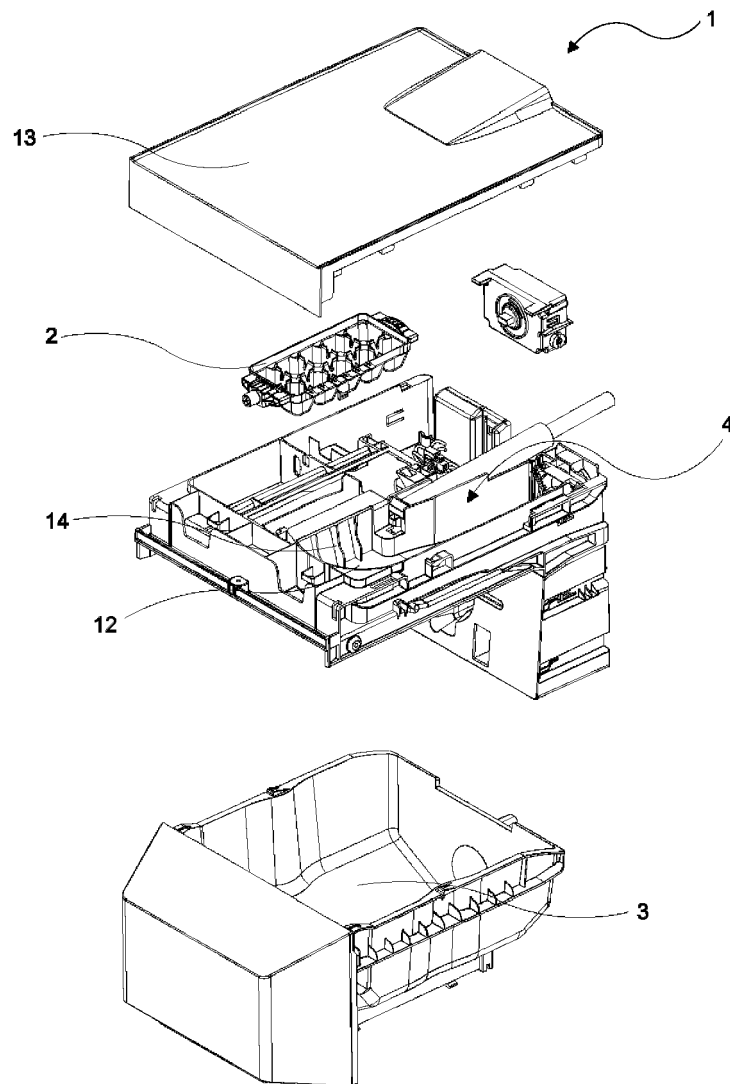


Figure 4

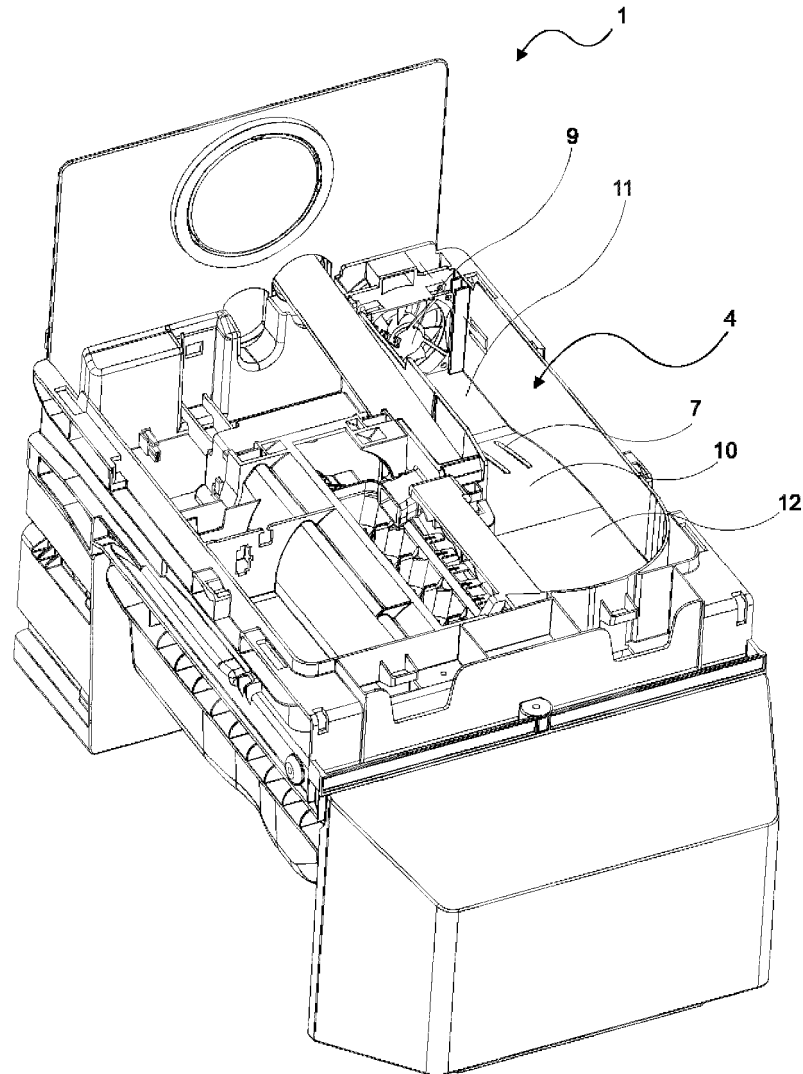
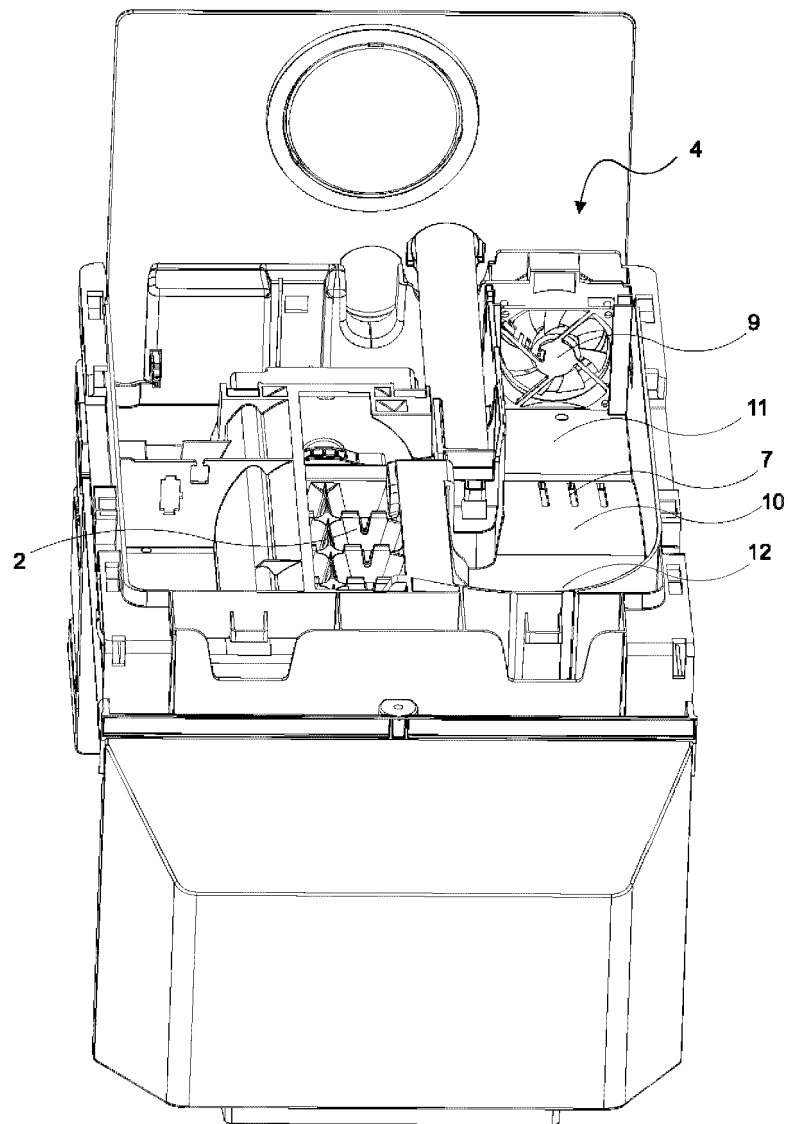


Figure 5





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Application Number

EP 21 19 9944

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3	The present search report has been drawn up for all claims		
Place of search The Hague		Date of completion of the search 23 February 2022	Examiner Dezso, Gabor
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