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(71) Applicant: **Arçelik Anonim Sirketi**
34445 Istanbul (TR)

(72) Inventors:
• **CENESIZ, Kaan**
34445 Istanbul (TR)
• **KARAAGAC, Emre**
34445 Istanbul (TR)
• **YAYLA, Sonat**
34445 Istanbul (TR)
• **GUNDUZ, Nihat**
34445 Istanbul (TR)

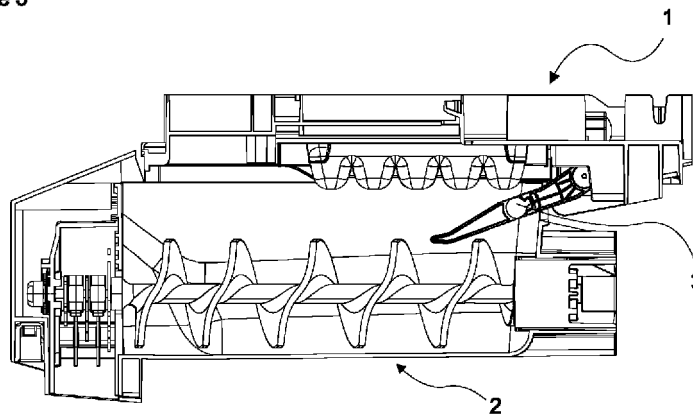
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(54) A COOLING APPLIANCE HAVING AN ICE MAKER

(57) The present invention relates to a cooling appliance comprising; an ice maker (1) for making ice from water supplied thereto; an ice storage (2) for storing ice made by the ice maker (1); an ice level arm (3) pivotably attached on the ice maker (1) so as to pivot up and down into the ice storage (2); an agitating means (4) for pivoting

the ice level arm (3), wherein the ice level arm (3) comprises a first arm (5) via which the ice level arm (3) is pivotably attached on the ice maker (1) and a second arm (6) pivotably attached around an axis and onto an end the first arm (5) by means of a link (7).

Figure 3



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Description

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

[0002] The cooling devices are used by many on a daily basis. They took up a volume inside the kitchens and as a result, the users are demanding various functionalities from their cooling appliances. Cooling appliances having automatic ice making mechanisms are a result of such a demand. In such cooling appliances, the ice making mechanisms is provided with an ice maker part and an ice storage part used to store ice pieces produced. Since user interference with the ice making mechanisms is not desired, many manufacturer automated the systems which in turn provides ease of convenience for the user and improves brand image. Automation, however, brought its own problems, the ice level detection being one of them. In order to detect the ice level inside the ice storage, producers mainly use a level arm, preferably attached to the ice maker, which is free to pivot up and down into the ice storage by means of a motor or a similar agitation means. The ice level arm, pivots into the ice storage in regular intervals and detect the depth of the ice inside the ice storage. Many different embodiments are provided, however most of the arms have complicated structures therefore increasing manufacturing costs. Another problem occurring due to the ice level arms is that the ice level arms occupies a large volume inside the ice storage therefore limiting the ice storage capacity.

[0003] A prior art publication in the technical field of the present invention may be referred to as US3863461A among others, the document disclosing a cooling appliance having an automatic ice maker comprising an ice level sensing means.

[0004] A prior art publication in the technical field of the present invention may be referred to as US6161390A among others, the document disclosing a cooling appliance having an ice maker assembly and method for controlling the same.

[0005] An objective of the present invention is to provide an ice level arm having decreased volume so as to increase the storage capacity of the ice storage.

[0006] Another objective of the present invention is to provide an ice level arm having simplified structure so as to decrease the manufacturing costs.

[0007] Another objective of the present invention is to provide an ice level arm having pointwise contact point therefore increasing measuring accuracy.

[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 an ice maker. The ice maker makes ice from water supplied thereto. The ice maker comprises plurality of empty volumes into where the water is supplied. Upon freezing of the water, the ice maker activates an agitation means. The agitation means pivots a tray accommodating the empty volumes therefore re-

leasing the ice cubes from the tray. Under the effect of gravitation, the ice cubes fall into an ice storage. The ice maker comprises an ice level arm, pivotably attached to the ice maker. The ice level arm is configured to pivot down and into the ice storage and up towards the ice maker. During the pivot movement towards the ice storage, the ice level arm encounters the ice cubes stored therein and stops. Therefore, the amount of ice inside the ice storage is measured. Pivot of the ice level arm is provided by means of the agitation means. The ice level arm comprises a first arm and a second arm. The first arm is the part via which the ice level arm is connected to the ice maker. The second arm is pivotably attached to the first arm and both arms are able to pivot independent of each other. The second arm is biased towards down and into the ice storage. The second arm is attached to the first arm along an axis. As the agitation means starts to pivot the first arm, the first arm pivots towards the ice storage. Depending on the length of the ice level arm and the depth of the ice cubes inside the ice storage, the ice level arm contacts the ice cubes stops to pivot. By means of the ice level arm, the level of ice inside the ice storage is accurately measured. Another advantageous effect provided by means of the ice level arm is, thanks to the multi parted structure the ice level arm possesses, the inner volume of the ice storage is utilized efficiently. Another advantageous effect provided by means of the ice level arm is that the volume of the ice storage is used efficiently.

[0009] In an embodiment of the invention, the link comprises a canal and a lug. The link is mainly composed of the reciprocal ends of the first arm and the second arm. The first is pivotably attached to the agitation means via an end whereas the other end is pivotably attached to the second arm. The canal is provided on the end of the first arm connected with the second arm. The lug is provided on the end of the second arm connected with the first arm. The lug is seated inside the canal and is configured to move along the canal upon pivoting of the second arm. The length of the canal limits the movement of the lug and therefore the pivot movement of the second arm. The canal and the lug structure, the link has, provides a rigid structure and a good control on the movement of the second arm.

[0010] In an embodiment of the invention, the comprises a screw and a washer used to assembly the second arm onto the first arm. The screw passes through the hole of the screw and enters into the bore provided along the link of the first arm and the second arm.

[0011] In an embodiment of the invention, the depth of the link is configured to be changed along the axis. The link is in telescopic structure and moves along the axis. Upon moving the link along the axis, the location of the first arm remains the same, whereas the second arm moves along the axis. By extending the second arm along the axis, the ice level at different positions inside the ice storage can be measured.

[0012] In an embodiment of the invention, agitating

means comprises a pair of cutouts into which the first arm is form fittingly seated by means of a pair of interlocking ribs.

[0013] By means of the present invention, an ice level arm is provided for the ice makers having decreased volume which helps to utilize the inner volume of the ice storage an efficient manner.

[0014] Another advantageous effect provided by means of this invention is that, thanks to the pivot movement of the arms, the ice level arm can be produced thinner, decreasing material related costs.

[0015] Another advantageous effect provided by means of this invention is that the multi arm structure the ice level arm has, enables the ice level arm to reach further.

[0016] 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 cooling appliance

Figure 2 - is an isolated view of the ice maker

Figure 3 - is a cross sectional view of dashed A-A lines in Figure 2 wherein the ice level arm is in a lower position

Figure 4 - is a cross sectional view of dashed A-A lines in Figure 2 wherein the ice level arm is in an upper position

Figure 5 - is a side view of the ice level arm

Figure 6 - is a perspective view of the first arm

Figure 7 - is a perspective view of the first arm

Figure 8 - is a perspective view of the second arm

Figure 9 - is an exploded view of the agitating means and the ice level arm.

[0017] 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 maker
2. Ice storage
3. Ice level arm
4. Agitating means
5. First arm
6. Second arm
7. Link
8. Canal
9. Lug
10. Cutout
11. Interlocking rib

[0018] The present invention relates to a cooling appliance comprising; an ice maker (1) for making ice from water supplied thereto; an ice storage (2) for storing ice made by the ice maker (1); an ice level arm (3) pivotably attached on the ice maker (1) so as to pivot up and down

into the ice storage (2); an agitating means (4) for pivoting the ice level arm (3).

[0019] The present invention relates to a cooling appliance wherein the ice level arm (3) comprises a first arm (5) via which the ice level arm (3) is pivotably attached on the ice maker (1) and a second arm (6) pivotably attached around an axis and onto an end the first arm (5) by means of a link (7). The ice maker (1) comprises an ice tray wherein plurality of empty volumes are provided. The water is supplied to the ice maker (1) and into the said empty volumes. The cool air coming from the fan is forced to pass along the said volumes, thereby freezing the water. After a predetermined time interval, the agitating means (4) agitates the ice maker (1). In other words, the agitating means (4) forces the ice tray to pivot thereby releasing the ice cubes produced inside the said volumes. The ice cubes then fall into the ice storage (2) piling upon each other. The cooling appliance comprises a control unit controlling the operational functions of the cooling appliance. The control unit, activates the agitating means (4) to pivot the ice level arm (3) on predetermined time intervals. Upon activation, the ice level arm (3) starts to pivot downwards and into the ice storage (2). Upon contacting the ice cubes inside the ice storage (2), the movement of the ice level arm (3) is stopped which in turn causes the control unit to increase the electric current provided to the agitating means (4). In case, the current provided accedes a predetermined value, the control unit decides that the ice storage (2) is full. As a result, production of ice is stopped which would have caused the ice cubes inside the ice storage (2) overflow the ice storage (2). The ice level arm (3) comprises the first arm (5), the second arm (6) and the link (7) interconnecting the said arms (5,6). The first arm (5) is attached to the ice maker (1) in a pivotable manner between an upper and a lower position. Likewise, the second arm (6) is attached to the first arm (5) in a pivotable manner between an upper and a lower position. The second arm (6) is biased towards lower position. After the first arm (5) starts to pivots towards the lower position, the second arm (6) makes first contact with the ice cubes. Upon contact, the second arm (6) is forced to pivot towards the upper position. After a certain amount of pivot movement of the second arm (6), the second arm (6) reaches its extend of pivot movement. The force applied by the second arm (6) to the ice cubes balances with the force applied by the ice cubes towards the second arm (6) and the pivot movement of both of the arms (5,6) stops. As a result, the ice level inside the ice storage (2) is detected. An advantageous effect of using two arms (5,6) for ice level arm (2), provides efficient use of the volume inside the ice maker (1) as the height of the level arm (2) is significantly decreased along the standard Z axis.

[0020] The present invention relates to a cooling appliance wherein the link (7) comprises a canal (8) and a lug (9) provided at the reciprocal ends of the said arms (5,6) wherein the lug (9) is configured to move along the canal (8) upon pivoting of the second arm (6). The link

(7) connects the first arm (5) and the second arm (6) via the reciprocal ends. The said ends comprises the lug (9) and the canal (8) wherein the lug (9) is configured to move along the canal (8). As the second arm (6) starts to pivot, the lug (9) starts to move along the canal (8). The canal (9) is in concave shape and determines the pivot angle of the second arm (6). In a preferred embodiment, the pivot angle is configured to be 30 degrees. In another preferred embodiment, the pivot angle is configured to be 45 degrees. In another preferred embodiment, the pivot angle is configured to be 60 degrees. The length of the canal (8) determines the maximum lower position of the second arm (6). By changing the length of the canal (8), the second arm (6) can be configured to reach deeper into the ice storage (2) so as to detect lower amounts of ice stored.

[0021] The present invention relates to a cooling appliance wherein the link (7) comprises a screw and a washer. The second arm (6) is pivotably attached onto the first arm (5) via the link by means of a washer and a screw.

[0022] The present invention relates to a cooling appliance wherein the depth of the link (7) is configured to be changed along the axis. Ice cubes stored inside the ice storage (2) piles in a pyramidal manner, the deepest part being extending along the length and midway of the ice storage (2). Therefore, the ice level arm (3) contacts the peak of the ice cube pile, meanwhile a significant volume being vacant towards the edges of the ice storage (2). By means of changing the depth of the link (7), the second arm (6) can be made to reach the edges of the ice storage (2). As a result, more ice can be stored inside the ice storage (2). This can be achieved simply by replacing the second arm (6) by another second arm (6) wherein the link portion of the second arm (6) is to have a bigger depth. This can also be achieved by providing a telescopic link (7) portion.

[0023] In another embodiment of the invention, the second arm (6) is attached to first arm (5) with a link (7) allowing the depth of the link (7) to be increased upon contact of the second arm (6) to the ice cubes. Therefore, the second arm (6) slides along the surface of the ice cubes. The impact between the second arm (6) and the ice cubes creates a current peaks which are to be detected by the control unit. Therefore, depth of the ice cubes can be detected and modelled.

[0024] The present invention relates to a cooling appliance wherein the agitating means (4) comprises a pair of cutouts (10) into which the first arm (5) is seated by means of a pair of interlocking ribs (11). The interlocking ribs (11) are configured to be seated inside the cutouts (10) flushly. This provides ease of assembly and a robust structure.

[0025] In another embodiment of the invention, the cooling appliance comprises a ice level arm (3) having three or four or five arms instead of two arms (5,6). Increasing the number of arms and decreasing their length helps reduce the volume occupied by the arms. Another

advantageous effect provided by means of plurality of arms is that the last arm contacting the ice makes a pointwise contact, increasing the detection efficiency of the ice level arm (3).

[0026] In another embodiment of the invention, the second arm (6) comprises a saw tooth pattern at the contacting the ice. By means of saw tooth protrusion, the ice cubes are avoided from sliding.

[0027] By means of the ice level arm (3), the inner volume of the ice storage is utilized efficiently, which is achieved by decreasing the dimensions of the ice level arm (3).

15 Claims

1. A cooling appliance comprising;
an ice maker (1) for making ice from water supplied thereto;
an ice storage (2) for storing ice made by the ice maker (1);
an ice level arm (3) pivotably attached on the ice maker (1) so as to pivot up and down into the ice storage (2);
an agitating means (4) for pivoting the ice level arm (3)

characterized in that

the ice level arm (3) comprises a first arm (5) via which the ice level arm (3) is pivotably attached on the ice maker (1) and a second arm (6) pivotably attached around an axis and onto an end the first arm (5) by means of a link (7).

2. A cooling appliance according to claim 1, **characterized in that** the link (7) comprises a canal (8) and a lug (9) provided at the reciprocal ends of the said arms (5,6) wherein the lug (9) is configured to move along the canal (8) upon pivoting of the second arm (6).
3. A cooling appliance according to any preceeding claim, **characterized in that** the link (7) comprises a screw and a washer.
4. A cooling appliance according to any preceeding claim, **characterized in that** the depth of the link (7) is configured to be changed along the axis.
5. A cooling appliance according to any preceeding claim, **characterized in that** the agitating means (4) comprises a pair of cutouts (10) into which the first arm (5) is seated by means of a pair of interlocking ribs (11).

Figure 1

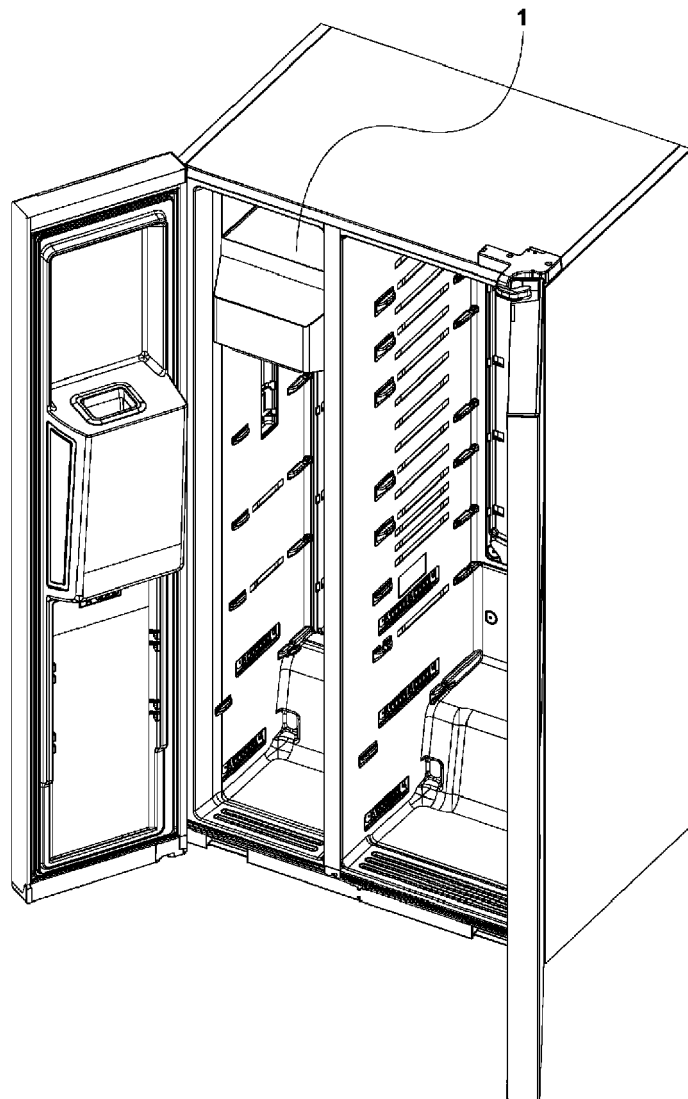


Figure 2

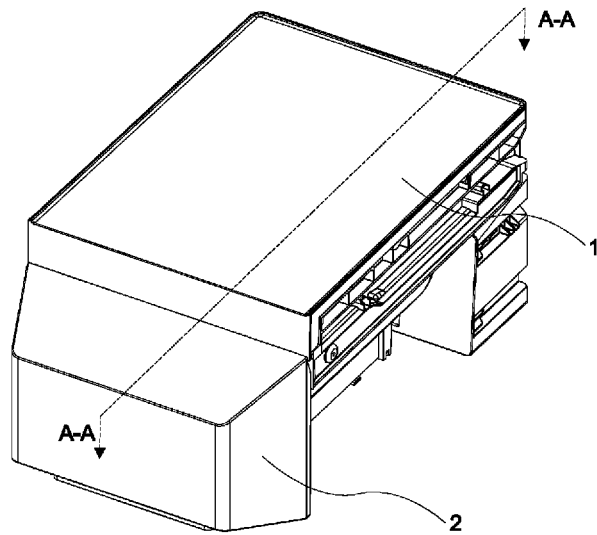


Figure 3

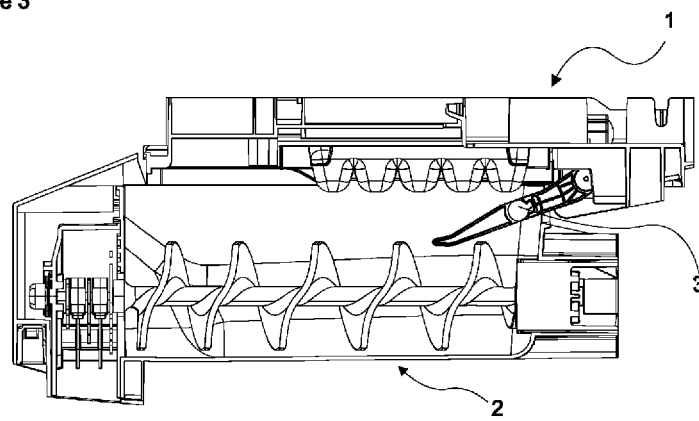


Figure 4

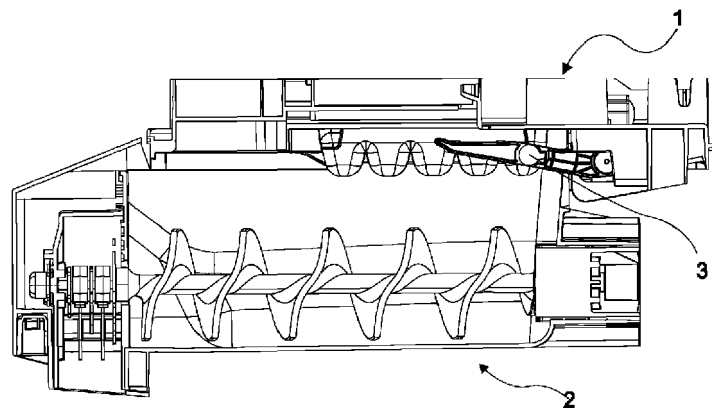


Figure 5

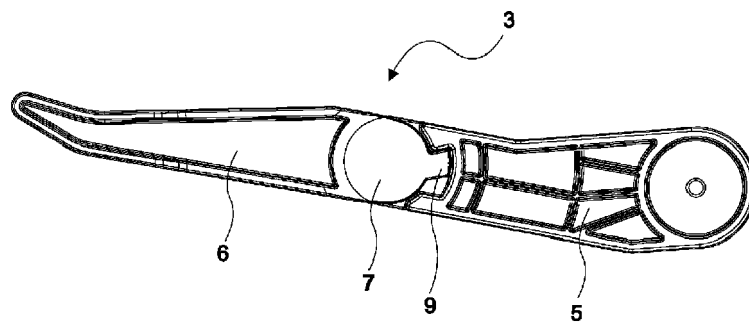


Figure 6

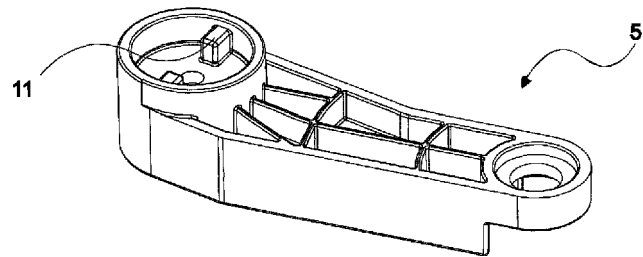


Figure 7

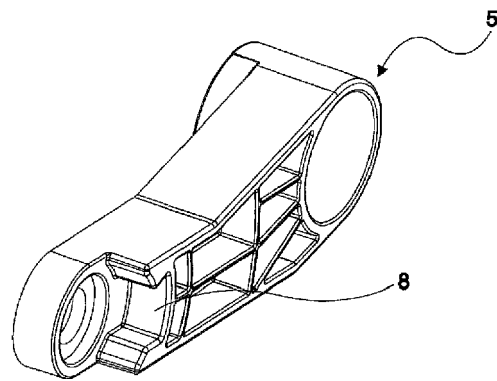
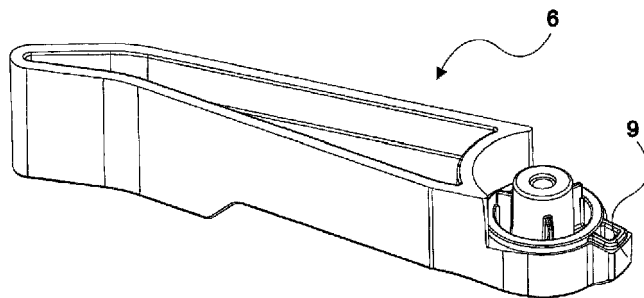


Figure 8



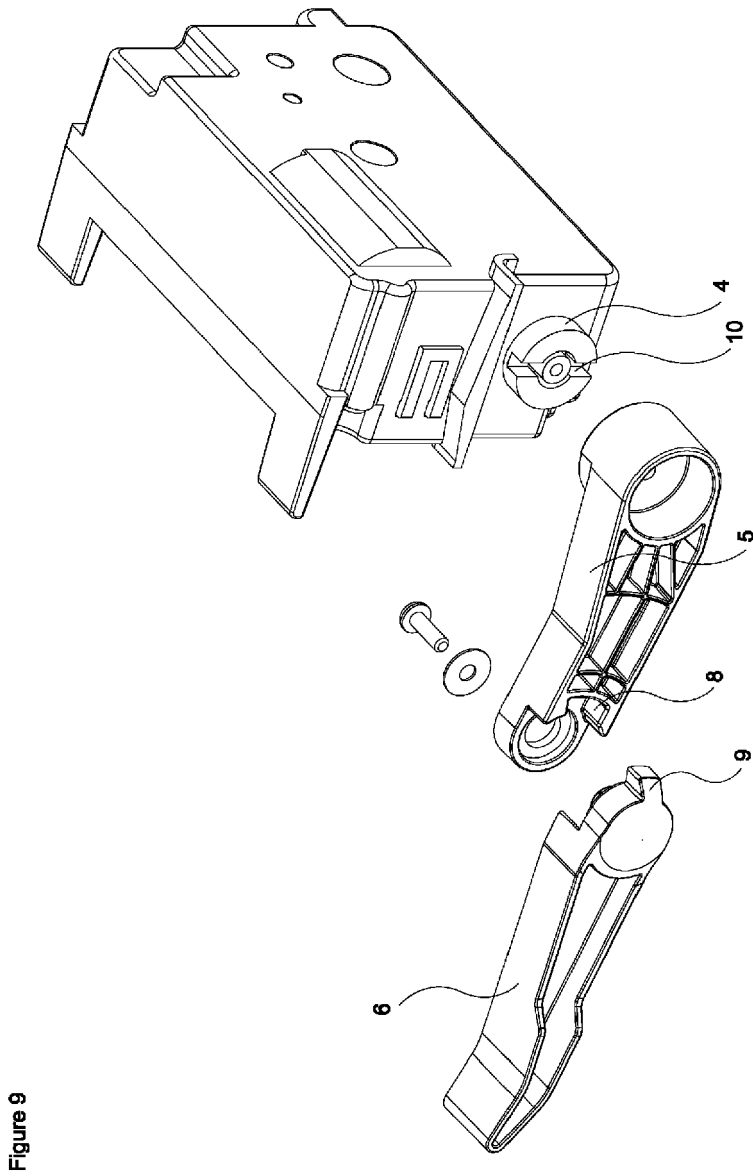


Figure 9



EUROPEAN SEARCH REPORT

 Application Number
 EP 21 17 6403

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EPO FORM 1503 03.82 (P04C01)

DOCUMENTS CONSIDERED TO BE RELEVANT			
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Y	* paragraphs [0017] - [0020]; figures 1-5 *	5	
X	US 2009/255282 A1 (AMONETT DANIEL K [US] ET AL) 15 October 2009 (2009-10-15) * paragraphs [0004], [0077], [0078]; claim 4; figures 1-5F *	1-5	
X	KR 2006 0029864 A (SAMSUNG ELECTRONICS CO LTD) 7 April 2006 (2006-04-07) * figures 1-3 *	1-3	
Y	US 10 451 328 B2 (ELECTROLUX HOME PROD INC [US]) 22 October 2019 (2019-10-22) * figure 6 *	5	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25C G01F
The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
The Hague		26 October 2021	Fest, Gilles
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 21 17 6403

5 This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
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26-10-2021

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REFERENCES CITED IN THE DESCRIPTION

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- US 6161390 A [0004]