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(54) **ICE DISPENSERS**

(57) An ice dispenser for storing and dispensing ice. The ice dispenser includes a holding bin that extends longitudinally between a first side and a second side, transversely between a third side and a fourth side, and vertically between a top to a bottom. A chute is configured to guide the ice from outside the holding bin into the holding bin. The chute has an upper end and an opposite lower end. The upper end of the chute extends longitudinally farther than the first side of the holding bin from the second side of the holding bin. A spout is operatively coupled to the holding bin for dispensing ice from the holding bin.

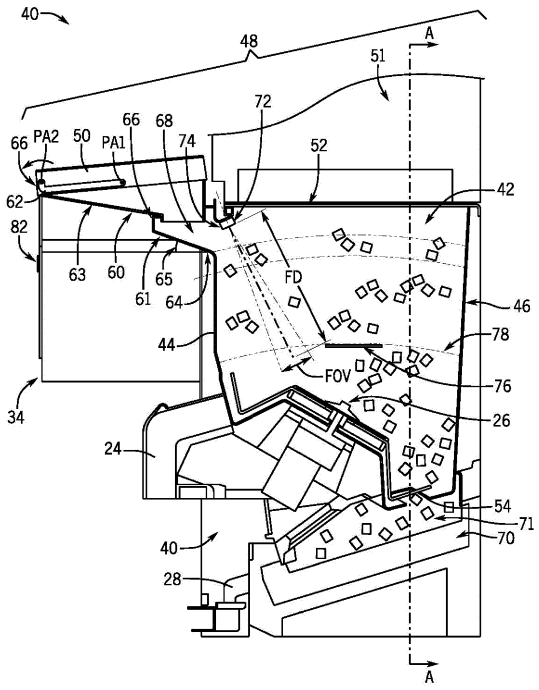

FIG. 2

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Description

CROSS REFERENCE TO RELATED APPLICATION

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 63/432,281, filed December 13, 2022.

FIELD

[0002] The present disclosure generally relates to ice dispensers, and more particularly to ice dispensers configured for storing and dispensing ice.

BACKGROUND

[0003] This section includes discussion intended to help understand various aspects of the subject matter presently disclosed below. This discussion should not be interpreted as constituting an admission of prior art.

[0004] Ice dispensers are generally known in the art for storing and dispensing ice on demand. The ice dispensers include a holding bin for containing the ice, as an auger or another device to move the ice towards a spout for dispensing upon demand. Certain ice dispensers also include a cold plate within the holding bin. The cold plate is provided in thermal contact with one or more lines containing a beverage (e.g., a carbonated water line). The cold plate is situated within the holding bin such that the ice within the holding bin cools the cold plate, which in turn cools the beverage within the lines.

[0005] For certain configurations of ice dispensers, ice is made in an external device and manually poured into the holding bin to be stored until a user requests the ice to be dispensed. These ice dispensers may be positioned in a customer-facing location in a restaurant or convenience store. In other examples, the ice dispensers are located behind a service counter or at the back of the house for employees to use in preparing beverages according to a customer order. While the present disclosure generally refers to ice dispensers not configured to produce the ice itself, the present teachings are also applicable to ice dispensers that do produce the ice in addition to holding and dispensing the ice upon demand.

[0006] Additional information regarding ice dispensers can be found in U.S. Patent 6,945,070.

SUMMARY

[0007] This Summary is provided to introduce a selection of concepts that are further described below in the Detailed Description. This Summary is not intended to identify key or essential features of the claimed subject matter, nor is it intended to be used as an aid in limiting the scope of the claimed subject matter.

[0008] One aspect of the present disclosure generally relates to an ice dispenser for storing and dispensing ice. The ice dispenser includes a holding bin extending longitudinally between a first side and a second side, transversely between a third side and a fourth side, and vertically between a top to a bottom. A chute is configured to guide the ice from outside the holding bin into the holding bin, where the chute has an upper end and an opposite lower end, and where the upper end of the chute extends longitudinally farther than the first side of the holding bin from the second side of the holding bin. A spout is operatively coupled to the holding bin for dispensing ice from the holding bin.

[0009] In certain examples, a cold plate is positioned below the holding bin, the cold plate including one or more lines configured to be cooled via the ice from the holding bin.

[0010] In certain examples, the lower end of the chute is positioned so as to be approximately vertically even with the top of the holding bin.

[0011] In certain examples, the chute extends between the upper end and the lower end at an angle between 20 and 60 degrees relative to the bottom of the holding bin.

[0012] In certain examples, a cover encloses the top of the holding bin, the cover having a lid for selectively opening a portion of the cover to access the holding bin. In further examples, the lid is movable between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible, and wherein the lid is rotated between 45 and 90 degrees from the closed position to the open position. In further examples, the lid is pivotally coupled via a pair of hinge arms that remain parallel to each other as the lid is moved between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible. In further examples, the lid extends between a first end and a second end, wherein the lid is pivotally coupled via a pair of hinge arms that each extend between a first end and a second end, and wherein the first ends of the hinge arms are pivotally coupled proximate the upper end of the chute and the second ends of the hinge arms are pivotally coupled to the lid proximate a midpoint of the lid between the first end and the second end thereof. In further examples, a sensor is configured to determine a level of the ice within the holding bin, wherein the sensor is hidden under the cover and accessible by removal thereof.

[0013] In certain examples, a sensor is configured to determine a level of the ice within the holding bin. In further examples, the sensor comprises an ultrasonic sensor and/or a radar sensor. Certain examples further include a controller and a light, the controller being operatively connected to both the sensor and the light, wherein the controller is configured to compare the level of the ice within the holding bin to a threshold level and to control the light based on the comparison of the level to the threshold level so as to indicate when additional ice is needed in the holding bin.

[0014] Another aspect according to the present disclosure generally relates to an ice dispenser for storing and dispensing ice. The ice dispenser includes a holding bin

configured for storing ice. A spout is operatively coupled to the holding bin for dispensing ice from the holding bin. A sensor is configured to determine a level of the ice within the holding bin. A controller and an indicator are configured to generate an indicator for a user, the controller being operatively coupled to the sensor and the indicator, wherein the controller is configured to compare the level of the ice within the holding bin to a threshold level and to control the indicator based on the comparison of the level to the threshold level so as to indicate when additional ice is needed in the holding bin.

[0015] In certain examples, a cold plate is positioned below the holding bin, the cold plate including one or more beverage lines configured to be cooled via the ice from the holding bin. IN further examples, the sensor comprises an ultrasonic sensor.

[0016] In certain examples, the indicator comprises a light emitting diode, and wherein the controller is configured to turn on the light when the level of the ice within the holding bin is below the threshold level.

[0017] In certain examples, a cover encloses a top of the holding bin, the cover having a lid for selectively opening a portion of the cover to access the holding bin. In further examples, the sensor is hidden under the cover and accessible by removal thereof.

[0018] In certain examples, a wireless transmitter is operatively coupled to the controller, wherein the controller is further configured to cause the wireless transmitter to send a signal receivable by an external device when additional ice is needed in the holding bin.

[0019] Another aspect according to the present disclosure generally relates to an ice dispenser for storing and dispensing ice. The ice dispenser includes a holding bin extending longitudinally between a first side and a second side, transversely between a third side and a fourth side, and vertically between a top to a bottom. A chute configured to guide the ice from outside the holding bin into the holding bin, wherein the chute has an upper end and an opposite lower end, and wherein the upper end of the chute extends longitudinally farther than the first side of the holding bin from the second side of the holding bin. A cold plate is positioned below the holding bin, the cold plate including a beverage line configured to be cooled via the ice from the holding bin. A spout is operatively coupled to the holding bin for dispensing ice from the holding bin. A cover encloses the top of the holding bin, the cover having a lid for selectively opening a portion of the cover to access the holding bin, wherein the lid is pivotally coupled via a pair of hinge arms that remain parallel to each other as the lid is moved between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible. A sensor is configured to determine a level of the ice within the holding bin, wherein the sensor is hidden under the cover and accessible by removal thereof. The ice dispenser further includes a controller and a light, the controller being operatively connected to both the sensor and the light, wherein the controller is configured to compare the level of the ice within the holding bin to a threshold level and to control the light based on the comparison of the level to the threshold level so as to indicate when additional ice is needed in the holding bin.

[0020] It should be recognized that the different aspects described throughout this disclosure may be combined in different manners, including those than expressly disclosed in the provided examples, while still constituting an invention accord to the present disclosure. By way of example, certain ice dispensers may have a chute and not include sensors for determining the level of ice in the holding bin, and vice versa.

[0021] Various other features, objects and advantages of the disclosure will be made apparent from the following description taken together with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

FIG. 1 is a sectional side view of an ice dispenser having features known in the art.

FIG. 2 is a close-up sectional side view of an ice dispenser according to the present disclosure for determining and communicating a level of ice within a holding bin.

FIG. 3 is a schematic view of a control system for operating an ice dispenser according to the present disclosure.

FIG. 4 is a top view of the bottom of the holding bin showing how ice is evenly distributed across a cold plate.

FIG. 5 is a sectional view taken along the line A-A of FIG. 2 showing how ice is evenly distributed across the cold plate.

FIG. 6 is an isometric view of the ice dispenser of FIG. 2 with the lid in an open position.

FIG. 7 is a side view showing the lid moving between the open position of FIG. 6 and the closed position of FIG. 2.

FIG. 8 is an isometric view showing a hatch system including the lid removed from the holding bin.

DETAILED DISCLOSURE

[0023] The present disclosure generally relates to ice dispensers. In particular, the present disclosure primarily describes ice dispensers that do not make the ice in which they dispenser, but rather those that are manually filled by operators with ice from a remote ice maker. FIG. 1 shows an ice dispenser 10 as presently known in the art. The ice dispenser 10 has a holding bin 12 configured to store ice 14 therein. Access to the holding bin 12 is provided via a door or lid 16 at the top 18 of the holding bin 12.

[0024] Ice 14 from the holding bin 12 is funneled down to a center 20 where it falls down onto a cold plate 22 within a chamber 25 positioned below the holding bin 12. The cold plate 22 is provided in thermal connection with

beverage lines such that the ice 14 cools the beverage within the beverage lines, via the cold plate 22, in a conventional manner (e.g., as present in the IDC Pro Dispenser offered by Cornelius, Inc. of Glendale Heights, Illinois). A spout 24 is positioned near the front of the ice dispenser 10. An auger device 26 is operable within the chamber 25 to move the ice 14 upwardly and forwardly to be dispensed out of the spout 24 on demand. As ice 14 melts on the cold plate 22, the water drains through a conduit 28 in a conventional manner.

[0025] The present inventors have recognized challenges and limitations with using ice dispensers as presently known in the art. First, since this type of ice dispenser does not make the ice itself, it requires periodic attention for both checking the remaining supply of ice and refilling the ice from an external ice maker as needed. In particular, the operator must manually check on the level 32 of ice 14 within the holding bin 12 to see if additional ice must be added. Failure to check on this level 32 of ice 14 in the holding bin 12 on a frequent enough basis can lead to the holding bin 12 running out of ice 14, which would result in dissatisfied customers and/or delays in the dispensing process. On the other hand, checking this level 32 of ice 14 in the holding bin 12 too often also has disadvantages. Manually checking this level 32 requires time from workers who are often fully occupied with other tasks. Moreover, checking the level 32 of ice 14 typically requires the operator to stand on a stool to be able to remove the lid 16 and look down inside the holding bin 12. Thus, each occasion of manually checking the level 32 of ice 14, only to find that additional ice is not needed, represents wasted time and effort, an increased risk of injury to the operator (e.g., unnecessarily climbing on a stool), and increased wear and tear and risk of damage to the ice dispense 10 from additional openings and closings of the lid 16.

[0026] The operator's findings upon manual inspection in the holding bin 12 dictate what happens next. If the operator does find that additional ice is indeed needed for the level 32 to reach or exceed a fill line 30, the operator obtains a bucket or bag full of ice and pours it into the open top 18 of the holding bin 12. If instead no additional ice is needed, the operator will likely manually take note of the time and check again after a short while.

[0027] The present inventors have further found that it is challenging to gain access to the open top 18 of the holding bin 12 to fill the ice. For example, the present inventors have identified that it would be beneficial for the operator to be as close to the top 18 of the holding bin 12 as possible, particularly since the bucket or bag of ice can be quite heavy and/or awkward to manage and pour. However, the presence of the spout 24 and the general interface 34 of the ice dispenser 10 limit how closely the operator can get to the top 18 of the holding bin 12. By way of example, the general interface 34 may include many items such as display screens or controls, system electronics, power supplies, control boards, and the like, thereby occupying a substantial volume of space as shown.

[0028] By way of example, dimensions of the ice dispenser may be approximately as follows:

- 40cm depth from the front of the general interface 34 to the location in which the ice may be refilled;
- 80cm depth from the front of the spout 24 to the back of the machine; and
- 100cm depth from the front of the general interface 34 to the back of the machine.

[0029] FIG. 2 depicts a portion of an ice dispenser 40 according to the present disclosure. The ice dispenser 40 has a holding bin 42 that extends in a longitudinal direction between a first side 44 and a second side 46, in a transverse direction between a third side and a fourth side that extend into and out of the page (not numbered), and in a vertical direction between a top 52 and a bottom 54. It should be recognized that the longitudinal direction, transverse direction, and vertical direction are each arranged perpendicularly from each other. The ice dispenser 40 further includes a cold plate 70, a chamber 230 in which the cold plate 70 is positioned, a spout 24, and/or an auger 26 or other conveying system. The cold plate 70, spout 24, and auger 26 may be configured in the same manner as those known in the art.

[0030] A chute 60 is positioned at the top 52 of the holding bin 42 and is configured to guide ice from outside the holding bin 42 (e.g., from a remote ice maker) into the holding bin 42. The chute 60 extends from an upper end 62 to a lower end 64 and has a width that in certain examples is approximately equal to a width of the holding bin 42 in the transverse direction. The chute 60 is angled at an angle 65 relative to horizontal such that ice slides down the chute 60 into the holding bin 42. In certain examples, the angle 65 is between 20 and 60 degrees relative to the bottom of the holding bin.

[0031] A front 66 of the chute 60 extends forwardly away from the holding bin 42. In other words, the front 66 of the chute 60 extends farther than the first side 44 of the holding bin 42 from the second side 46 of the holding bin in the longitudinal direction. In the embodiment shown, the chute 60 is comprised of two portions; a first portion 61 that is formed with the holding bin 42, and a second portion 63 that is part of a separate module 65 configured to be coupled to the holding bin 42 (discussed further below). It should be recognized that the present disclosure contemplates other designs for the chute 60 feeding ice into the holding bin 42. It should further be recognized that while the angle 65 is referred to singularly, this may be a compound angle of two or more different angles, which may vary for the first portion 61 and the second portion 63, and/or may transition at other locations of the overall chute 60.

[0032] By way of example, dimensions of the ice dispenser may be approximately as follows:

- 80cm depth from the front of the spout 24 to the back

of the machine;

- 100cm depth from the front of the general interface 34 to the back of the machine;
- 58cm depth from front 44 of holding bin to back of the machine;
- 44cm depth from front 66 of chute 60 to front 44 of holding bin 42;
- +/- 25cm, 15cm, 10cm, 5cm, or less depth from the front of chute 60 to the front of general interface 34 (in certain examples with the front 66 extending even further forwardly from the front of the general interface than +25cm) ;
- 42cm height between upper end 62 and lower end 64 of chute 60; and
- 96cm height between top 52 of holding bin 42 and bottom of machine.

[0033] With continued reference to FIG. 2, the top 52 of the holding bin 42 is covered with a cover 48, which includes a stationary portion 51 configured to be coupled to the top 52 of the holding bin 42, such as via fasteners such as screws, rivets, or other mechanisms known in the art. The cover 48 also includes a lid 50 that is moveable relative to the stationary portion 51. The lid 50 is configured to move upwardly or vertically away from the top 52 of the holding bin 42 and/or forwardly to rest in front of the interface 34. The embodiment of FIG. 2 is configured such that the lid 50 initially moves upwardly, then moves forwardly, pivots, and moves downwardly again. In this manner, the lid 50 pivots, rotates, or otherwise moves approximately 90 degrees when comparing the open and closed positions thereof, as discussed further below. The present disclosure contemplates alternate mechanisms for opening the lid 50.

[0034] When the lid 50 is open, access to the holding bin 42 is provided via an opening 68 within the top 52 of the holding bin 42. It should be recognized that the opening 68 is covered by the lid 50 when the lid 50 is closed. When the lid 50 is open, ice 14 can then be added to holding bin 42 via the opening 68 in the top 52 thereof. It should be recognized that the present disclosure contemplates designs having different dimensions and angles, such as a chute 60 that is narrower than the width of the holding bin 42 and angled differently than shown, and/or different mechanisms for opening the lid 50, by way of example.

[0035] The lower end 66 of the chute 60 is generally aligned vertically with the opening 68 in the top 52 of the holding bin 42. Therefore, any ice 14 that is poured onto the chute 60 is directed or funneled by the chute 60 down into the holding bin 42 via the opening 68. It should be recognized that because the front 66 of the chute 60 extends forwardly from the front 44 of the holding bin 42 (as well as any encasements, cladding, or the like), the operator does not need to reach as far back as the holding bin 42 to pour the ice 14 into the holding bin 42. As shown in FIG. 2, the front 66 of the chute 60 also extends approximately as far forward as the interface 34. This provides that the dispenser 40 does not require additional space longitudinally relative to the dispenser 10 of FIG. 1. This also provides that the operator does not have to reach past the interface 34, whereby the chute 60 effectively enables the operator to fill the ice 14 as if the holding bin 42 were the forwardmost portion of the dispenser 40.

[0036] As discussed above, a cold plate 70 is positioned below the holding bin 42 and is configured to be cooled via the ice 14 sitting thereon. The cold plate 70 may be generally positioned and/or configured in a conventional manner, as well as an agitator system to break up the ice and push it out, and spout for dispensing the ice.

[0037] With continued reference to FIG. 2, the ice dispenser 40 further includes a sensor 72 configured to detect ice 14 within the holding bin 42. In particular, the sensor 72 is configured to measure a vertical height or fill level of the of the ice 14 with the holding bin 42. The fill level may be determined based on a distance between the ice 14 and the sensor 72, based on how much of an interior of the holding bin 42 remains visible, and/or as a fill level relative to other landmarks within the holding bin 42, such as a markings on the interior walls thereof.

[0038] By way of example, the sensor 72 may be a proximity and/or vision-based sensors comprising one or more ultrasonic sensors, radars, LiDAR devices, cameras, lasers, or other devices individually capable of determining distances or relative positions of objects. Certain types of sensors 72 may work better than others within the holding bin 42, particularly as the lighting conditions are very low. In particular, ultrasonic sensors, radar, lasers, or infrared sensors may be particularly well-suited. By way of example, the present inventors have recognized that ultrasound and radar do not require light, which simplifies the design and also provides that detection is not affected by differing levels of ambient lighting. Likewise, ultrasound and radar do not require lenses and thus avoid the need for periodic cleaning. The ultrasonic or radar sensor can also be completely embedded within the holding bin 42 since the energy can be sent at close range through a plastic surface. In this manner, the sensor 72 can be completely enclosed and protected from the environment. By way of example, the sensor may be an ultrasonic sensor made by Pepperl and Fuchs, such as models UC100-18GS-IUEP-IO-V1 or UC400-F77-EP-IO-V31.

[0039] With continued reference to FIG. 2, the sensor 72 may be configured to cover a field of view FOV between 0 and 90 degrees (shown here as approximately 30 degrees) with a focal distance FD between 0 and 3 feet (shown here as approximately 1 foot), by way of example. Different sensors may be used to cover the different distances, different areas of the holding bin 42, and/or to provide redundancy. In an overlapping configuration, data from multiple sensors 72 may be processed together calibrating devices, image stitching, and/or to improve the accuracy of calculating distances (e.g., through triangulation techniques known in the art for

processing images from two or more cameras, such as stereo-vision techniques).

[0040] The height or fill level of the ice 14 may be determined as a highest height detected within the field of view FOV of the sensor 72, an average height of multiple heights detected within the field of view FOV, a minimum height detected by the sensor 72, or other configurations. The sensor 72 may also be positioned so as to particularly detect the fill level in a region of the holding bin 42 that is typically lower, such in the back opposite where the ice is filled via the chute 60.

[0041] The sensing distance for the sensor 72 is selected or adjusted for the present use, particularly with technologies of sensors 72 requiring a minimum distance from the sensor 72 and the objects being sensed (e.g., closer than that minimum distance may result in the reflected signal missing the detector of the sensor 72 when returning). In certain cases this minimum distance is approximately 3 inches or 76.2 mm.

[0042] The sensor 72 is positioned under the cover 48 at the top 52 of the holding bin 42, and particularly under the stationary portion 51 of the cover 48. This positioning provides that the sensor 72 is shielded from the impact of ice being poured into the holding bin 42 via the chute 60. The position may also be specifically selected so as to prevents an optional ice maker (e.g., positioned on the top 52 of the holding bin 42) from interfering with the sensor 72. The sensor 72 may also be contained within an impact resistant housing 74 for further protection, which may also or alternatively protect the sensor from moisture, water, and/or the like.

[0043] With reference to FIGS. 2 and 3, the sensor 72 communicates with a controller, shown as the control system CS100. In particular, the sensor 72 is an input CS99 to the control system CS100, providing data corresponding to a fill level 76 of ice 14 within the holding bin 42. The control system CS 100 is configured to compare the fill level 76 read by the sensor 72 to one or more threshold fill levels, depicted in FIG. 2 as a lower threshold 78 and an upper threshold 80.

[0044] The lower threshold 78 and an upper threshold 80 may be stored as distances from the sensor 72, which can be compared to the fill level measured for the ice 14 in the holding bin 42. The heights corresponding to the lower threshold 78 and upper threshold 80 may also or alternatively be provided as physical demarcations within the holding bin 42 as shown such that sensor 72 (e.g., an optical sensor) and/or the operator can visually discern these levels while filling the holding bin 42.

[0045] If the control system CS100 determines that the fill level 76 is below the lower threshold 78, whereby additional ice is needed in the holding bin 42, an indication is provided to the operator via an indicator such as a light emitting diode (LED) 82. By way of example, alternative indicators include a display screen, speaker 83, or wireless transmitter 85 (e.g., a Wi-Fi antenna). In this manner, the indicators are output devices CS101 of the control system CS100. In certain embodiments, the indication is a level of ice is shown on the display screen (e.g., a user interface), for example as a graphical representation of the holding bin with an ice level indicated at a vertical position corresponding to the actual ice lever determined by the system. By way of example, this may be shown at all times, only when the ice level falls below a certain threshold, or the representation may vary by height level (e.g., the level of ice indication turning orange and then red as different thresholds are crossed as ice is depleted).

[0046] In certain embodiments, the indicator deactivates again (e.g., the LED 82 turns off) once the fill level 76 is measured to be above the upper threshold 80. In other embodiments, a separate indicator (e.g., another LED) is illuminated to indicate that the holding bin 42 is full once the fill level 76 reaches the upper threshold 80. The indicator may also or alternatively include wireless communicating the need (or non-need) for additional ice, such as by communicating with a wireless receiver positioned elsewhere or carried by the operator. For example, the control system CS100 sends a text message to the operator (e.g., to an external device 87 such as a smart phone) when additional ice is needed, and/or generates a display on an incoming order display notifying the operator of this need.

[0047] Additional information is now provided for the example control system CS100 shown in FIG. 3. Certain aspects of the present disclosure are described or depicted as functional and/or logical block components or processing steps, which may be performed by any number of hardware, software, and/or firmware components configured to perform the specified functions. For example, certain embodiments employ integrated circuit components, such as memory elements, digital signal processing elements, logic elements, look-up tables, or the like, configured to carry out a variety of functions under the control of one or more processors or other control devices. The connections between functional and logical block components are merely exemplary, which may be direct or indirect, and may follow alternate pathways.

[0048] In certain examples, the control system CS 100 communicates with each of the one or more components of the ice dispenser 40 via a communication link CL, which can be any wired or wireless link. The control module CS 100 is capable of receiving information and/or controlling one or more operational characteristics of the ice dispenser 40 and its various sub-systems by sending and receiving control signals via the communication links CL. In one example, the communication link CL is a controller area network (CAN) bus; however, other types of links could be used. It will be recognized that the extent of connections and the communication links CL may in fact be one or more shared connections, or links, among some or all of the components in the ice dispenser 40. Moreover, the communication link CL lines are meant only to demonstrate that the various control elements are capable of communicating with one another, and do not represent actual wiring connections between the various elements, nor do they represent the only paths of com-

munication between the elements. Additionally, the ice dispenser 40 may incorporate various types of communication devices and systems, and thus the illustrated communication links CL may in fact represent various different types of wireless and/or wired data communication systems.

[0049] The control system CS100 may be a computing system that includes a processing system CS110, memory system CS120, and input/output (I/O) system CS130 for communicating with other devices, such as input devices CS99 (e.g., sensors 72) and output devices CS101 (e.g., LEDs 82), either of which may also or alternatively be stored in a cloud 1002. The processing system CS110 loads and executes an executable program CS122 from the memory system CS120, accesses data CS 124 stored within the memory system CS120, and directs the ice dispenser 40 to operate as described herein and also to perform conventional functions.

[0050] The processing system CS 110 may be implemented as a single microprocessor or other circuitry, or be distributed across multiple processing devices or subsystems that cooperate to execute the executable program CS 122 from the memory system CS 120. Nonlimiting examples of the processing system include general purpose central processing units, application specific processors, and logic devices.

[0051] The memory system CS120 may comprise any storage media readable by the processing system CS110 and capable of storing the executable program CS122 and/or data CS124. The memory system CS120 may be implemented as a single storage device or be distributed across multiple storage devices or sub-systems that cooperate to store computer readable instructions, data structures, program modules, or other data. The memory system CS120 may include volatile and/or non-volatile systems and may include removable and/or non-removable media implemented in any method or technology for storage of information. The storage media may include non-transitory and/or transitory storage media, including random access memory, read only memory, magnetic discs, optical discs, flash memory, virtual memory, and non-virtual memory, magnetic storage devices, or any other medium which can be used to store information and be accessed by an instruction execution system, for example.

[0052] In this manner, the ice dispenser 40 provides for automatically determining the fill level 76 of the ice 14 within the holding bin 42 and automatically notifies the operator when attention is needed. Additionally, by including the chute 60, which as stated above extends forwardly from the holding bin 42, the operator's task of accessing the opening 68 in the top 52 of the holding bin 42 is greatly simplified. The operator no longer needs to reach so far longitudinally rearwardly as this chute 60 provides a forward filling mechanism that automatically funnels the ice rearwardly to the holding bin 42. The present inventors have identified that this chute 60 also allows the cover 48 to extend over a greater portion of the top 52 of the holding bin 42. In examples, this may provide improved temperature differential within the holding bin 42 versus the ambient temperature.

[0053] The present inventor have also identified that ice dispensers presently known in the art pose challenges in that the location of the ice bin holder make it very difficult to see if the level of ice is sufficient for the dispenser, especially during peak serving times. Even if the machine has an ice maker the demand could exceed the capacity to make ice and could possibly not have enough to dispense ice in a cup and even starve the cold plate of cooling ice. In this case, the operator is unaware that additional ice may need to be added from an external ice maker to meet this demand.

[0054] The present inventors have further identified that ice dispensers presently known in the art often provide uneven distribution of ice on the cold plate. This results in poor cooling for the beverage lines and/or other elements meant to be cooled by having ice on the cold plate.

[0055] FIGS. 4 and 5 further depict how the ice dispenser 40 according to the present disclosure provides for even distribution of ice across the cold plate 70. As discussed above, the holding bin 42 extends between the first side 44 at the front opposite the second side 46 at the back, and likewise between the top 52 and the bottom 54. An opening 202 is formed through the bottom 54 of the holding bin 42, defined between a front edge 204 and an opposite back edge 206, and between opposing sides 208. The front edge 204 curves inwardly in a middle region 210 toward the back edge 206. With additional reference to FIG. 2, the bottom 54 of the holding bin 42 is contoured so as to funnel ice downwardly and rearwardly within the holding bin 42 towards the opening 202. Ice 14 falls from the holding bin 42 into a chamber 71 containing the cold plate 70 via the opening 202.

[0056] As best seen in FIG. 2, the present inventors have particularly configured the bottom 54 of the holding bin 42 and the position of the opening 202 therein such that ice 14 falls from the holding bin 42 onto a rear end 212 of the cold plate 70 that is longitudinally closer to the second end 46 of the holding bin 42 than to the first end 44 of the holding bin 42. The rear end 212 of the cold plate 70 is also vertically higher than an opposite front end 214 thereof, allowing melted ice (i.e., water) to drain via the drain conduit 28 in a conventional manner. By positioning the opening 202 above the rear end 212 of the cold plate 70, the present inventors have recognized that ice distribution is improved across the cold plate 70. In particular, since the ice 14 may settle downwardly via gravity toward the front end 214 of the cold plate 70, filling the chamber 71 containing the cold plate 70 provides that the surface of the cold plate 70 remains consistently covered with ice 14.

[0057] It should be recognized that the shape, size, and position of the opening 202 within the bottom 54 of the holding bin 42 shown is merely one example. The present disclosure contemplates configurations having

greater or fewer deflectors, deflectors having different shapes, relative sizes, and positions, and/or other variations that those expressly shown, or a different number of openings or a different location, size, and/or shape of the opening.

[0058] In this manner, the presently disclosed ice dispensers provide for even distribution of ice upon the cold plate to maximize heat transfer with the cold plate.

[0059] FIGS. 6-8 provide further detail for one example of a configuration for the lid 50 providing access to add ice into the holding bin 42. The lid 50 is part of an overall hatch system 250 that is configured to be coupled to the top 52 of the holding bin 42 (or elsewhere on the ice dispenser 40). As best shown in FIG. 8, the hatch system 250 is advantageously configured to be a retrofittable replacement to conventional lids presently known in the art.

[0060] With continued reference to FIGS. 6-8, the hatch system 250 has a lid 50 that extends between a first end 254 and a second end 256, sides 258, and between a top 260 and a bottom 262. The hatch system 250 further includes a base 264 that extends between a first end 266 and a second end 268, sides 270, and between a top 272 and a bottom 274. The bottom 262 of the lid 50 rests upon the top 272 of the base 264 when the lid 50 is in the closed position shown in FIG. 8.

[0061] The base 264 of the hatch system 250 may be coupled to the top 52 via conventional mechanisms, such as a press fit arrangement, being held in place via gravity, using pins and/or other fasteners (e.g., screws or bolts), adhesives, and/or the like. By way of example, the fasteners may be inserted downwardly through the hatch system 250 to be threaded into the top 52 of the holding bin 42 similar to how a spark plug is threaded into an engine block. Quick removal systems such as slotted arrangements, locking clips, plungers, or pins may also be used for fast and tool-less removal.

[0062] With reference to FIG. 7, the lid 50 is pivotally coupled to the base 252 via a pair of hinge arms 276 each having a first end 278 and an opposite second end 280. The first ends 278 of the hinge arms 276 are pivotally coupled at pivot axis PA1 to the sides 258 of the lid 50 at a position between the first end 254 and the second end 256 thereof (shown here to be at or near a midpoint). The second ends 280 of the hinge arms 276 are pivotally coupled at pivot axis PA2 to the sides 270 of the base 264, here near the first end 266 thereof. The hinge arms 276 may be pivotally coupled via conventional fasteners, such as screws, bolts, pins, or axles. The hinge arms 276 remain parallel to each other as the lid 50 is moveable between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible, and wherein the lid is rotated between 45 and 90 degrees from the closed position to the open position (shown here to be approximately 80 degrees).

[0063] In other words, the pair of hinge arms 276 allow the lid 50 to move upwardly away from the opening 68 providing access to the holding bin 42 while also moving forwardly and subsequently downwardly in front of the interface 34. This provides that the lid 50 is out of the way when the operator wishes to add ice to the holding bin 42 (via the chute 60). In the example shown, the lid 50 moves approximately 90 degrees between the closed and opened positions. This design also provides that the lid 50 does not need to be completely removed and placed anywhere, avoiding a risk of damage.

[0064] In certain examples, one end (the first end 278 or the second end 280) of each of the hinge arms 276 is pivotally coupled proximate the upper end 62 of the chute 60 and the opposite end is pivotally coupled to the lid proximate a midpoint of the lid 50 between the first end 254 and the second end 256 thereof. Other configurations are contemplated, including the hinge arms 276 being pivotally coupled in other positions, pivotally coupled such that the lid 50 opens upwardly and rearwardly, and/or sliding in tracks at the lid 50 and/or holding bin 42 ends. The lid 50 may also pivot without a hinge arm, may slide, and/or may be lifted off for opening.

[0065] As discussed above, a sensor 72 is provided for measuring the level of the ice within the holding bin 42. In certain examples, the sensor 72 is coupled to the top 52 of the holding bin 42. Other contemplated locations for coupling the sensor 72 include the side walls of the holding bin 42, the lid 50, or others. The present disclosure also contemplates different mechanisms for coupling the sensor 72 to the top 52 of the holding bin 42. In certain examples, the sensor 72 is coupled to the underside of the top 52 of the holding bin 42 or elsewhere via fasteners such as screws. In other examples, the sensor 72 is coupled to the top 52 from above, being threaded into a threaded opening in the top 52, coupled to the top 52 via fasteners such as screws, or other known techniques. In further examples, such as shown in FIG. 8, the sensor 72 is positioned to be hidden under the hatch system 250 when the hatch system 250 is in place. The sensor 72 can then easily be serviced or replaced by removing the hatch system 250.

[0066] The present inventors have advantageously identified that certain types of sensors 72, such as radar and ultrasound, can be positioned so as to read through the top 52 of the holding bin 42. This protects the sensors 72 from contacting the ice or other items within the holding bin 42 and also eliminates the need for cleaning.

[0067] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to make and use the invention. Certain terms have been used for brevity, clarity, and understanding. No unnecessary limitations are to be inferred therefrom beyond the requirement of the prior art because such terms are used for descriptive purposes only and are intended to be broadly construed. The patentable scope of the invention is defined by the claims and may include other examples that occur to those skilled in the art. Such other examples are intended to be within the scope of the claims if they have features or structural elements that do not differ from the literal

language of the claims, or if they include equivalent features or structural elements with insubstantial differences from the literal languages of the claims.

Claims

1. An ice dispenser for storing and dispensing ice, the ice dispenser comprising:

   a holding bin extending longitudinally between a first side and a second side, transversely between a third side and a fourth side, and vertically between a top to a bottom;
   a chute configured to guide the ice from outside the holding bin into the holding bin, wherein the chute has an upper end and an opposite lower end, and wherein the upper end of the chute extends longitudinally farther than the first side of the holding bin from the second side of the holding bin; and
   a spout operatively coupled to the holding bin for dispensing ice from the holding bin.

2. The ice dispenser according to claim 1, further comprising a cold plate positioned below the holding bin, the cold plate including one or more lines configured to be cooled via the ice from the holding bin.

3. The ice dispenser according to any of claims 1 and 2, wherein the lower end of the chute is positioned so as to be approximately vertically even with the top of the holding bin.

4. The ice dispenser according to any one of the preceding claims, wherein the chute extends between the upper end and the lower end at an angle between 20 and 60 degrees relative to the bottom of the holding bin.

5. The ice dispenser according to any one of the preceding claims, further comprising a cover that encloses the top of the holding bin, the cover having a lid for selectively opening a portion of the cover to access the holding bin, optionally wherein the lid is movable between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible, and wherein the lid is rotated between 45 and 90 degrees from the closed position to the open position.

6. The ice dispenser according to claim 5, wherein the lid is pivotally coupled via a pair of hinge arms that remain parallel to each other as the lid is moved between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible.

7. The ice dispenser according to claim 5 or claim 6, wherein the lid extends between a first end and a second end, wherein the lid is pivotally coupled via a pair of hinge arms that each extend between a first end and a second end, and wherein the first ends of the hinge arms are pivotally coupled proximate the upper end of the chute and the second ends of the hinge arms are pivotally coupled to the lid proximate a midpoint of the lid between the first end and the second end thereof.

8. The ice dispenser according to any one of the preceding claims, further comprising a sensor configured to determine a level of the ice within the holding bin, optionally wherein the sensor comprises an ultrasonic sensor and/or a radar sensor, and optionally when dependent upon any claim dependent on claim 5 wherein the sensor is hidden under the cover and accessible by removal thereof.

9. The ice dispenser according to claim 8, further comprising a controller and a light, the controller being operatively connected to both the sensor and the light, wherein the controller is configured to compare the level of the ice within the holding bin to a threshold level and to control the light based on the comparison of the level to the threshold level so as to indicate when additional ice is needed in the holding bin.

10. An ice dispenser for storing and dispensing ice, the ice dispenser comprising:

    a holding bin configured for storing ice;
    a spout operatively coupled to the holding bin for dispensing ice from the holding bin;
    a sensor configured to determine a level of the ice within the holding bin; and
    a controller and an indicator configured to generate an indicator for a user, the controller being operatively coupled to the sensor and the indicator, wherein the controller is configured to compare the level of the ice within the holding bin to a threshold level and to control the indicator based on the comparison of the level to the threshold level so as to indicate when additional ice is needed in the holding bin.

11. The ice dispenser according to claim 10, further comprising a cold plate positioned below the holding bin, the cold plate including one or more beverage lines configured to be cooled via the ice from the holding bin, wherein optionally the sensor comprises an ultrasonic sensor.

12. The ice dispenser according to any of claims 10 to 11, wherein the indicator comprises a light emitting diode, and wherein the controller is configured to turn on the light when the level of the ice within the holding

bin is below the threshold level.

13. The ice dispenser according to any of claims 10 to 12, further comprising a cover that encloses a top of the holding bin, the cover having a lid for selectively opening a portion of the cover to access the holding bin, optionally, wherein the sensor is hidden under the cover and accessible by removal thereof.

14. The ice dispenser according to any of claims 10 to 13, further comprising a wireless transmitter operatively coupled to the controller, wherein the controller is further configured to cause the wireless transmitter to send a signal receivable by an external device when additional ice is needed in the holding bin.

15. An ice dispenser for storing and dispensing ice, the ice dispenser comprising:

a holding bin extending longitudinally between a first side and a second side, transversely between a third side and a fourth side, and vertically between a top to a bottom;
a chute configured to guide the ice from outside the holding bin into the holding bin, wherein the chute has an upper end and an opposite lower end, and wherein the upper end of the chute extends longitudinally farther than the first side of the holding bin from the second side of the holding bin;
a cold plate positioned below the holding bin, the cold plate including a beverage line configured to be cooled via the ice from the holding bin;
a spout operatively coupled to the holding bin for dispensing ice from the holding bin;
a cover that encloses the top of the holding bin, the cover having a lid for selectively opening a portion of the cover to access the holding bin, wherein the lid is pivotally coupled via a pair of hinge arms that remain parallel to each other as the lid is moved between a closed position in which access to the holding bin is blocked and an open position in which the holding bin is accessible;
a sensor configured to determine a level of the ice within the holding bin, wherein the sensor is hidden under the cover and accessible by removal thereof; and
a controller and a light, the controller being operatively connected to both the sensor and the light, wherein the controller is configured to compare the level of the ice within the holding bin to a threshold level and to control the light based on the comparison of the level to the threshold level so as to indicate when additional ice is needed in the holding bin.

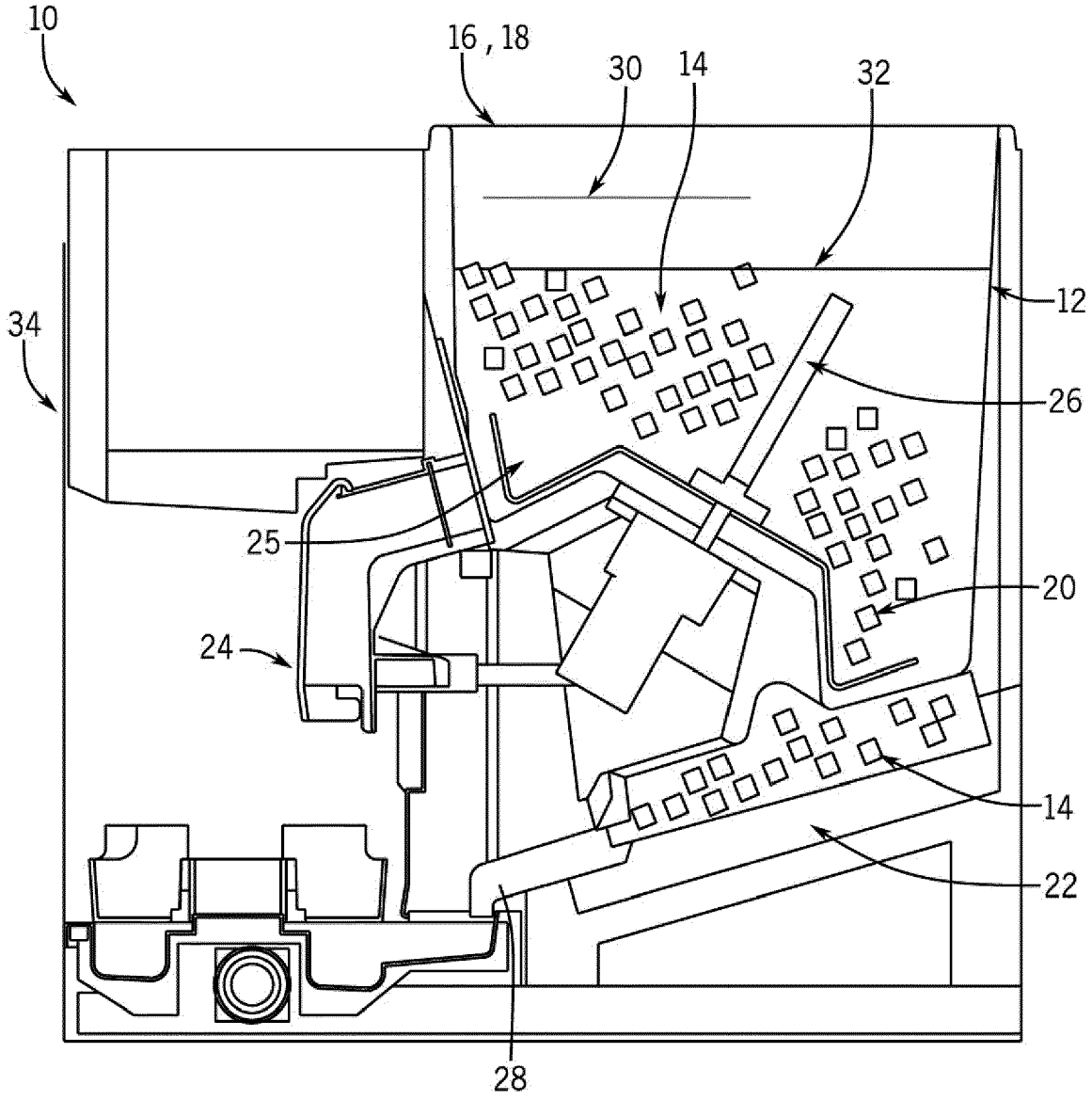

FIG. 1

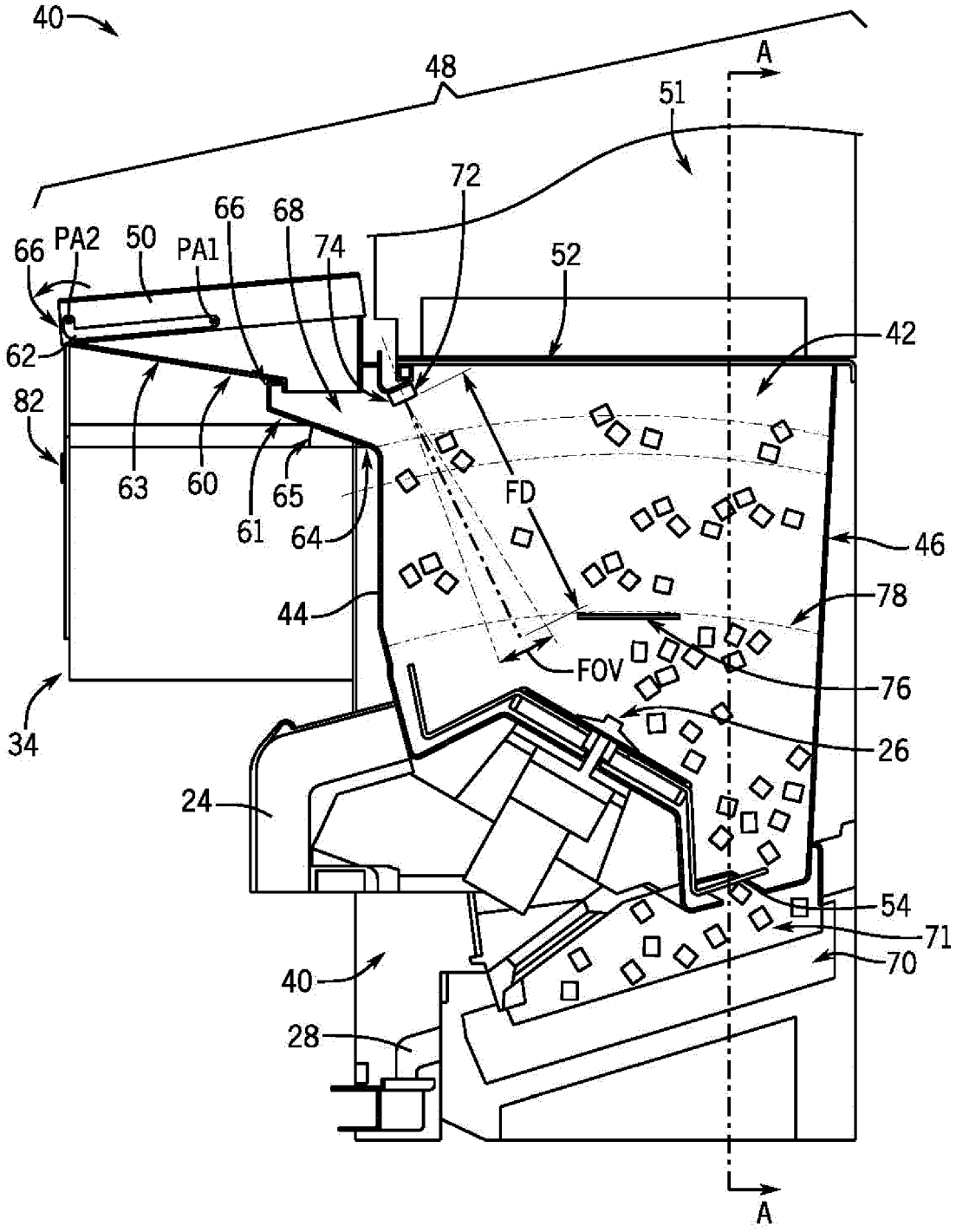
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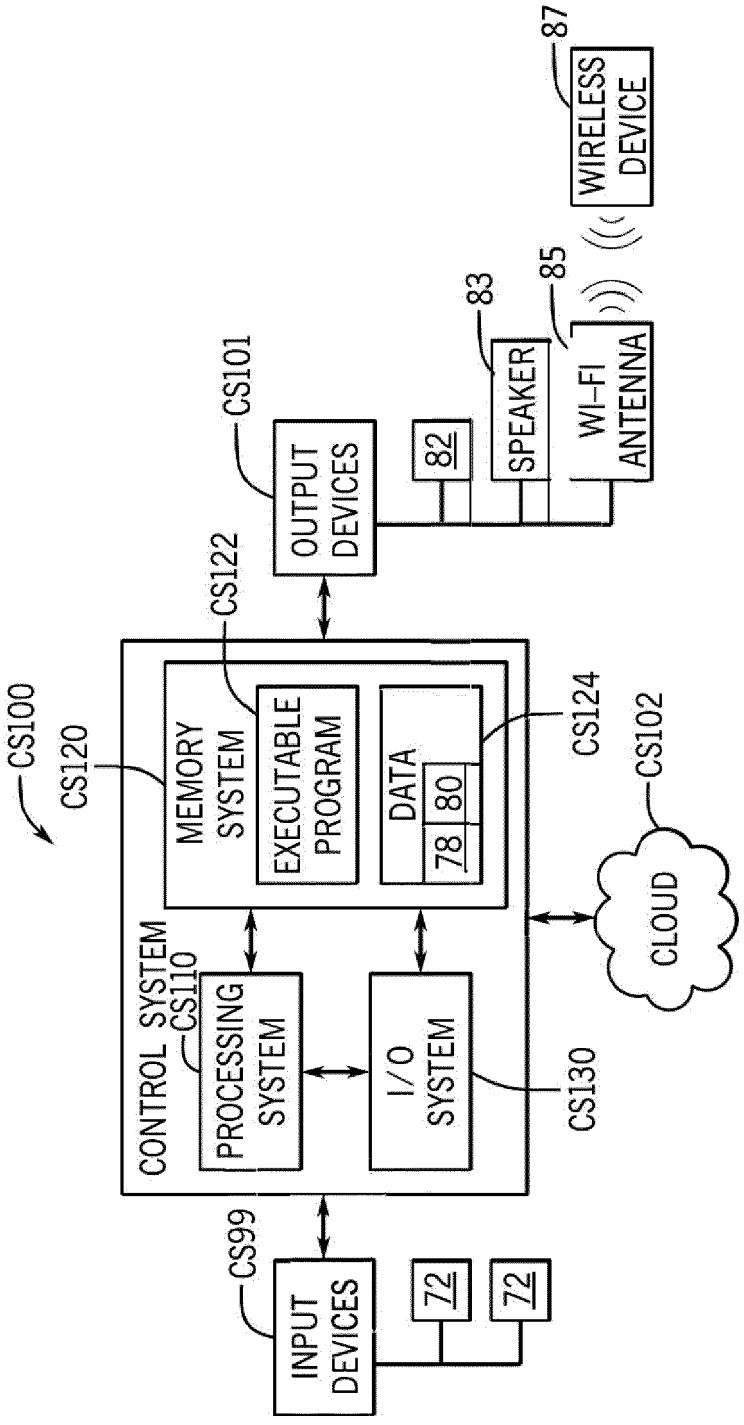
FIG. 2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SPEAKER
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WI-FI ANTENNA
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WIRELESS DEVICE

FIG. 3

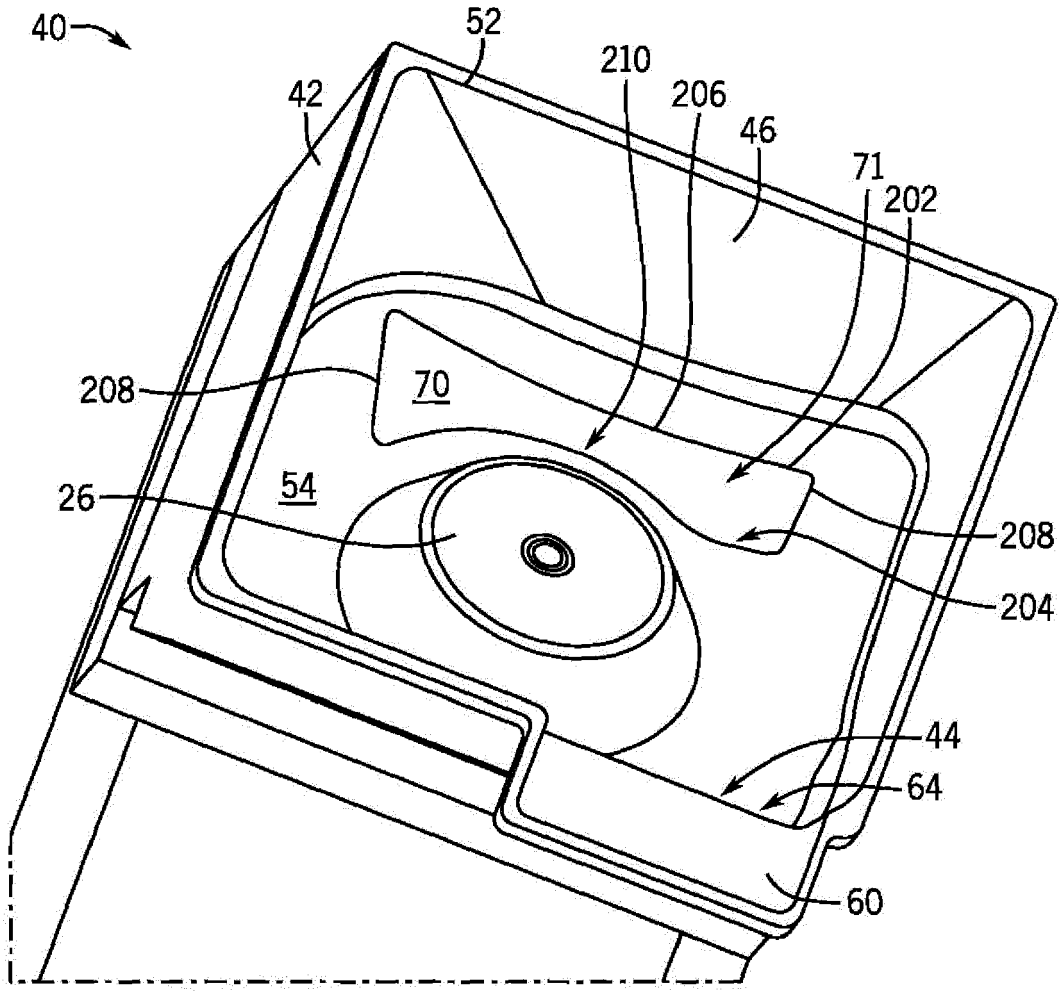

FIG. 4

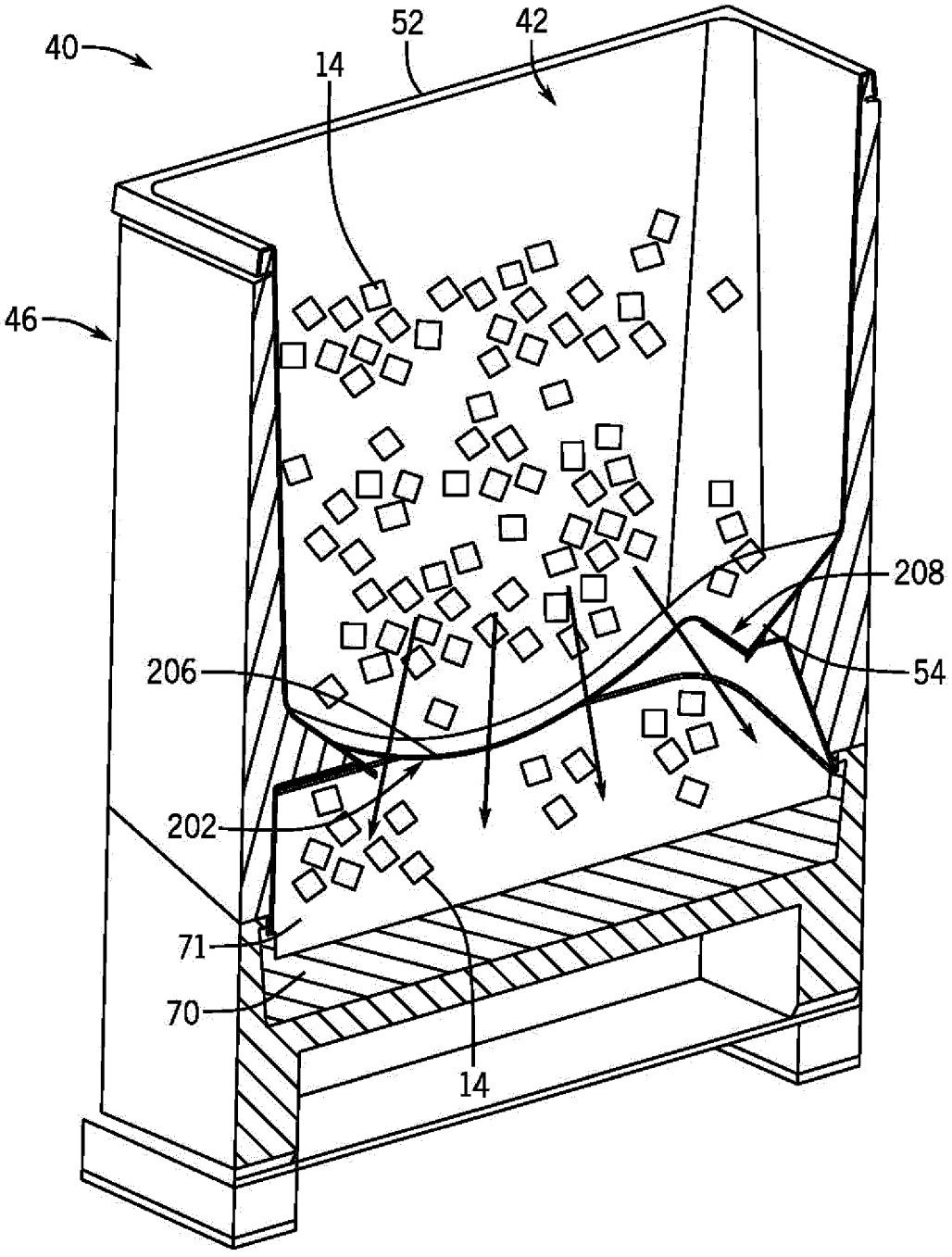

FIG. 5

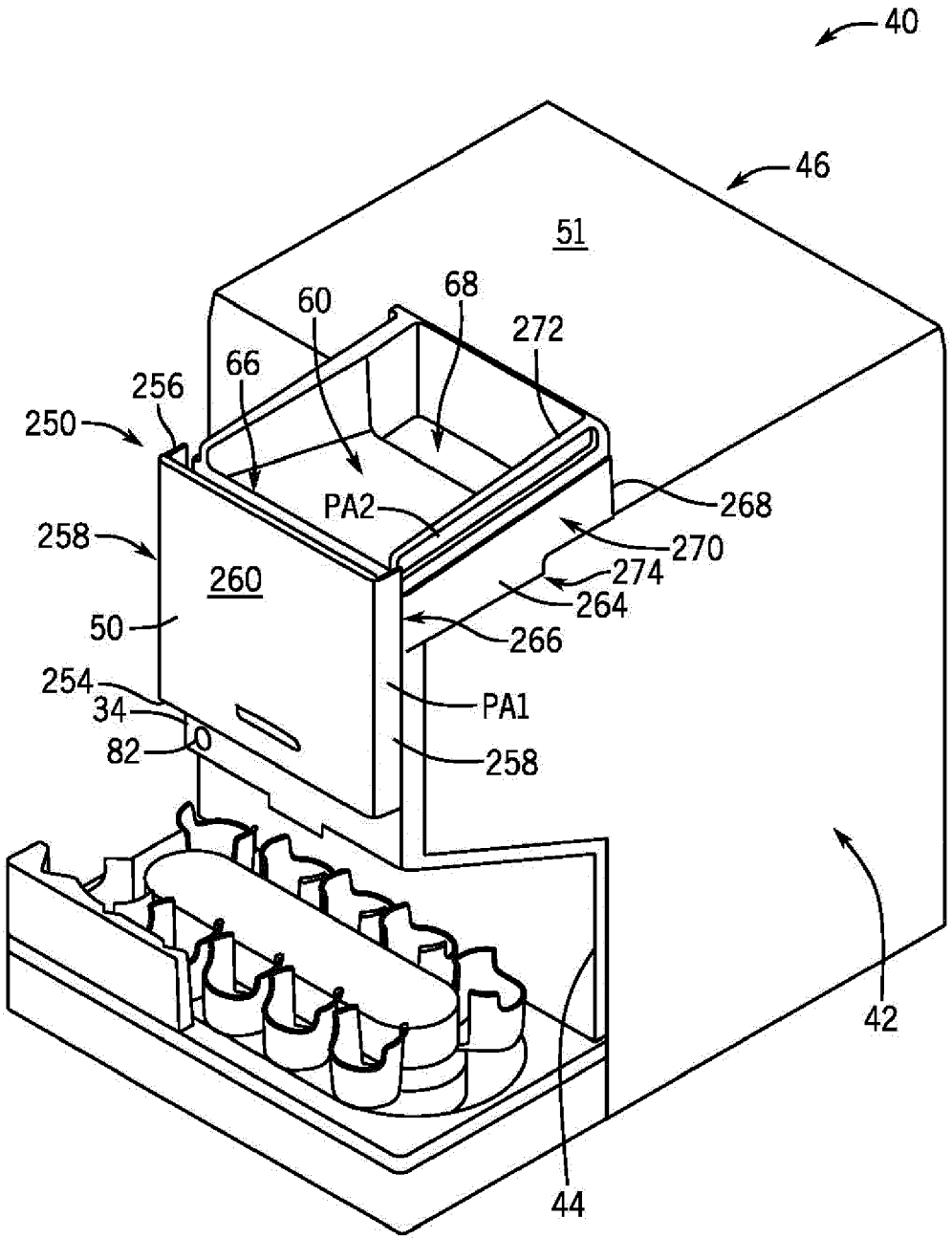
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FIG. 6

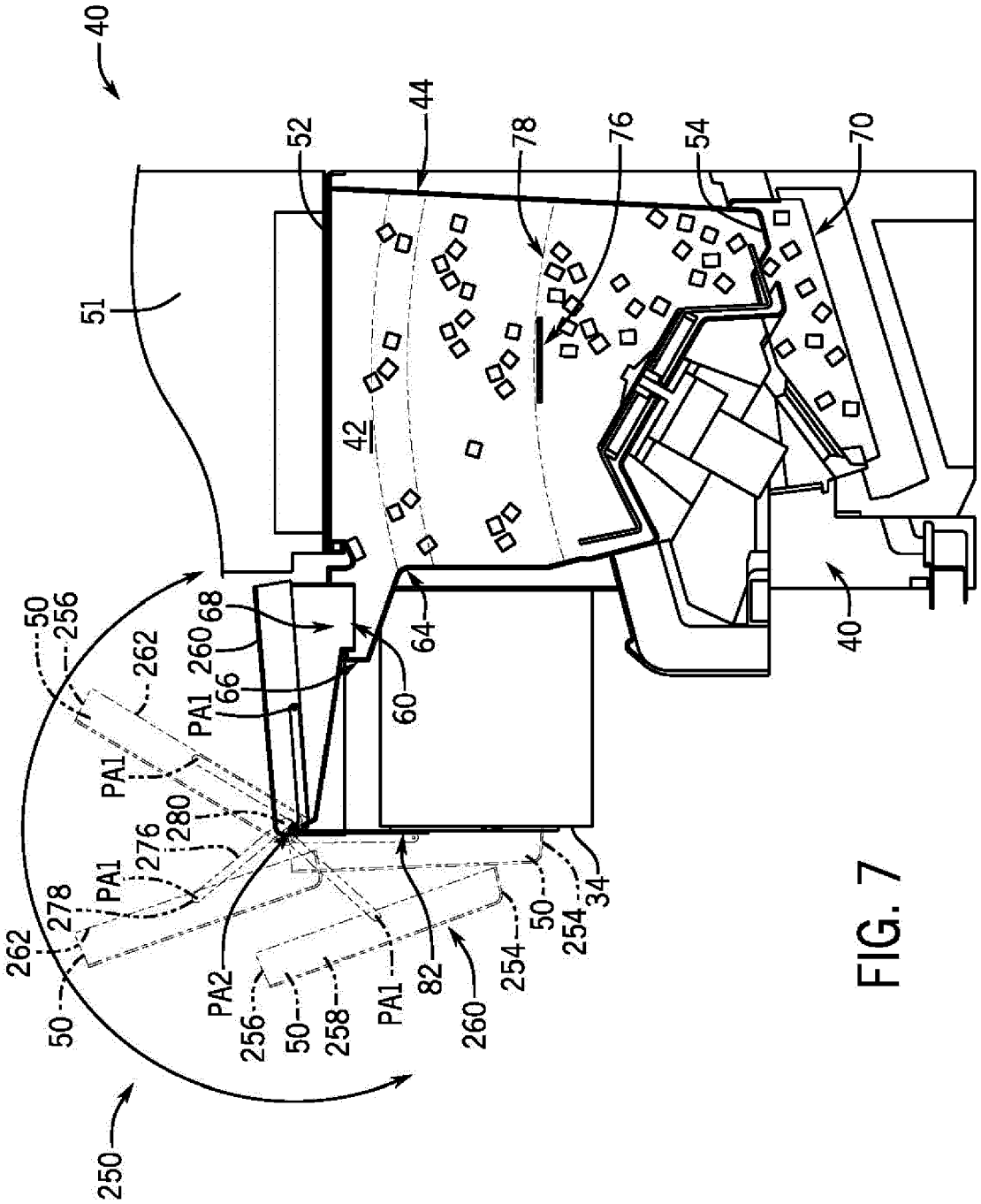
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FIG. 7

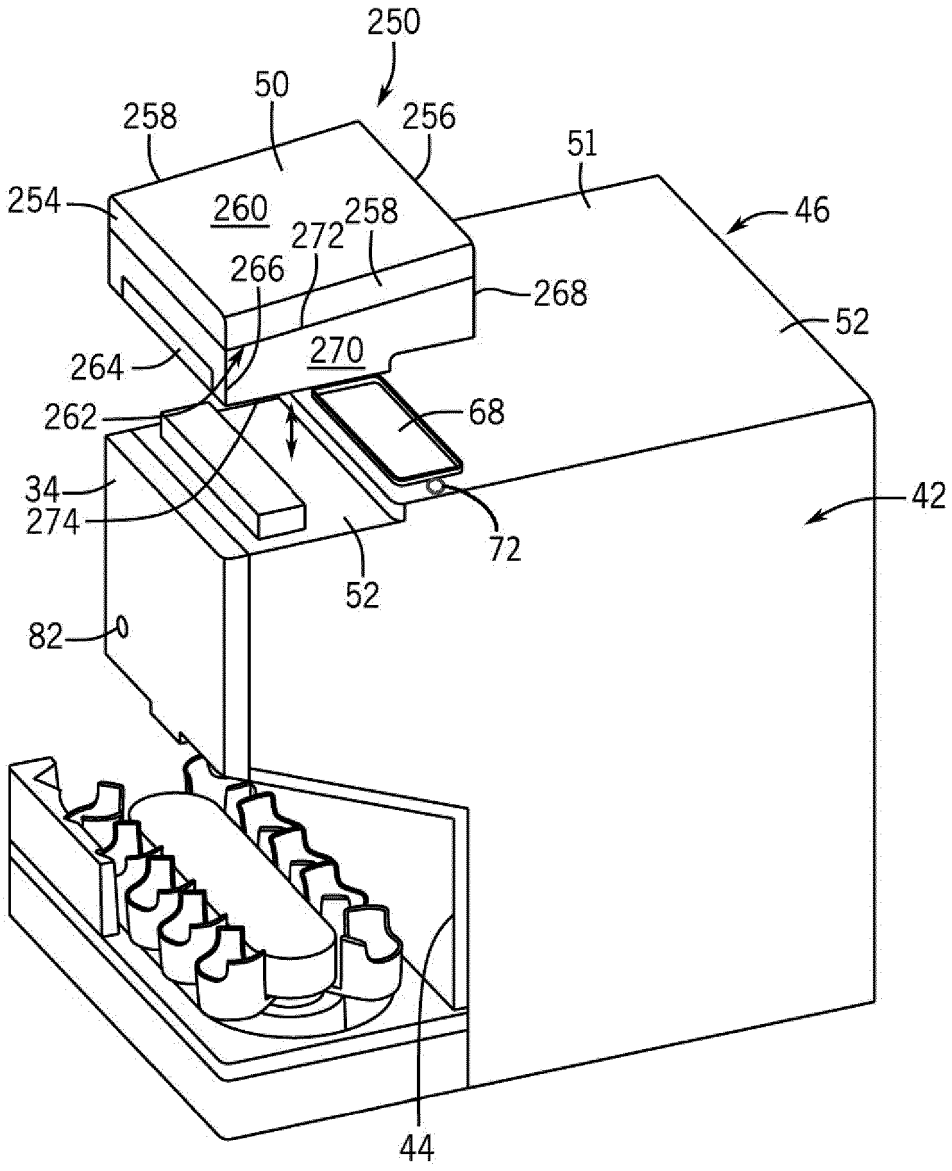
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FIG. 8

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PARTIAL EUROPEAN SEARCH REPORT

under Rule 62a and/or 63 of the European Patent Convention. This report shall be considered, for the purposes of subsequent proceedings, as the European search report

Application Number
EP 23 21 6156

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 62 664 A1 (BSH BOSCH SIEMENS HAUSGERAETE [DE]) 18 July 2002 (2002-07-18)	1,3-7	INV. F25C5/182
Y	* abstract; figures 1-4 * * paragraph [0021] - paragraph [0031] *	8,9	
X	CA 2 314 327 A1 (LANCER CORP [US]) 29 August 1996 (1996-08-29) * abstract; figures 1-7 *	1-7	
X	CN 109 721 184 A (CHUNGHO NAIS CO LTD) 7 May 2019 (2019-05-07) * abstract; figures 1-3 *	1,3-7	
Y	US 2009/100847 A1 (MOON KYUNG HEE [KR] ET AL) 23 April 2009 (2009-04-23)	8,9	
A	* abstract; figures 1, 2, 6-8 * * paragraph [0053] - paragraph [0058] *	1	
			TECHNICAL FIELDS SEARCHED (IPC)
			F25C

INCOMPLETE SEARCH

The Search Division considers that the present application, or one or more of its claims, does/do not comply with the EPC so that only a partial search (R.62a, 63) has been carried out.

Claims searched completely :

Claims searched incompletely :

Claims not searched :

Reason for the limitation of the search:

see sheet C

Place of search	Date of completion of the search	Examiner
The Hague	14 June 2024	Bejaoui, Amin

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

EPO FORM 1503 03.82 (P04E07)

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INCOMPLETE SEARCH
SHEET C

Application Number
EP 23 21 6156

Claim(s) completely searchable:
1-9

Claim(s) not searched:
10-15

Reason for the limitation of the search:

The search has been restricted to the subject-matter indicated by the applicant in his letter of 17.04.2024 filed in reply to the invitation pursuant to Rule 62a(1) EPC.

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 23 21 6156

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on
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14-06-2024

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		US 2009100847 A1	23-04-2009

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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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- US 6945070 B **[0006]**