



(51) International Patent Classification:
F25C 1/00 (2006.01)

(21) International Application Number:
PCT/TR2024/050844

(22) International Filing Date:
18 July 2024 (18.07.2024)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2023/017777 20 December 2023 (20.12.2023) TR

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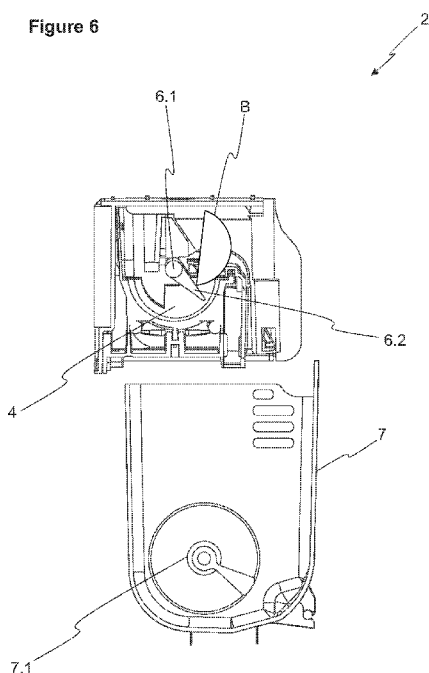
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(81) Designated States (*unless otherwise indicated, for every
kind of national protection available*): AE, AG, AL, AM,
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY, BZ,
CA, CH, CL, CN, CO, CR, CU, CV, CZ, DE, DJ, DK, DM,
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,
HN, HR, HU, ID, IL, IN, IQ, IR, IS, IT, JM, JO, JP, KE, KG,
KH, KN, KP, KR, KW, KZ, LA, LC, LK, LR, LS, LU, LY,
MA, MD, MG, MK, MN, MU, MW, MX, MY, MZ, NA,
NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO,
RS, RU, RW, SA, SC, SD, SE, SG, SK, SL, ST, SV, SY, TH,
TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, WS,
ZA, ZM, ZW.

(84) Designated States (*unless otherwise indicated, for every
kind of regional protection available*): ARIPO (BW, CV,
GH, GM, KE, LR, LS, MW, MZ, NA, RW, SC, SD, SL, ST,
SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ,
RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ,
DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT,
LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE,

(54) Title: A COOLING DEVICE COMPRISING A ICE MAKING UNIT

Figure 6



(57) Abstract: The present invention relates to a cooling device (1) comprising an ice making unit (2) having a body (3), a plurality of ice cells (4) on the body (3) to turn the water inside into ice pieces (B), at least one ice heater (5) which is provided under the ice cells (4) and an ice scraper (6) having a scraping shaft (6.1), scraping claws (6.2) which are provided on the scraping shaft (6.1), which can rotate in the ice cells (4) and which separate the ice pieces (B) from a surface of the ice cells (4); and an actuator (6.3) which provides rotational movement to the scraping shaft (6.1); at least one ice storage unit (7); an evaporator (E); and a cooling fan (8) which provides the circulation of the air in the ice making unit (2) to 0 ensure the formation of ice pieces (B).

SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN,
GQ, GW, KM, ML, MR, NE, SN, TD, TG).

Published:

- *with international search report (Art. 21(3))*
- *in black and white; the international application as filed
contained color or greyscale and is available for download
from PATENTSCOPE*

A COOLING DEVICE COMPRISING A ICE MAKING UNIT

The present invention relates to a cooling device comprising an ice making unit.

Cooling devices, such as refrigerators, are frequently used to meet the need to keep food
5 and beverages cold as well as to make ice. The cooling devices comprises an ice making
unit to provide ready-made ice pieces to users effortlessly. In the ice making units, an ice
cell is filled with water, which then turns into ice piece. After the water is converted into
ice piece, the ice piece is transferred to an ice storage unit. The user can use the ready-made
ice pieces in the ice storage unit whenever needed.

10 When the water turns into ice, the ice pieces stick to the ice cells. To separate the stuck ice
piece from the ice cell without any damage, the ice cell is heated by means of a heater. The
heated ice cell melts the surface of the ice piece, thus enabling the ice piece to be separated
from the ice cell. Then, an ice scraper enables the ice pieces in the ice cells to be transferred
to the ice storage unit and stored. As the amount of ready-made ice pieces in the ice
15 storage unit decreases as a result of use, this cycle in the ice making units is repeated to
enable the cooling device to always serve ready-made ice pieces to the users.

In the state of the art cooling devices having an ice making unit, a water film forms on the
ice surface as the ice piece is melted and separated from the ice cell. This water film causes
the ice pieces to be transferred to the ice storage unit while it is wet. Wet ice pieces stored
20 in the ice storage unit may stick to each other, to the ice storage unit and/or to the ice
dispensing units in the ice storage unit. This causes the ice pieces to merge and become
unusable. Moreover, this may cause the user to injure himself/herself while trying to
separate the ice pieces from each other. Furthermore, there is a risk that the plastic
components in the ice dispensing units may break and reach the ice pieces and from the ice
25 pieces to the user's beverages. If this situation is not noticed by the user, it can cause serious
injuries.

In the state of the art International Patent Document No. WO2019143087A1, an ice maker
is disclosed, which can selectively produce ice pieces with different transparency levels.
The ice maker comprises an ice making chamber having an ice making container which

receives the ice making water; a cooling unit for providing cold air to the ice making chamber so as to cool the ice making water; an ice making fan for circulating the cold air to be supplied; an ice making heater unit which provides heat to the ice making water while cooling the ice making water, and a control unit which controls at least one of the cooling
5 unit, the ice making fan and ice making heater unit to contain any type of ice among the different types.

The aim of the present invention is the realization of a cooling device wherein ice pieces which are dry and without a water film thereon are stored by being transferred to the ice storage unit. Thus, a cooling device is realized, which eliminates the problems of user
10 dissatisfaction and injury as a result of ice pieces sticking to each other and/or surrounding components.

The cooling device of the present invention comprises an ice making unit having a body, a plurality of ice cells on the body to turn the water therein into ice pieces, at least one ice heater which is provided under the ice cells and an ice scraper. The ice scraper has a
15 scraping shaft, scraping claws which are provided on the scraping shaft, which can rotate in the ice cells and which separate the ice pieces from a surface of the ice cells; and an actuator which provides rotational movement to the scraping shaft. The cooling device further comprises at least one ice storage unit; an evaporator; and a cooling fan which provides the circulation of the air in the ice making unit to ensure the formation of ice
20 pieces. The cooling device further comprises a processing unit configured to heat the ice cell by means of the ice heater to ensure the separation of the ice pieces from the ice cells, to rotate the scraping shaft at a selected angle by means of the actuator to prevent the ice pieces from contacting the ice cells such that the scraping claws lift the ice pieces, to turn on the cooling fan to freeze a film of water on the ice pieces, and to rotate the scraping shaft
25 by means of the actuator to move the ice pieces into the ice storage unit after the water film freezes. Freezing the water film on the ice pieces before being transferred to the ice storage unit prevents the ice pieces from sticking to each other, the ice storage unit and/or the ice dispensing unit provided in the ice storage unit. Thus, the cooling device serves as many separate ice pieces as requested to the user. The user does not waste time and energy to
30 separate the sticking ice pieces from each other. Moreover, the risk of injury to the user

which may be caused by the cutting tools that the user may use to separate the sticking ice pieces from each other is eliminated. Moreover, the sticking ice pieces are prevented from damaging the ice storage unit and/or ice dispensing unit. Thus, the risk of pieces breaking off from the ice storage unit and/or ice dispensing unit and mixing with ice pieces or the user's food is eliminated.

In an embodiment of the present invention, the selected angle is an angle between 90°-270°. The selected angles between 90°-270° prevent the contact between the ice pieces and the ice cells and enable the same to be lifted by and remain on the scraping claws.

In an embodiment of the present invention, the processing unit is configured to operate the cooling fan for a selected period of time to freeze the water film on the ice pieces and to rotate the scraping shaft by means of the actuator to move the ice pieces into the ice storage unit after the water film freezes at the end of the selected time. Since this embodiment does not require a sensor, a less costly cooling device is realized. However, since some environmental conditions are unknown, such as the freezing time of the ice film being different due to the difference in the density of the water used for ice making, the selected time may be longer than necessary. If the selected time is longer than the time required for the ice film to freeze, the ice-making speed of the cooling device may decrease. In a variation of this embodiment of the present invention, the selected time is between 1 minute and 15 minutes. It has been observed that the water film can be frozen according to the variables in a selected period between 1 minute and 15 minutes.

In an embodiment of the present invention, the cooling device comprises a water film freezing sensor for detecting the freezing of the water film on the ice pieces. Thus, as soon as the water film freezes, the ice pieces are moved into the ice storage unit and the water taken into the ice cells is cooled to start the ice making process. Thus, high ice making speeds can be achieved without wasting extra time.

In a variation of this embodiment of the present invention, the water film freezing sensor has a light source for illuminating the surface of the lifted ice pieces and a light sensor for detecting light reflected from the ice piece surface. In this embodiment, the processing unit is configured to detect that the water film is frozen when the light sensor detects a value above/below a selected detection value. The light sensor can detect the wavelength and/or

light intensity of the reflected light. The wavelength-detecting light sensor provides more precise and reliable detection values. The light sensor which detects light intensity provides less accurate and less reliable detection values than the light sensor which detects wavelength, but offers a more economical solution for detecting the freezing of the water film.

In this embodiment of the present invention, the body is manufactured from metal. By means of the high heat conduction of metal, heat transfer between the air flow and the water in the ice cells occurs at a high level.

In an embodiment of the present invention, the ice storage unit comprises an ice dispensing unit to discharge the ice pieces from the ice storage unit. Thus, the user is enabled to easily access the ice pieces in the ice storage unit. The ice dispensing unit is in the form of a screw conveyor.

The cooling device realized in order to attain the aim of the present invention is illustrated in the attached figures, where:

Figure 1 – is the perspective view of the cooling device of the present invention.

Figure 2 – is the perspective view of an exemplary ice making unit in the cooling device of the present invention.

Figure 3 – is the sideways cross-sectional view of an exemplary ice making unit in the cooling device of the present invention.

Figure 4 – is the sideways isometric cross-sectional view of an exemplary ice making unit in the cooling device of the present invention.

Figure 5 – is the front cross-sectional view of an exemplary ice making unit, where the ice pieces are in the ice cells, in the cooling device of the present invention.

Figure 6 – is the front cross-sectional view of an exemplary ice making unit, which shows a position of the scraping claw in the ice cell while rotating in the ice cell.

Figure 7 – is the front cross-sectional view of an exemplary ice making unit, which shows a position of the scraping claw in an exemplary where the ice piece is lifted off a surface of the ice cell.

Figure 8 – is the front cross-sectional view of an exemplary ice making unit, which shows a position of the scraping claw in an exemplary where the ice pieces are transferred into the ice storage unit.

Figure 9 – is the isometric view of the ice making unit in the cooling device of the present invention.

Figure 10 – is the bottom isometric view of the ice making unit shown in Figure 5.

Figure 11 – is the sideways cross-sectional view of an exemplary ice making unit.

Figure 12 – is the isometric cross-sectional view of an exemplary ice making unit.

Figure 13 – is the isometric cross-sectional view of an exemplary ice scraper.

The elements illustrated in the figures are numbered as follows:

1. Cooling device
2. Ice making unit
3. Body
4. Ice cell
5. Ice heater
6. Ice scraper
 - 6.1. Scraping shaft
 - 6.2 Scraping claw
 - 6.3 Actuator
7. Ice storage unit
 - 7.1 Ice dispensing unit
8. Cooling fan
- E. Evaporator
- B. Ice piece
- HA. Air flow

The cooling device (1) of the present invention comprises an ice making unit (2) having a body (3); a plurality of ice cells (4) on the body (3) to turn the water inside into ice pieces (B); at least one ice heater (5) which is provided under the ice cells (4) and an ice scraper (6). The ice scraper (6) has a scraping shaft (6.1), scraping claws (6.2) which are provided
5 on the scraping shaft (6.1), which can rotate in the ice cells (4) and which separate the ice pieces (B) from a surface of the ice cells (4); and an actuator (6.3) which provides rotational movement to the scraping shaft (6.1) (Figure 13). The cooling device (1) further comprises at least one ice storage unit (7); an evaporator (E); and a cooling fan (8) which provides the circulation of the air in the ice making unit (2) to ensure the formation of ice
10 pieces (B).

The cooling device (1) further comprises a processing unit configured to heat the ice cell (4) by means of the ice heater (8) to ensure the separation of the ice pieces (B) from the ice cells (4), to rotate the scraping shaft (6.1) at a selected angle by means of the actuator (6.3) to prevent the ice pieces (B) from contacting the ice cells (4) such that the scraping claws
15 (6.2) lift the ice pieces (B), to turn on the cooling fan (8) to freeze a film of water on the ice pieces (B), and to rotate the scraping shaft (6.1) by means of the actuator (6.3) to move the ice pieces (B) into the ice storage unit (7) after the water film freezes.

The cooling device (1) of the present invention is operated as follows: After the water in the ice cells (4) is converted into ice pieces (B), in other words, when the ice making unit
20 (2) makes ice pieces (B), the ice pieces (B) are in the ice cells (4) and stick to the inner surface of the ice cells (4). To make new ice pieces (B) and to store the ready-made ice pieces (B) by taking them to the ice storage unit (7), the ice pieces (B) in the ice cells (4) must be removed from the ice cells (4). Therefore, first the processing unit heats the ice cells (4) by means of the ice heater (5). As a result of heating the ice cells (4), the ice pieces
25 (B) in the ice cells (4) melt to some extent and thus the sticking of the ice pieces (B) to the inner surface of the ice cells (4) is eliminated. Afterwards, the ice pieces (B) in the ice cells (4) are started to be lifted by means of the ice scraper (6). For this lifting process, the processing unit starts to rotate the scraping shaft (6.1) by means of the actuator (6.3). As the scraping shaft (6.1) rotates, the scraping claws (6.2) start to rotate and move towards the ice
30 pieces (B) in the ice cells (4) (Figure 5 and Figure 6). The processing unit rotates the

scraping shaft (6.1) until the contact of the ice pieces (B) with the ice cells (4) is broken (Figure 7). The contact of the ice pieces (B) with the ice cells (4) is broken by rotating the scraping shaft (6.1) at the selected angle. In this position, the ice pieces (B) do not contact the ice cells (4). In the preferred embodiment of the present invention, the ice pieces (B) are on the scraping claws (6.2). Moreover, in this position, there is a water film on the ice pieces (B). The ice film is formed as a result of the heating process applied to eliminate the previous sticking situation and of the ice pieces (B) melting to some extent. In this position, the processing unit operates the cooling fan (8) to freeze the water film. After the water film on the ice pieces (B) freezes, the processing unit again starts to rotate the scraping shaft (6.1) by means of the actuator (6.3). By means of the rotation of the scraping shaft (6.1), the ice pieces (B) are transferred into the ice storage unit (7) (Figure 8). Thus, the ice pieces (B) are stored in the ice storage unit (7) without sticking to each other or to the ice storage unit (7).

In an embodiment of the present invention, the selected angle is an angle between 90°-270°.

In an embodiment of the present invention, the ice cell (4) is semicircular. The preferred angle for the semicircular ice cell (4) is approximately 180° (Figure 5 and Figure 7). The nearly 180° rotation of the scraping shaft (6.1) enables the ends of the scraping claws (6.2) to make a 180° radial movement. During this radial movement, the scraping claws (6.2) push the semicircular ice pieces (B) from one corner and take the same from the semicircular ice cells (4). When the scraping claws (6.2) complete their 180° radial movement, the semicircular ice pieces (B) are kept fixed on the scraping claws (6.2) such that the flat surface thereof is on the scratching claw (6.2) (Figure 5, Figure 6 and Figure 7).

In an embodiment of the present invention, the processing unit is configured to operate the cooling fan (8) for a selected period of time to freeze the water film on the ice pieces (B) and to rotate the scraping shaft (6.1) by means of the actuator (6.3) to move the ice pieces (B) into the ice storage unit (7) after the water film freezes at the end of the selected time. In this embodiment, it is assumed that the water film on the ice pieces (B) freezes after the selected time. In a variation of this embodiment, the selected time is between 1 minute and 15 minutes.

In an embodiment of the present invention, the cooling device (1) comprises a water film freezing sensor for detecting the freezing of the water film on the ice pieces (B). In a variation of this embodiment, the water film freezing sensor has a light source for illuminating the surface of the lifted ice pieces (B) and a light sensor for detecting light reflected from the ice piece surface. In this embodiment, the processing unit is configured to detect that the water film is frozen when the light sensor detects a value above/below a selected detection value. In this embodiment, the freezing of the water film on the ice pieces (B) is detected by means of the fact that the ice piece (B) surfaces with and without a water film reflect light differently. The water film forms a light-reflecting layer on the ice piece (B) surface. Therefore, the ice piece (B) surface without a water film absorbs light more than the ice piece (B) surface with a water film. Thus, the light reflected from the ice piece (B) surface is detected by the light sensor. The light sensor can detect the wavelength or light intensity of the reflected light. The processing unit may be configured to assume that the water film on the ice piece (B) is frozen when the light sensor detects a light intensity above a selected light intensity. Alternatively, the processing unit may be configured to assume that the water film on the ice piece (B) is frozen when the light sensor detects light at a wavelength within a selected range or at a wavelength above/below a selected wavelength.

In an embodiment of the present invention, the body (3) is manufactured from metal. In this embodiment, the body (3) is preferably manufactured from aluminum or copper due to its high thermal conductivity. Thus, the heat transfer to the water in the ice cells (4) is carried out with high efficiency and the ice making speed of the cooling device (1) is increased.

In an embodiment of the present invention, the ice storage unit (7) comprises an ice dispensing unit (7.1) to discharge the ice cubes (B) from the ice storage unit (7). Thus, the user is enabled to easily access the ice cubes (B) in the ice storage unit (7). In a variation of this embodiment, the ice dispensing unit (7.1) is in the form of a screw conveyor.

CLAIMS

1. A cooling device (1) **comprising** an ice making unit (2) having a body (3), a plurality of ice cells (4) on the body (3) to turn the water inside into ice pieces (B), at least one ice heater (5) which is provided under the ice cells (4) and an ice scraper (6) having a scraping shaft (6.1), scraping claws (6.2) which are provided on the scraping shaft (6.1), which can rotate in the ice cells (4) and which separate the ice pieces (B) from a surface of the ice cells (4); and an actuator (6.3) which provides rotational movement to the scraping shaft (6.1); at least one ice storage unit (7); an evaporator (E); and a cooling fan (8) which provides the circulation of the air in the ice making unit (2) to ensure the formation of ice pieces (B), **characterized by** a processing unit which is configured
- to heat the ice cell (4) by means of the ice heater (8) to ensure the separation of the ice pieces (B) from the ice cells (4),
 - to rotate the scraping shaft (6.1) at a selected angle by means of the actuator (6.3) to prevent the ice pieces (B) from contacting the ice cells (4) such that the scraping claws (6.2) lift the ice pieces (B),
 - to turn on the cooling fan (8) to freeze a film of water on the ice pieces (B), and
 - to rotate the scraping shaft (6.1) by means of the actuator (6.3) to move the ice pieces (B) into the ice storage unit (7) after the water film freezes.
2. A cooling device (1) as in Claim 1, **characterized in that** the selected angle is an angle between 90°-270°.
3. A cooling device (1) as in any one of the above claims, **characterized by** a processing unit which is configured to operate the cooling fan (8) for a selected period of time to freeze the water film on the ice pieces (B) and
- to rotate the scraping shaft (6.1) by means of the actuator (6.3) to move the ice pieces (B) into the ice storage unit (7) after the water film freezes at the end of the selected time.

4. A cooling device (1) as in Claim 3, **characterized in that** the selected time is between 1 minute and 15 minutes.
5. A cooling device (1) as in Claim 1 or Claim 2, **characterized by** a water film freezing sensor for detecting the freezing of the water film on the ice pieces (B).
- 5 6. A cooling device (1) as in Claim 5, **characterized by** the water film freezing sensor having a light source for illuminating the surface of the lifted ice pieces (B) and a light sensor for detecting light reflected from the ice piece surface, and a processing unit which is configured to detect that the water film is frozen when the light sensor detects a value above/below a selected detection value.
- 10 7. A cooling device (1) as in any one of the above claims, **characterized by** the body (3) which is metal.
8. A cooling device (1) as in any one of the above claims, **characterized by** the ice storage unit (7) comprising an ice dispensing unit (7.1) to discharge the ice cubes (B) from the ice storage unit (7).

15

Figure 1

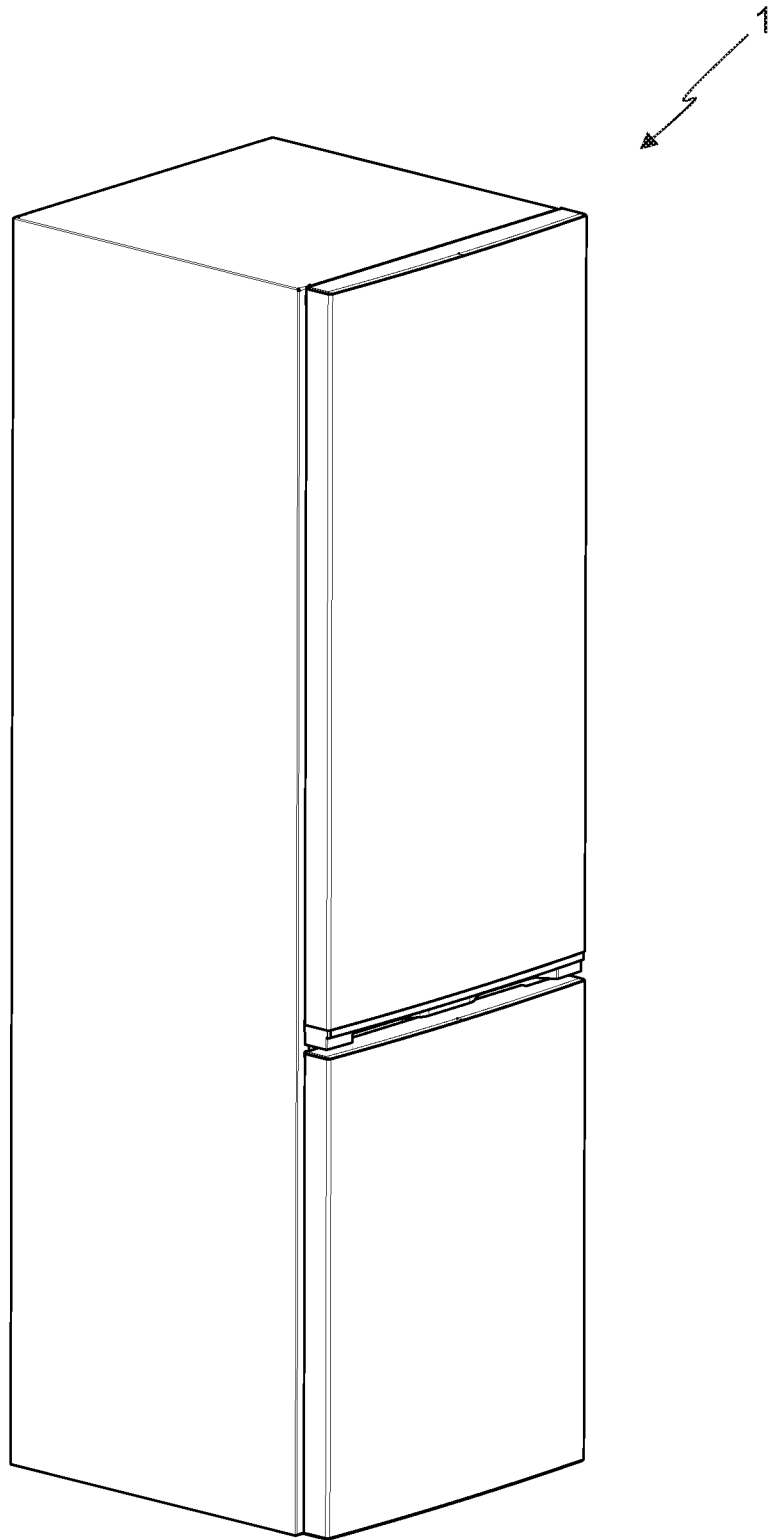


Figure 2

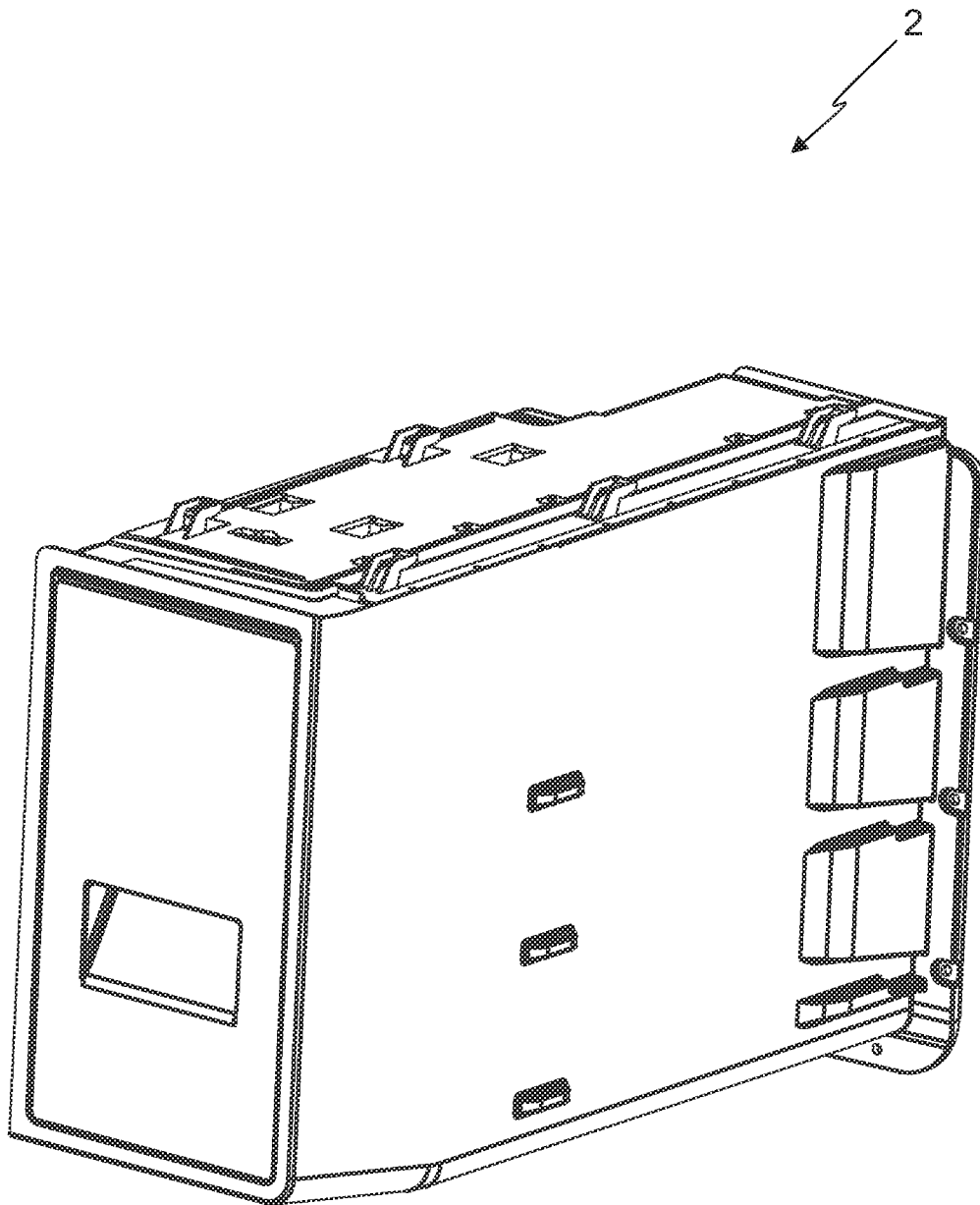


Figure 3

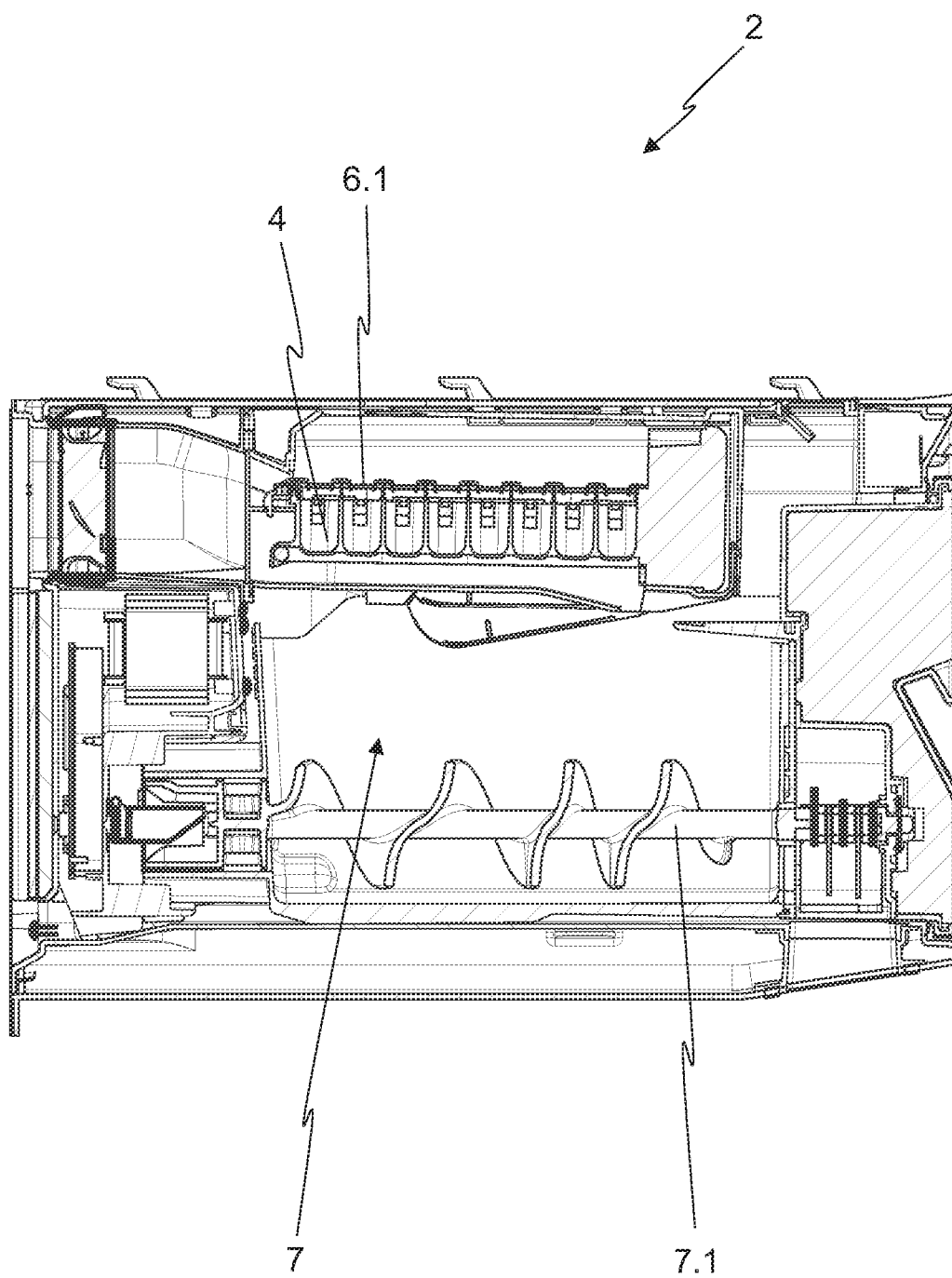


Figure 4

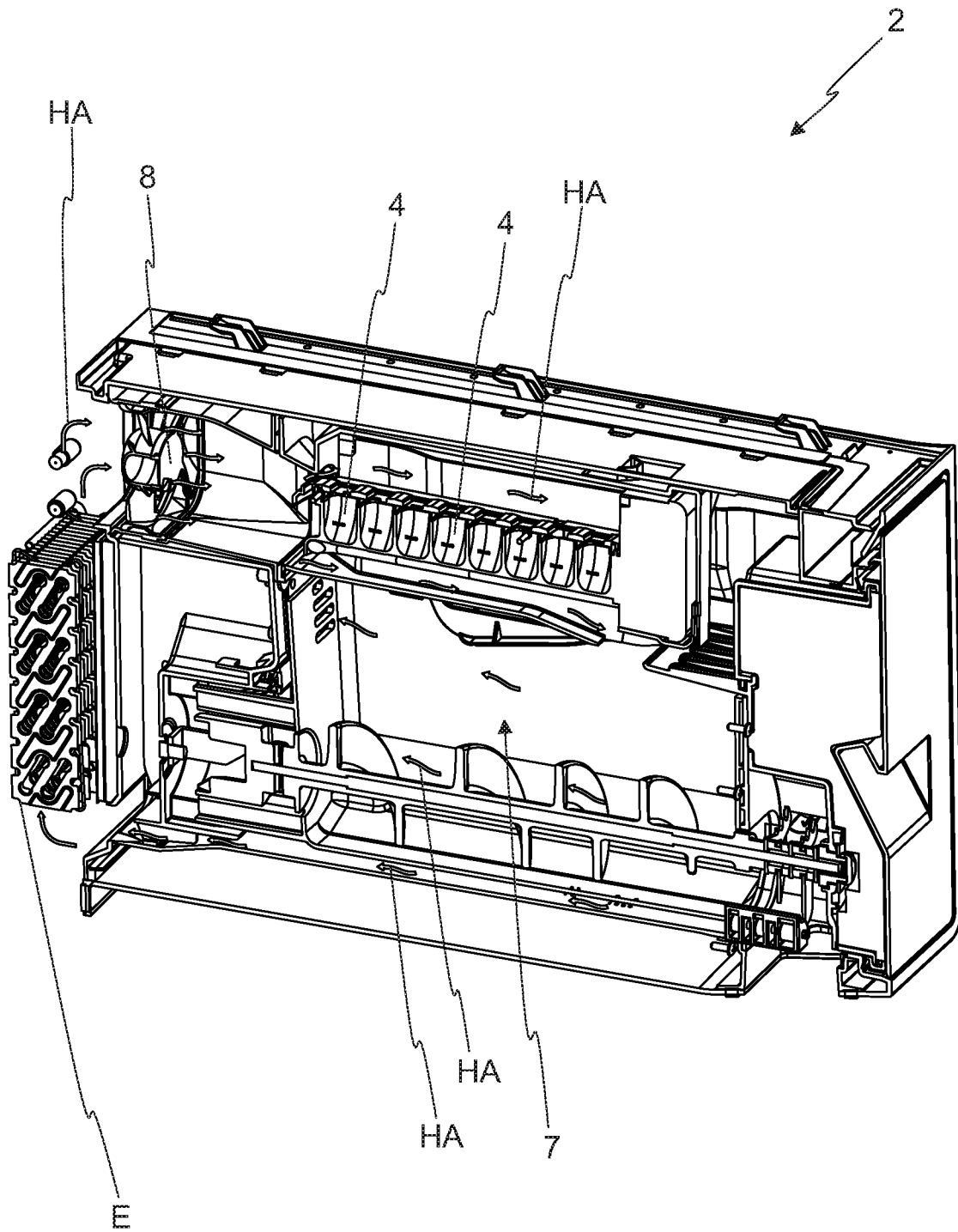


Figure 5

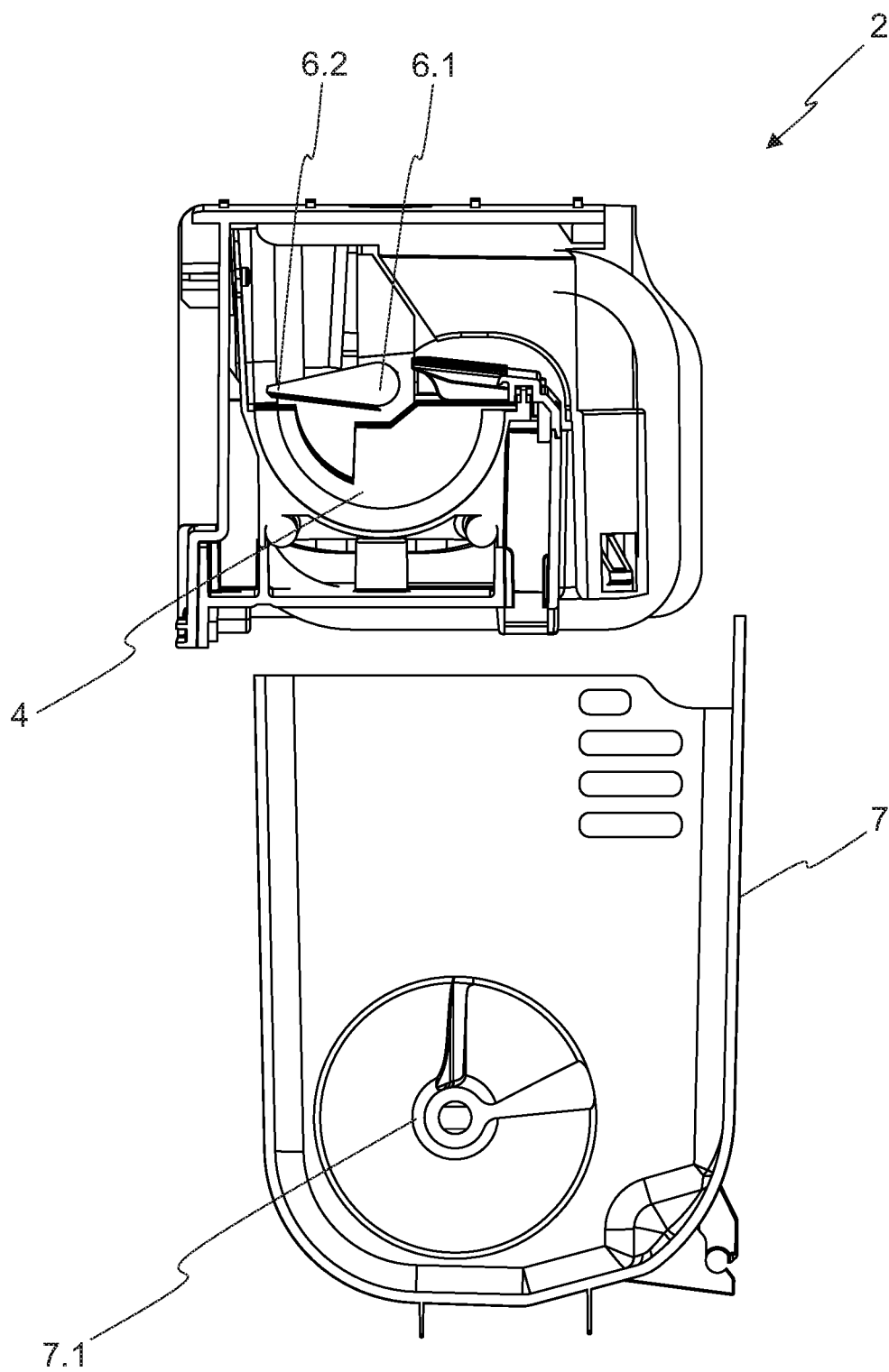


Figure 6

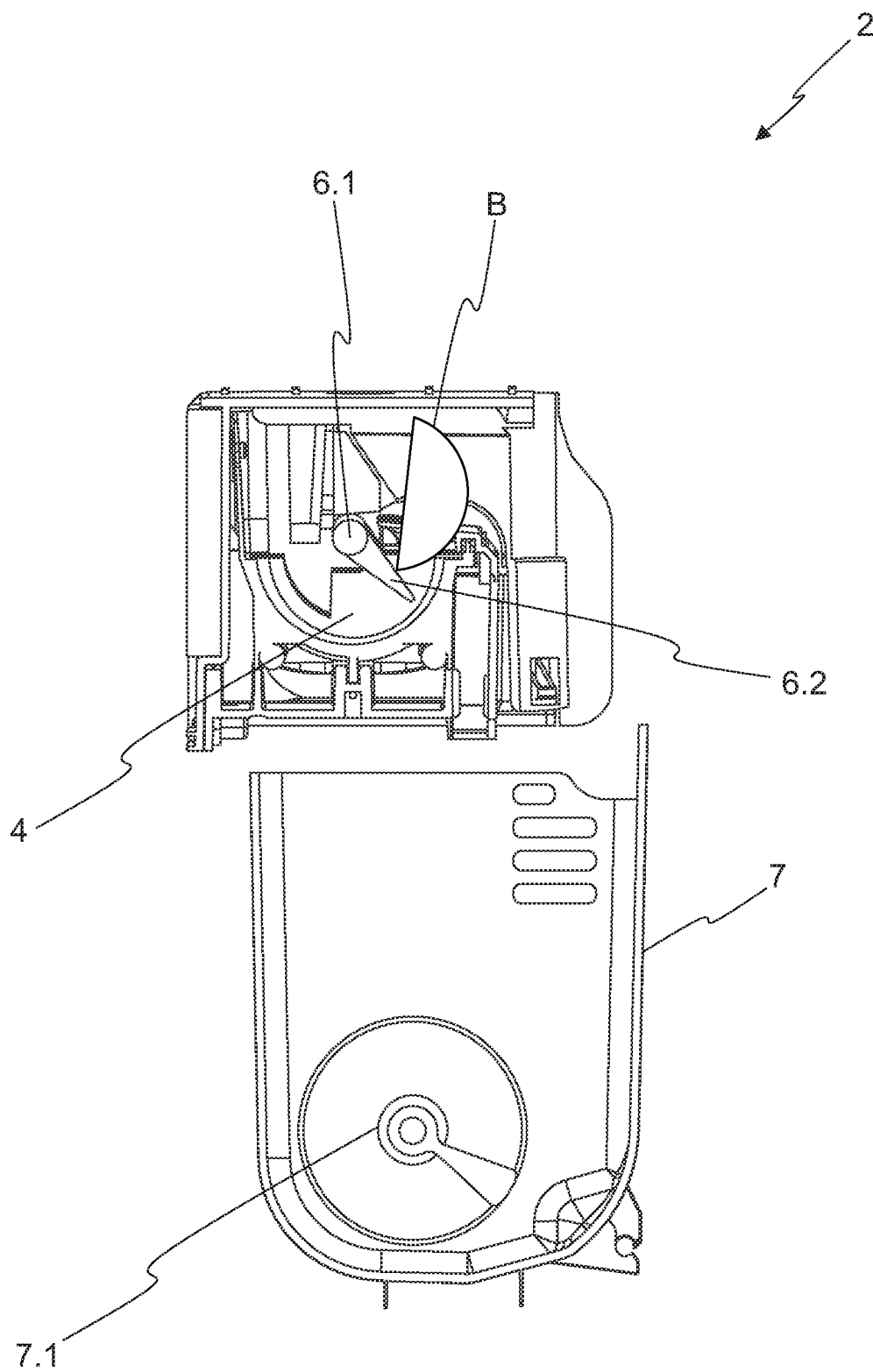


Figure 7

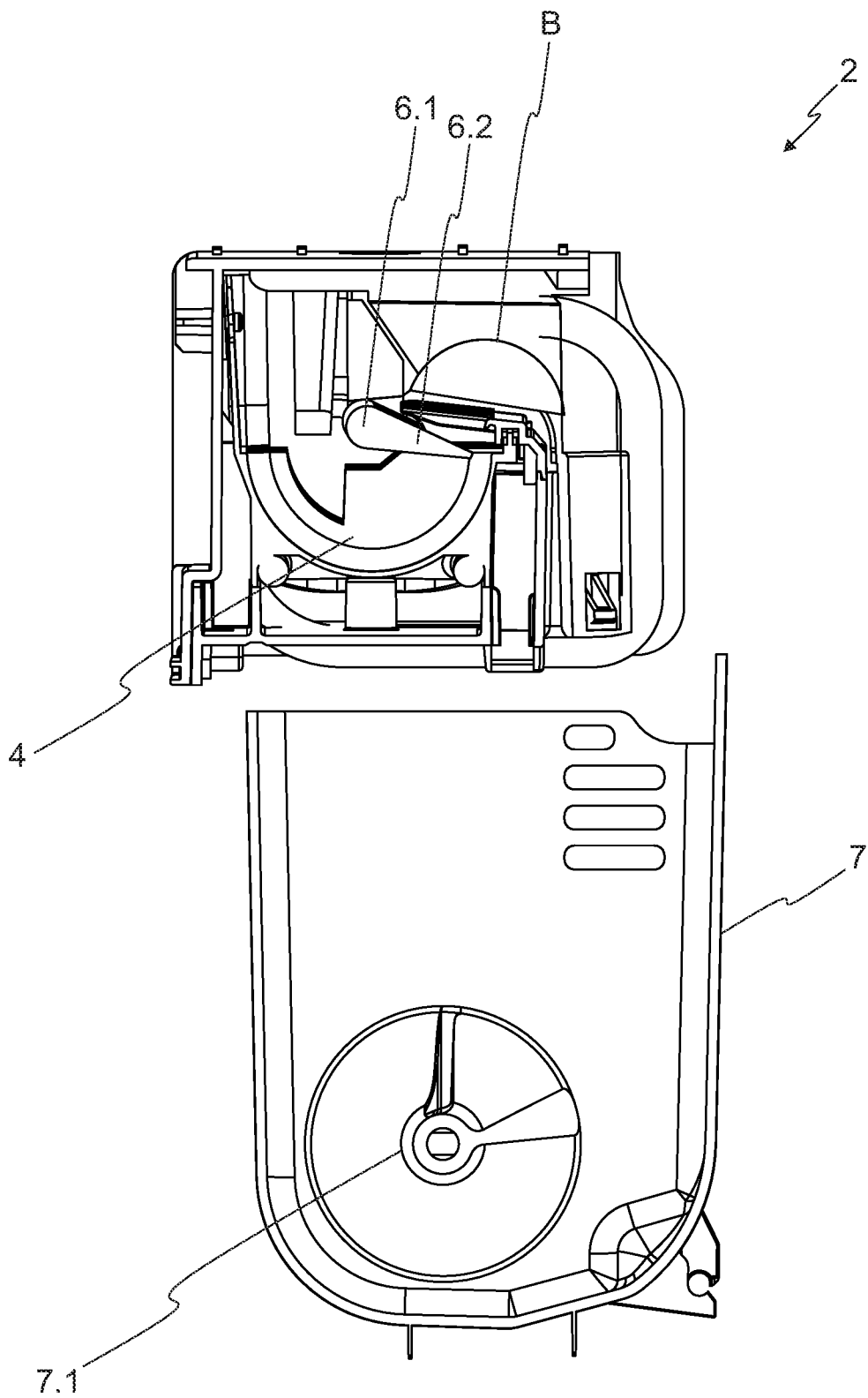


Figure 8

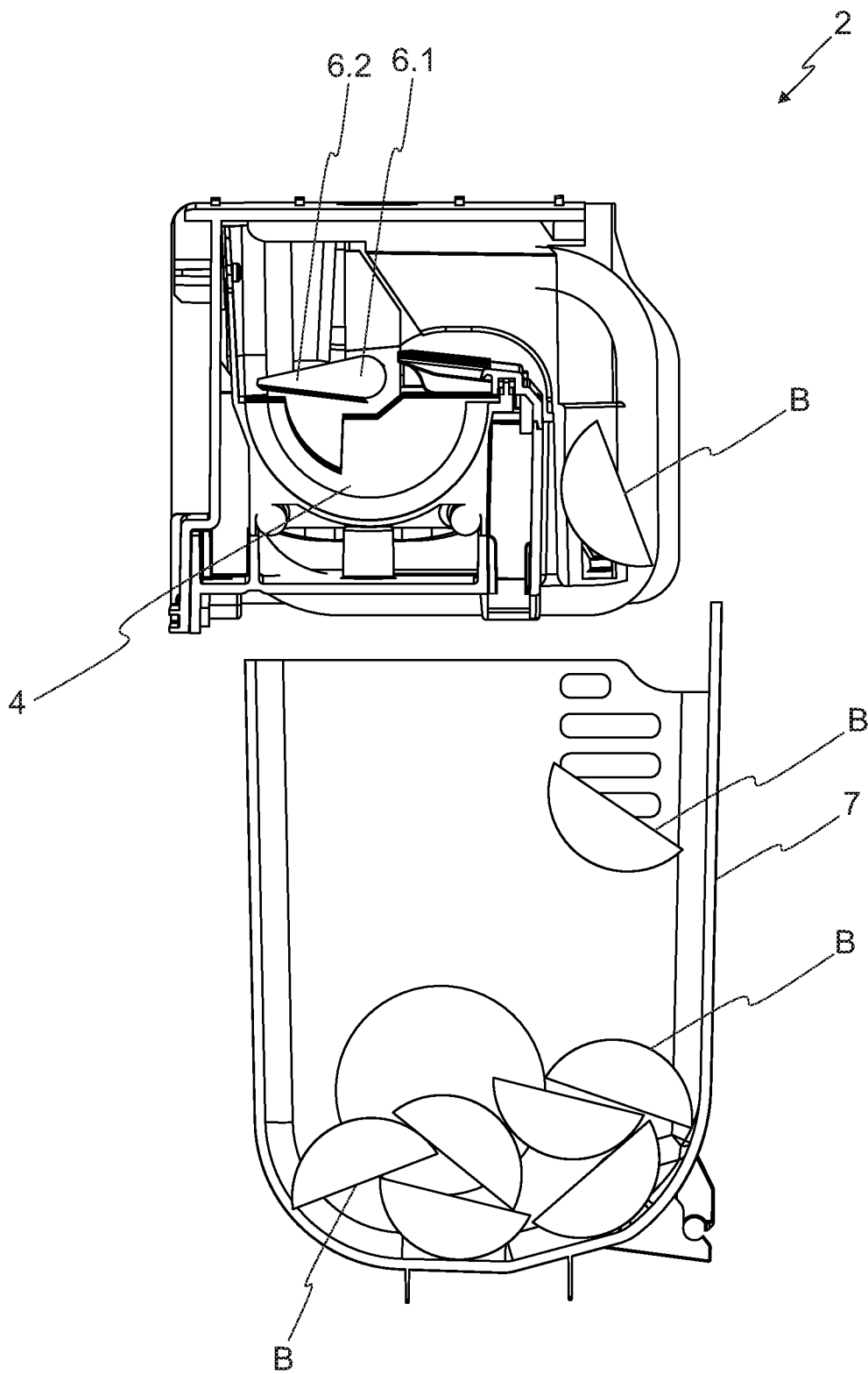


Figure 9

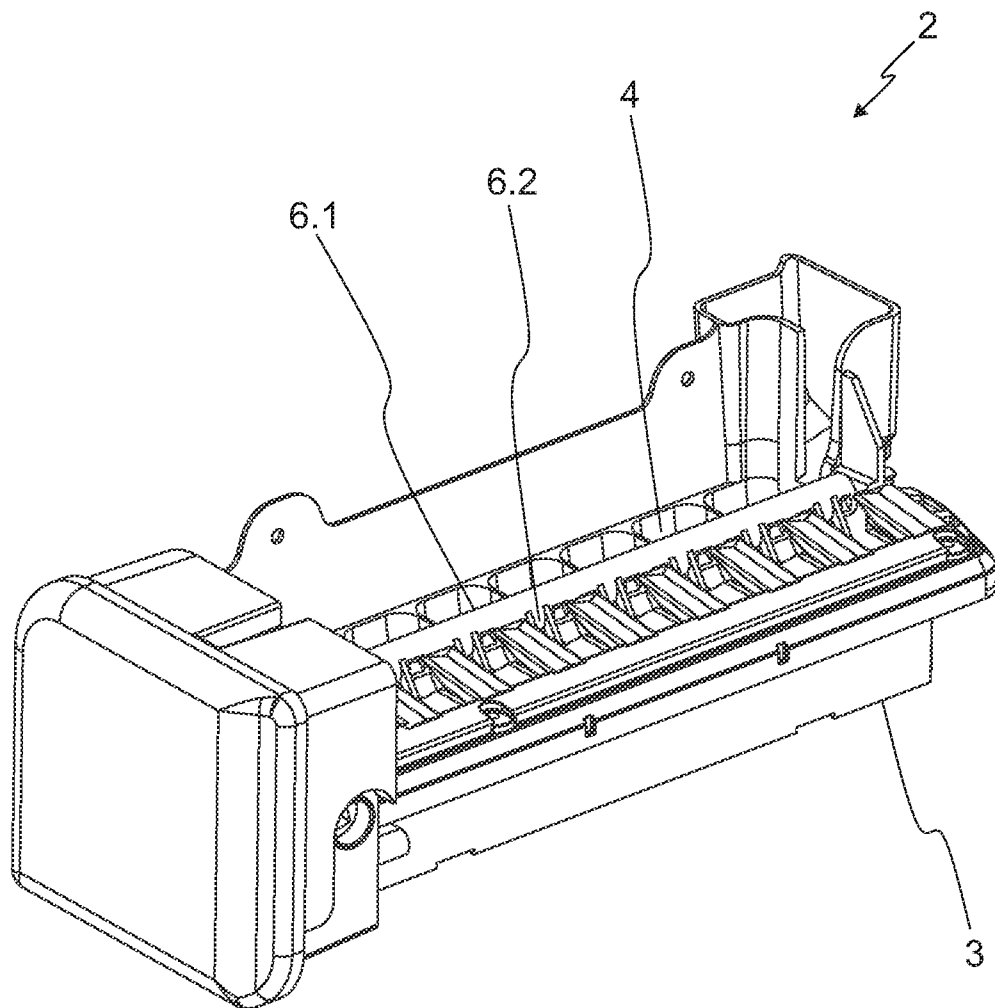


Figure 10

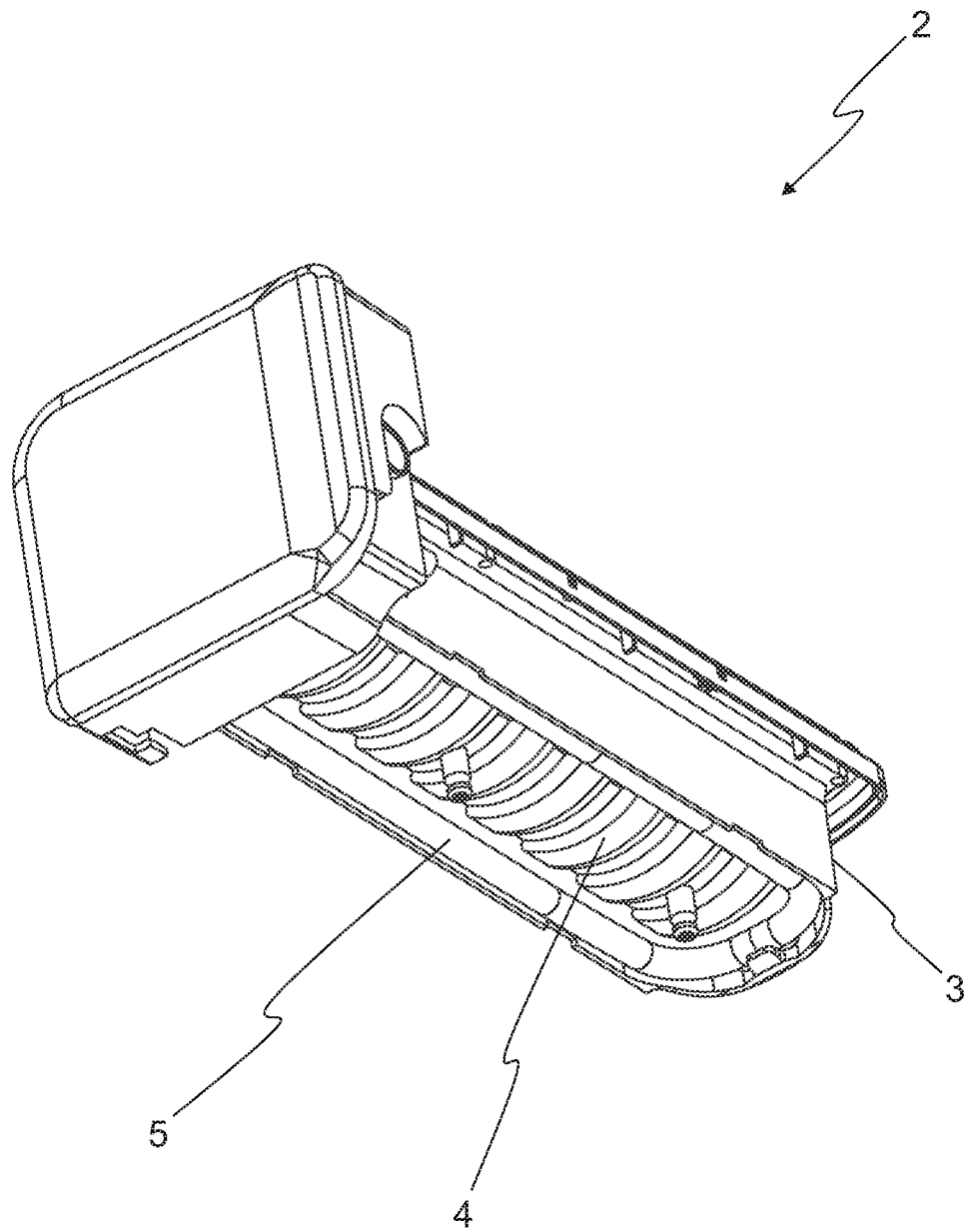


Figure 11

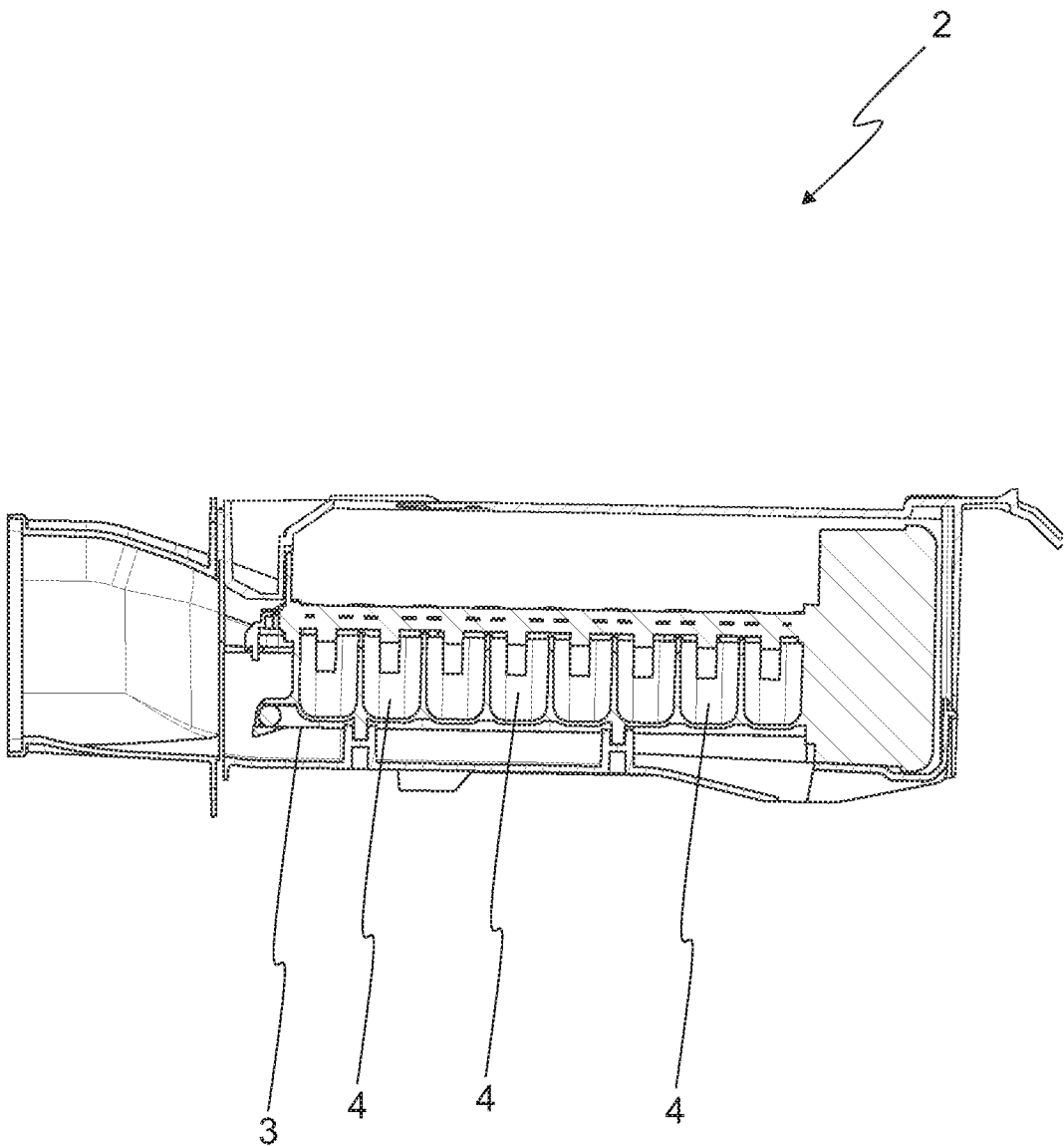


Figure 12

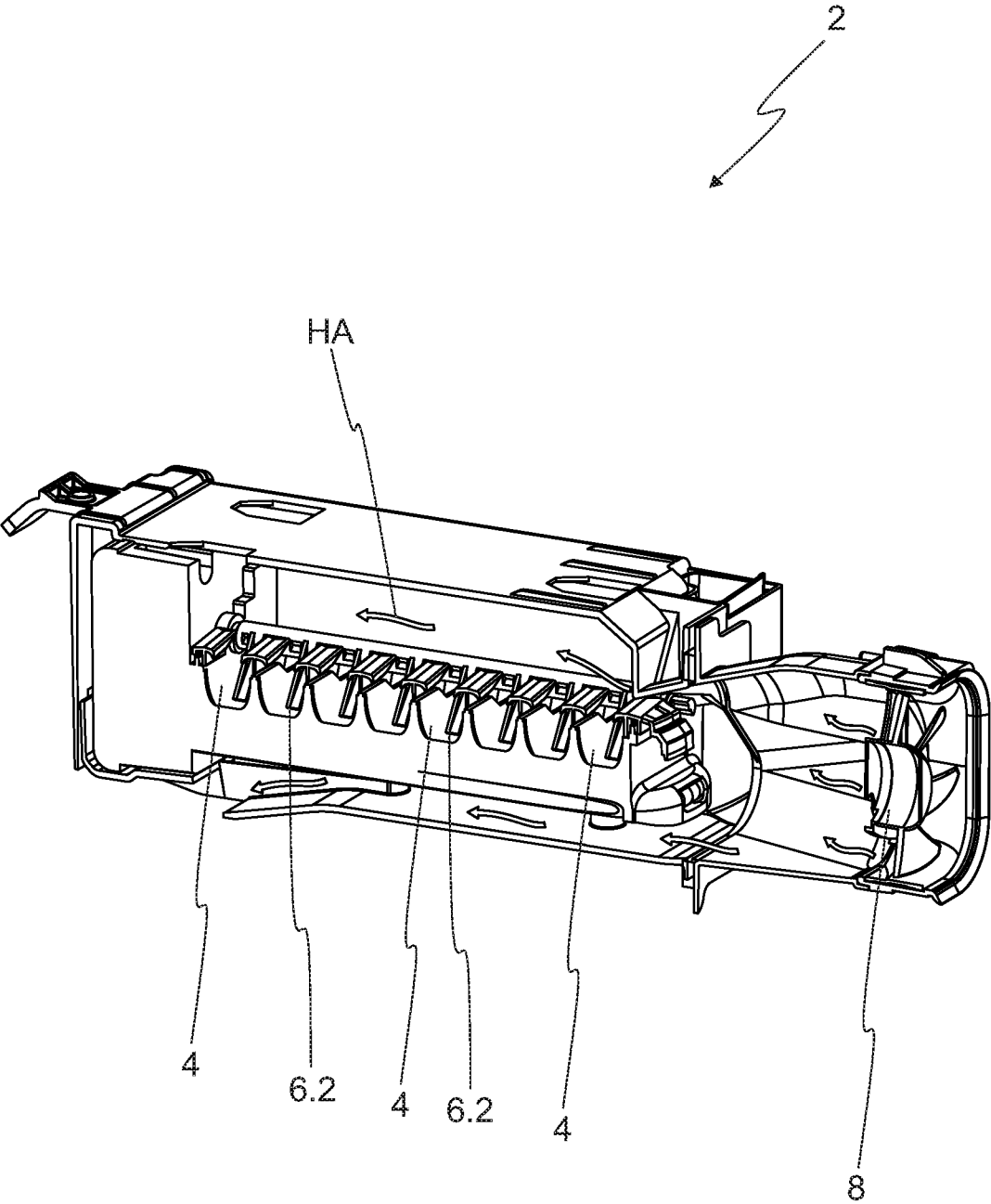
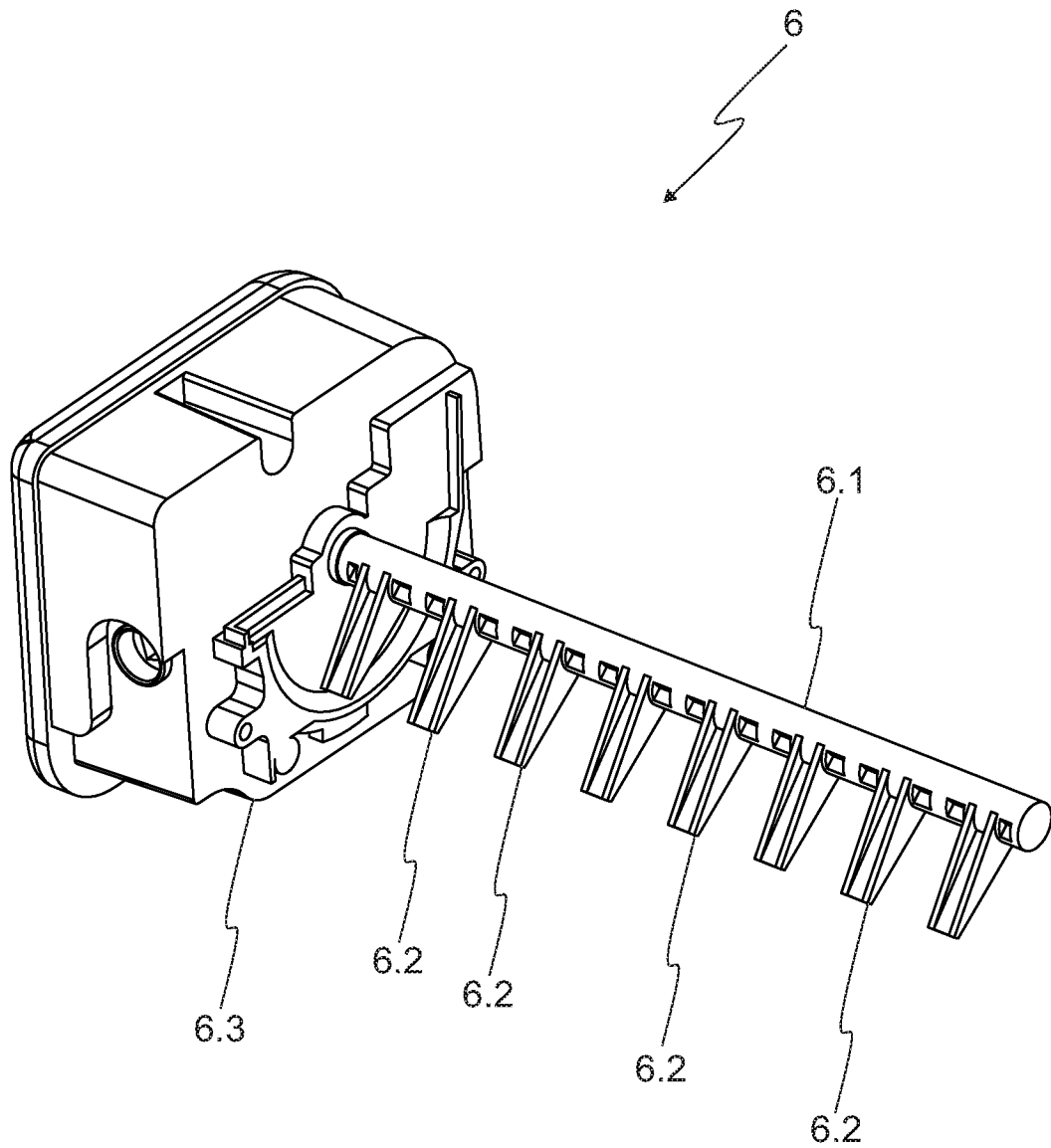


Figure 13



INTERNATIONAL SEARCH REPORT

International application No.

PCT/TR2024/050844

A. CLASSIFICATION OF SUBJECT MATTER

F25C 1/00(2006.01)i

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)

F25C 1/00

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

TURKPATENT Patent Database

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO Abstract & Fulltext Databases & Keywords: ice, making, unit, separate, cooling, fan, device, heat, angle, evaporate, rotate, peel, tray, minute, film, freeze, water, prevent, sense, control, time, duration, source, light

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X A	WO 2023160681 A1 (QINGDAO HAIER REFRIGERATOR CO LTD [CN]) 31 August 2023 (2023-08-31) Abstract; Paragraphs 39-43	1, 3, 7, 8 2, 4-6
A	KR 100672392 B1 (LG ELECTRONICS INC [KR]) 24 January 2007 (2007-01-24) Whole document	1-8
A	JP 2013234810 A (PANASONIC CORP) 21 November 2013 (2013-11-21) Abstract; Paragraphs 54-56	1-8



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Date of the actual completion of the international search

08 November 2024

Date of mailing of the international search report

08 November 2024

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/TR2024/050844

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