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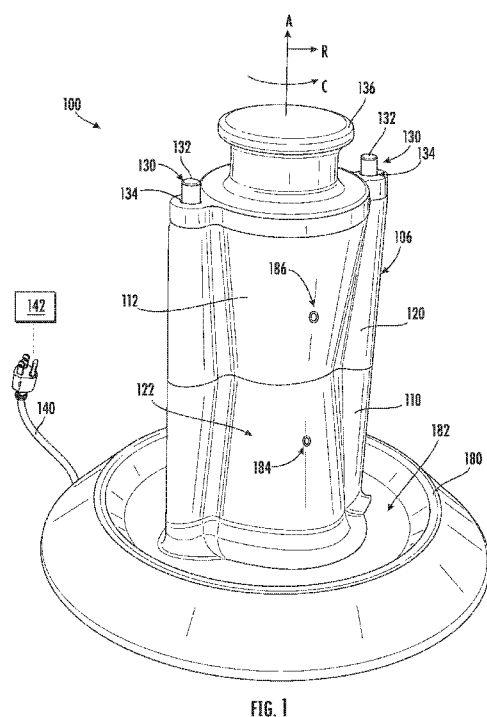
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(54) Title: ANNULAR HEATING ASSEMBLY FOR AN ICE PRESS



(57) Abstract: An electric ice press (100) which be utilized to reshape an initial ice billet (102) into a sculpted ice nugget (104) may include a mold body (106) having a first mold segment (110) and a second mold segment (120) movable relative to each other. Each mold segment (110, 120) may define a heater cavity (150, 152) that is configured for receiving a ceramic annular heater (154, 156) for heating the mold body (106) to form the sculpted ice nugget (104).

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ANNULAR HEATING ASSEMBLY FOR AN ICE PRESS

FIELD OF THE INVENTION

[0001] The present subject matter relates generally to appliances for shaping ice and more particularly to an electric ice press for shaping ice to a predetermined desired profile.

BACKGROUND OF THE INVENTION

[0002] In domestic and commercial applications, ice is often formed as solid cubes, such as crescent cubes or generally rectangular blocks. The shape of such cubes is often dictated by the container holding water during a freezing process. For instance, an ice maker can receive liquid water, and such liquid water can freeze within the ice maker to form ice cubes. In particular, certain ice makers include a freezing mold that defines a plurality of cavities. The plurality of cavities can be filled with liquid water, and such liquid water can freeze within the plurality of cavities to form solid ice cubes. Typical solid cubes or blocks may be relatively small in order to accommodate a large number of uses, such as temporary cold storage and rapid cooling of liquids in a wide range of sizes.

[0003] Although the typical solid cubes or blocks may be useful in a variety of circumstances, there are certain conditions in which distinct or unique ice shapes may be desirable. As an example, it has been found that relatively large ice cubes or spheres (e.g., larger than two inches in diameter) will melt slower than typical ice sizes/shapes. Slow melting of ice may be especially desirable in certain liquors or cocktails. Moreover, such cubes or spheres may provide a unique or upscale impression for the user.

[0004] In the past, users desiring larger or uniquely-shaped pieces of ice were forced to utilize cumbersome techniques and devices. As an example, large billets of ice may be shaved or sculpted by hand. However, sculpting ice by hand can be extremely difficult, dangerous, and time-consuming. In recent years, passive ice presses have come to market. Typically, these passive presses include large solid metal pieces that define a profile to which a larger ice billet may be reshaped. Generally, the passive presses rely on the large mass of the press to slowly melt a

large ice billet into a desired shape. Such systems reduce some of the dangers and user skill required when reshaping ice by hand. However, the systems require large amounts of solid metal, and the process is still very time-consuming. Moreover, typical ice presses use the heat capacity of the metal molds to supply the needed heat. Therefore, melting multiple pieces of ice in succession may require a user to place the passive press under hot water between each ice piece or wait until the mold is heated.

[0005] Alternatively, certain ice presses use an electric heater for heating the ice mold, but such heaters commonly cartridge have undesirable geometries and positions such that they only provide localized heat that melts the ice billet in an uneven manner. In addition, these heaters often do not have the capacity to heat the entire mold at the rate necessary to facilitate the formation of a clear ice cube.

[0006] Accordingly, further improvements in the field of ice-shaping would be desirable. More specifically, it may be desirable to provide an appliance or assembly for rapidly and reliably producing ice pieces that have a relatively-large predetermined shape or profile would be particularly beneficial.

BRIEF DESCRIPTION OF THE INVENTION

[0007] Aspects and advantages of the invention will be set forth in part in the following description, or may be obvious from the description, or may be learned through practice of the invention.

[0008] In one exemplary embodiment, an electric ice press defining an axial direction is provided. The electric ice press includes a mold body including a first mold segment and a second mold segment, the first mold segment and the second mold segment being movable relative to each other along the axial direction and defining a mold cavity, the first mold segment defining a heater cavity, and an annular heater positioned within the heater cavity for heating the first mold segment.

[0009] In another exemplary embodiment, an electric ice press defining an axial direction is provided. The electric ice press includes a mold body including a first mold segment and a second mold segment, the first mold segment and the second mold segment being movable relative to each other along the axial direction and defining a mold cavity, the first mold segment defining a first heater cavity and the second mold segment defining a second heater cavity, a first annular heater positioned

within the first heater cavity for heating the first mold segment, and a second annular heater positioned within the second heater cavity for heating the second mold segment.

[0010] These and other features, aspects and advantages of the present invention will become better understood with reference to the following description and appended claims. The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate embodiments of the invention and, together with the description, serve to explain the principles of the invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] A full and enabling disclosure of the present invention, including the best mode thereof, directed to one of ordinary skill in the art, is set forth in the specification, which makes reference to the appended figures.

[0012] FIG. 1 provides a perspective view of an ice press appliance according to exemplary embodiments of the present disclosure.

[0013] FIG. 2 provides a front view of the exemplary ice press appliance of FIG. 1.

[0014] FIG. 3 provides a front view of the exemplary ice press appliance of FIG. 1, wherein the ice press appliance is provided in a receiving position with an initial ice billet.

[0015] FIG. 4 provides a front view of the exemplary ice press appliance of FIG. 1, wherein the ice press appliance is provided in a receiving position with a sculpted ice nugget.

[0016] FIG. 5 provides a front cross-sectional view of an ice press appliance according to exemplary embodiments of the present disclosure.

[0017] FIG. 6 provides a side cross-sectional view of an ice press appliance according to exemplary embodiments of the present disclosure.

[0018] FIG. 7 provides an exploded perspective view of a top half of the exemplary ice press appliance of FIG. 1 according to exemplary embodiments of the present disclosure.

[0019] FIG. 8 provides another exploded perspective view of a top half of the exemplary ice press appliance of FIG. 1 and a heating assembly according to exemplary embodiments of the present disclosure.

[0020] Repeat use of reference characters in the present specification and drawings is intended to represent the same or analogous features or elements of the present invention.

DETAILED DESCRIPTION

[0021] Reference now will be made in detail to embodiments of the invention, one or more examples of which are illustrated in the drawings. Each example is provided by way of explanation of the invention, not limitation of the invention. In fact, it will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope or spirit of the invention. For instance, features illustrated or described as part of one embodiment can be used with another embodiment to yield a still further embodiment. Thus, it is intended that the present invention covers such modifications and variations as come within the scope of the appended claims and their equivalents.

[0022] As used herein, the terms “first,” “second,” and “third” may be used interchangeably to distinguish one component from another and are not intended to signify location or importance of the individual components. The term “or” is generally intended to be inclusive (i.e., “A or B” is intended to mean “A or B or both”). In addition, terms of approximation, such as “approximately,” “substantially,” or “about,” refer to being within a ten percent margin of error.

[0023] Turning now to the figures, FIGS. 1 through 8 provide views of an ice press 100 according to exemplary embodiments of the present disclosure. Generally, ice press 100 may serve to reshape or transform a relatively-large initial ice billet 102 (e.g., an integral or monolithic block of raw unsculpted ice, see FIG. 3) into a relatively-small sculpted ice nugget 104 (see, e.g., FIG. 4) that has a predetermined desirable profile. FIG. 1 provides a perspective view of ice press 100. FIG. 2 provides a front view of ice press 100 in a closed or sculpted position. FIGS. 3 and 4 provide front views of ice press 100 in an open or receiving position where ice billet 102 may be provided or ice nugget 104 may be removed. FIGS. 5 and 6 provide cross-sectional views of an ice press appliance according to exemplary embodiments of the present disclosure. FIG. 7 provides an exploded perspective view of ice press 100. FIG. 8 another exploded perspective view of ice press 100.

[0024] As shown, ice press 100 includes a mold body 106 that defines an axial direction A. A radial direction R may be defined outward from (e.g., perpendicular to) axial direction A. A circumferential direction C may be defined about axial direction A (e.g., perpendicular to axial direction A in a plane defined by radial direction R).

[0025] Within mold body 106, a mold cavity 108 is defined. As will be described below, within mold cavity 108 the sculpted ice nugget 104 is shaped and its profile is determined. In some embodiments, mold cavity 108 is defined by two discrete mold segments 110, 120. For instance, a first mold segment 110 and a second mold segment 120 may be selectively mated to each other and, together, define mold cavity 108.

[0026] Each mold segment 110, 120 generally includes an outer sidewall 112, 122 and an inner cavity wall 114, 124. In particular, the outer sidewall 112, 122 of each mold segment 110, 120 faces outward (e.g., in the radial direction R) toward the ambient environment. The outer sidewall 112, 122 may generally extend about the axial direction A (e.g., along the circumferential direction C). Moreover, outer sidewalls 112, 122 may extend from an upper portion of the corresponding mold segment 110, 120 to a lower portion of the mold segment 110, 120. As a result, a user may be able to view and touch the outer sidewall 112, 122 of each assembled mold segment 110, 120, regardless of whether ice press 100 is in the receiving position or the sculpted position.

[0027] In contrast to the outer sidewall 112, 122, the inner cavity wall 114, 124 of each mold segment 110, 120 faces inward (e.g., within mold body 106) and toward mold cavity 108. For instance, each inner cavity wall 114, 124 may be formed about and extend radially outward from the axial direction A. The inner cavity wall 114 of the first mold segment 110 may generally face upward (e.g., relative to the axial direction A) toward a bottom portion of the second mold segment 120. The inner cavity wall 124 of the second mold segment 120 may generally face downward (e.g., relative to the axial direction A) toward an upper portion of first mold segment 110.

[0028] In some embodiments, the inner cavity walls 114, 124 define at least a portion of mold cavity 108. For instance, the inner cavity wall 114 of first mold segment 110 may form a first cavity portion 116 (e.g., along the inner cavity wall 114). Additionally or alternatively, the inner cavity wall 124 of second mold segment

120 may define a second cavity portion 126 (e.g., above the first cavity portion 116 along the corresponding inner cavity wall 124 of second mold segment 120). As shown, each inner cavity wall 114, 124 may be generally open to the ambient environment when ice press 100 is in the receiving position and enclosed or otherwise restricted from user view and access when ice press 100 is in the sculpted position.

[0029] A first mating surface 118 may be defined on a top end of first mold segment 110 and a second mating surface 128 may be defined on a bottom end of second mold segment 120 (e.g., such that second mating surface generally faces downward toward first mating surface 118 along the axial direction A). Mating surfaces 118, 128 generally join corresponding outer sidewalls 112, 122 and inner cavity walls 114, 124. In particular, mating surfaces 118, 128 may extend along the radial direction R between the outer sidewall 112, 122 and the inner cavity wall 114, 124. For instance, first mating surface 118 of first mold segment 110 may extend in the radial direction R from the perimeter or outer radial extreme of inner cavity wall 114 to the corresponding outer sidewall 112. Second mating surface 128 of second mold segment 120 may extend in the radial direction R from the perimeter or outer radial extreme of inner cavity wall 124 to the corresponding outer sidewall 122.

[0030] Together, the mating surfaces 118, 128 may be formed as complementary surfaces to contact each other (e.g., in the sculpted position). In addition, according to the illustrated exemplary embodiment, mating surface 118, 128 are defined approximately at a midpoint or equator of mold body 106 along the axial direction A, e.g., such that two hemispheres (i.e., mold halves or segments 110, 120) are defined. However, it should be appreciated the shape, position, and relative sizes of mold segments 110, 120 may vary while remaining within the scope of the present subject matter.

[0031] It is generally understood that mold body 106 may be formed from any suitable material. For instance, one or more portions (e.g., inner cavity walls 114, 124) may be formed from a conductive metal, such as aluminum, stainless, steel, or copper (including alloys thereof). Optionally, one or more portions of mold body 106 may be integrally formed (e.g., as unitary monolithic members). As an example, inner cavity wall 114 of first mold segment 110 may be integrally formed within one or both of first mating surface 118 and outer sidewall 112. As an additional or alternative

example, inner cavity wall 124 of second mold segment 120 may be integrally formed with one or both of mating surface 128 and outer sidewall 122.

[0032] Generally, the sculpted ice nugget 104 will be shaped within and conform to mold cavity 108 along the inner cavity walls 114, 124. The resulting sculpted ice nugget 104 is therefore a solid unitary ice piece that is shaped according to the shape or profile of inner cavity walls 114, 124 (e.g., in the sculpted position). Thus, the adjoined inner cavity walls 114, 124 (i.e., in the sculpted position) and cavity portions 116, 126 may define the ultimate shape or profile of sculpted ice nugget 104.

[0033] In some embodiments, one or both of cavity portions 116, 126 are hemispherical voids. For instance, first cavity portion 116 may be a lower hemispherical void and second cavity portion 126 may be an upper hemispherical portion. Together, the cavity portions 116, 126 may thus define mold cavity 108 and thereby sculpted ice nugget 104 as a sphere. Optionally, each hemispherical void may have a diameter that is greater than two inches. According to other exemplary embodiments, mold cavity 108 may be a sphere of approximately 3 inches in diameter, or larger. Nonetheless, it is understood that any other suitable shape (e.g., a geometric cube, polyhedron, etc.) or profile may be provided. Moreover, it is further understood that additional or alternative embodiments may provide a predefined embossing or engraving along one or more of the inner cavity walls 114, 124 to direct the shape or profile of sculpted ice nugget 104.

[0034] As illustrated, the mold segments 110, 120 can be selectively separated or moved relative to each other (e.g., as desired by user). For instance, second mold segment 120 may be movably positioned above first mold segment 110 along the axial direction A. When assembled, second mold segment 120 may thus move (e.g., slide or pivot) up and down along the axial direction A. In particular, second mold segment 120 may move and alternate between the sculpted position (e.g., FIGS. 1 and 2) and the receiving position (e.g., FIGS. 3 and 4).

[0035] In the sculpted position, mold cavity 108 is generally enclosed, such that access to mold cavity 108 is restricted. Moreover, second mold segment 120 may be supported or rest on first mold segment 110. In some such embodiments, a lower portion of second mold segment 120 contacts (e.g., directly or indirectly contacts) an upper portion of first mold segment 110. For instance, first mating surface 118 may

directly contact second mating surface 128, e.g., such that mating surfaces 118, 128 are seated against each other. In the sculpted position, both cavity portions 116, 126 may be aligned (e.g., in the axial direction A and the radial direction R) in mutual fluid communication. The unified mold cavity 108 may furthermore be enclosed by the cavity portions 116, 126 (e.g., at the inner cavity walls 114, 124 defining first cavity portion 116 and second cavity portion 126, respectively).

[0036] In contrast to the sculpted position, mold cavity 108 is generally open in the receiving position. For instance, discrete portions 116, 126 of mold cavity 108 may be separated from each other such that a void or gap is defined (e.g., in the axial direction A) between first mold segment 110 and second mold segment 120. Access to mold cavity 108 may thus be permitted. Moreover, as illustrated in FIG. 3, the initial ice billet 102 (being larger in volume than the volume of the enclosed mold cavity 108) may be placed on mold body 106. Specifically, the initial ice billet 102 may be placed on an upper portion of first mold segment 110 or within the void or gap defined between first mold segment 110 and second mold segment 120. If a reshaping operation has already been performed (e.g., the initial ice billet 102 has been reshaped as the sculpted ice nugget 104), the sculpted ice nugget 104 may be accessed at the receiving position, as illustrated in FIG. 4.

[0037] In certain embodiments, the movement of second mold segment 120 relative to first mold segment 110 is guided by one or more attachment features. For instance, as shown in the exemplary embodiments of FIGS. 3 through 5, one or more complementary structural guide rail-sleeve pairs 130 may be defined between first mold segment 110 and second mold segment 120 on mold body 106. Such structural guide rail-sleeve pairs 130 each include a mated structural guide rail 132 and structural sleeve 134 within which the structural guide rail 132 may slide. Each structural guide rail-sleeve pair 130 may extend parallel to the axial direction A to guide or facilitate the sliding of second mold segment 120 relative to first mold segment 110 along the axial direction A. Moreover, structural guide rail-sleeve pairs 130 may align the mold segments 110, 120 (e.g., as second mold segment 120 moves to the sculpted position). Optionally, the structural guide rail-sleeve pairs 130 may be freely separable (e.g., upward along the axial direction A), thereby permitting the complete removal of second mold segment 120 from first mold segment 110. Notably,

a wider variety of sizes of ice billet 102 may be accommodated between the mold segments 110, 120.

[0038] As shown, a handle 136 may be fixed to second mold segment 120 (e.g., at a top portion thereof), allowing a user to easily grab or lift second mold segment 120. In some such embodiments, the lifting force necessary to move second mold segment 120 upward (e.g., from the sculpted position to the receiving position) can be selectively provided, at least in part, by a user. A closing force necessary to move second mold segment 120 downward (e.g., from the receiving position to the sculpted position) may be provided, at least in part, by gravity.

[0039] Although the figures illustrate two manual sliding structural guide rail-sleeve pairs 130. It is understood that any other suitable alternative arrangement may be provided for connecting and guiding movement between first mold segment 110 and second mold segment 120. As an example, three or more sliding structural guide rail-sleeve pairs 130 may be provided. As an additional or alternative example, one or more motors (e.g., linear actuators) may be provided to motivate or assist relative movement of the mold segments 110, 120. As yet another additional or alternative example, a multi-axis pivot assembly (e.g., having at least two parallel rotation axes) may connect second mold segment 120 to first mold segment 110 and permit rotational as well as axial movement.

[0040] As shown in FIG. 1, ice press 100 may further include a power cord 140 which is electrically coupled with a power supply 142. As explained in more detail below, power supply 142 may provide the electrical power necessary for energizing one or more heating elements to heat mold body 106. Although a single power cord 140 is illustrated, it should be appreciated that ice press 100 may include any other suitable number and configuration of electrical connections for energizing one or more heaters.

[0041] Specifically, turning now generally to FIGS. 5 through 8, ice press 100 includes one or more electric heating elements or electric heaters 144 that is/are disposed within mold body 106 to generate heat during use (e.g., reshaping operations). Specifically, as shown, the electric heater(s) 144 is/are disposed within mold body 106 in conductive thermal engagement with mold cavity 108. Heat generated at the electric heater(s) 144 may thus be conducted through mold body 106

and to mold cavity 108 (e.g., through inner cavity walls 114, 124). FIGS. 5 and 6 respectively provide front and side cross-sectional views of one exemplary embodiment, including one configuration of heaters 144. It is noted that although these exemplary embodiments are explicitly illustrated, one of ordinary skill in the art would understand that additional or alternative embodiments or configurations may be provided to include one or more features of these examples (e.g., to include one or more additional heaters or configurations from those shown in FIGS. 5 through 8).

[0042] Generally, the electric heater(s) 144 are provided as any suitable electrically-driven heat generator. For instance, electric heating elements 144 may include one or more resistive heating elements. For example, positive thermal coefficient of resistance heaters that increase in resistance upon heating may be used, such as metal, ceramic, or polymeric PTC elements (e.g., such as electrical resistance heating rods or calrod heaters). Additionally or alternatively, it is understood that other suitable heating elements, such as a thermoelectric heating element, may be included with the electric heater(s) 144.

[0043] As shown in FIGS. 5 through 8, ice press 100 may define a plurality of cavities or heater chambers that are generally configured for receiving heating elements 144. In this regard, as illustrated, first mold segment 110 defines a first heater cavity 150 and second mold segment 120 defined a second heater cavity 152. First heater cavity 150 and second heater cavity 152 are generally configured for receiving one or more electric heaters 144. More specifically, according to the illustrated embodiment, ice press 100 includes a first annular heater 154 that is positioned within first heater cavity 150 and a second annular heater 156 that is positioned within second heater cavity 152. As explained in more detail below, the use of annular heaters 154, 156 provides for higher heating capacity, improved energy efficiency, and better temperature distribution within mold body 106. Thus, annular heaters 154, 156 have a specific geometry and configuration for improved operation of ice press 100.

[0044] As shown schematically in FIGS. 5 and 6, first annular heater 154 and second annular heater 156 are electrically coupled with power supply 142 through power cord 140. As power is supplied through first annular heater 154 and second annular heater 156, heat is generated to warm first mold segment 110 and second

mold segment 120, respectively. According to exemplary embodiments, first annular heater 154 and second annular heater 156 may be identical, such that an even temperature distribution is obtained throughout the mold body 106. Moreover, in the event a temperature imbalance or gradient occurs within mold body 106, first annular heater 154 and second annular heater 156 may be operated independently to regulate the temperature as desired, e.g., to eliminate such temperature imbalances.

[0045] Notably, the size, position, and configuration of annular heaters 154, 156 may be adjusted as needed for a given application to achieve the desired temperature distribution within mold cavity 108. In this regard, one exemplary geometry of first annular heater 154 will be described below. However, it should be appreciated that these geometries may vary and may be the same as or different than second annular heater 156 according to exemplary embodiments. As illustrated in FIGS. 5 and 6, first annular heater 154 may be annular or ring-shaped and may generally define an outer diameter 160 and an inner diameter 162, e.g., each of which is measured along the radial direction R when first annular heater 154 is positioned within first heater cavity 150. In addition, first annular heater 154 may define a heater thickness 164, e.g., measured along the axial direction A when first annular heater 154 is positioned within first heater cavity 150.

[0046] According to exemplary embodiments, first annular heater 154 may be centered along the axial direction A along with mold cavity 108 and may have an outer diameter 160 that is substantially equivalent or greater than a cavity diameter 170 of mold cavity 108, e.g., as measured along the radial direction R when mold body 106 is in the closed position. According to alternative exemplary embodiments, outer diameter 160 may be slightly larger than or smaller than cavity diameter 170, e.g., by about 10%, 20%, 30%, 40%, etc. In addition, according to an exemplary embodiment, inner diameter 162 of first annular heater 154 and second annular heater 156 may be less than or equal to cavity diameter 170.

[0047] In addition, first annular heater 154 may have a substantially constant ring thickness. In this regard, first annular heater 154 may define a diameter ratio of outer diameter 160 divided by inner diameter 162. According to exemplary embodiments of the present subject matter, the diameter ratio may be greater than about 1 and less than about 10. According still other embodiments diameter ratio may be between about 1.2

and 6, between about 1.4 and 5, between about 1.5 and 3, etc. In addition, first annular heater 154 may define an aspect ratio equal to heater thickness 164 divided by outer diameter 160. According to exemplary embodiments, the aspect ratio may be between about 0.1 and 1, between about 0.2 and 0.9, between about 0.3 and 0.7, between about 0.4 and 0.6, or about 0.5. Variations and modifications may be made to the size and position of first annular heater 154 while remaining within scope the present subject matter.

[0048] Referring now specifically to FIGS. 5 through 7, ice press 100 may include additional features that are positioned within a central passage 172 defined by first annular heater 154 and/or second annular heater 156. In this regard, for example, ice press 100 may include a thermal fuse 174 and a thermostat 176 that are positioned within central passage 172. Thermal fuse 174 and thermostat 176 may generally be configured for improving the operation of first annular heater 154 and second annular heater 156, e.g., to achieve the desired temperature distribution within mold body are remaining within safety limits. In this regard, for example, thermostat 176 may include one or more temperature measuring devices or temperature sensors (e.g., such as temperature sensors 192, 194 described below).

[0049] Turning now again to FIG. 6, in some embodiments, one or more portions of mold body 106 are tapered (e.g., radially inward). Such tapering may generally extend inward toward the mold cavity 108. As an example, the outer sidewall 112 of first mold segment 110 may be tapered from a lower portion of the first mold segment 110 to an upper portion of the first mold segment 110 (e.g., along the axial direction A from a receiving tray 180 to first mating surface 118). In some such embodiments, at least a portion of outer sidewall 112 thus forms a frusto-conical member having a larger diameter at the lower portion (e.g., distal to mold cavity 108) and a smaller diameter at the upper portion (e.g., proximal to mold cavity 108).

[0050] As an additional or alternative example, the outer sidewall 122 of second mold segment 120 may be tapered from an upper portion of the second mold segment 120 to a lower portion of the second mold segment 120 (e.g., along the axial direction A from the handle 136 to second mating surface 128). In some such embodiments, at least a portion of outer sidewall 122 thus forms a frusto-conical member having a

larger diameter at the upper portion (e.g., distal to mold cavity 108) and a smaller diameter at the lower portion (e.g., proximal to mold cavity 108).

[0051] In some embodiments, both outer sidewalls 112, 122 are formed as mirrored tapered bodies that converge, for instance, radially outward from mold body 106. Notably, extraneous portions of the initial ice billet 102 (FIG. 3) that are not needed for the mass of the sculpted ice nugget 104 (FIG. 4) may be readily separated from billet 102 (e.g., as shaved ice chunks) and directed away from mold cavity 108. Moreover, the tapered form may advantageously concentrate the heat directed towards the ice billet 102 (e.g., radially outward from the cavity portions 116, 126).

[0052] In optional embodiments, a receiving tray 180 is provided on first mold segment 110 (e.g., below mold cavity 108). For example, receiving tray 180 may be attached to or formed integrally with first mold segment 110 at a lower portion thereof. As shown, receiving tray 180 extends radially outward from, for instance, outer sidewall 112. Moreover, receiving tray 180 may form a circumferential channel 182 about mold body 106. During use, extraneous portions of the initial ice billet 102 (FIG. 3) may thus accumulate within the circumferential channel 182 of receiving tray 180 (e.g., as water or separated ice chunks), instead of the counter or surface on which ice press 100 is supported.

[0053] Referring to FIGS. 1 and 6, in certain embodiments, one or more water channels 184, 186 are defined through mold body 106. Such water channels 184, 186 may be in fluid communication with mold cavity 108 and generally permit melted water to flow therefrom (e.g., from an outer sidewall 112, 122 to the ambient environment and, subsequently, receiving tray 180). Moreover, in comparison to the diameter of mold body 106, the diameter of water channels 184, 186 through which water passes may be relatively small (e.g., about $1/16^{\text{th}}$ of an inch).

[0054] In some embodiments, a first mold segment 110 defines a lower water channel 184 that extends in fluid communication between inner cavity wall 114 and outer sidewall 112. For instance, the lower water channel 184 may extend from the first cavity portion 116 (e.g., at an axially lowermost portion thereof) and to the outer sidewall 112. As ice within the first cavity portion 116 melts to liquid water, at least a portion of that water may thus pass from the first cavity portion 116, through the lower water channel 184, and to the ambient environment (e.g., toward the receiving

tray 180). Notably, melted water may be readily exhausted from below mold cavity 108, permitting contact to be maintained between inner cavity wall 114 and the ice thereabove as it is melted.

[0055] In additional or alternative embodiments, a second mold segment 120 defines an upper water channel 186 that extends in fluid communication between inner cavity wall 124 and outer sidewall 122. For instance, the upper water channel 186 may extend from the second cavity portion 126 (e.g., at an axially uppermost portion thereof) and to the outer sidewall 122. As ice within the second cavity portion 126 melts to liquid water, at least a portion of that water may thus pass from the second cavity portion 126, through the upper water channel 186, and to the ambient environment (e.g., toward the receiving tray 180). Notably, melted water may be readily exhausted from above mold cavity 108, permitting contact to be maintained between inner cavity wall 124 and the ice therebelow as it is melted.

[0056] Generally, operation of the heater(s) 144 may be directed by a controller 190 in operative communication (e.g., wireless or electrical communication) therewith. Controller 190 may include a memory (e.g., non-transitive media) and microprocessor, such as a general or special purpose microprocessor operable to execute programming instructions or micro-control code associated with a selected heating level, operation, or cooking cycle. The memory may represent random access memory such as DRAM, or read only memory such as ROM or FLASH. In one embodiment, the processor executes programming instructions stored in memory. The memory may be a separate component from the processor or may be included onboard within the processor. Alternatively, controller 190 may be constructed without using a microprocessor (e.g., using a combination of discrete analog or digital logic circuitry, such as switches, amplifiers, integrators, comparators, flip-flops, AND gates, and the like) to perform control functionality instead of relying upon software.

[0057] In certain embodiments, one or more temperature sensors 192, 194 (e.g., thermistors, thermocouples, dielectric switches, etc.) are provided on or within mold body 106 (e.g., in thermal communication with mold cavity 108). Moreover, such temperature sensors 192, 194 may be in operative communication (e.g., wired electrical communication) with controller 190. In some embodiments, a base temperature sensor 192 is mounted within first mold segment 110. In additional or

alternative embodiments, a top temperature sensor 194 is mounted within second mold segment 120.

[0058] In certain embodiments, the controller 190 is configured to activate, deactivate, or adjust the heaters 144 (i.e., first annular heater 154 and second annular heater 156) based on temperature detected at the sensor(s) 192, 194 or via thermostat 176. As an example, a predetermined temperature threshold value or range may be provided (e.g., at controller 190) to prevent overheating of first annular heater 154 and second annular heater 156. If a detected temperature at sensor 192 or 194 is determined to exceed the threshold value or range, first annular heater 154 and/or second annular heater 156 may be deactivated or otherwise restricted in heat output. If a subsequent detected temperature at sensor 192 or 194 is determined to fall below or within the threshold value or range, first annular heater 154 and/or second annular heater 156 may be reactivated or otherwise increased in heat output. Optionally, deactivation-reactivation may be repeated continuously (e.g., as a closed feedback loop) during operation of ice press 100. Notably, excessive temperatures at the mold body 106 may be prevented (e.g., when mold body 106 is not in contact with ice or when a reshaping operation for a sculpted nugget 104 is complete). Moreover, although one example of heat control and adjustment using a threshold value or range is explicitly described, it is noted any suitable configuration may further be provided (e.g., within controller 190).

[0059] Advantageously, the described embodiments of ice press 100 may rapidly and evenly heat ice billet 102 (FIG. 3) from opposite axial ends as mold body 106 is guided to the sculpted position. Moreover, the press 100 may advantageously be reused multiple times without requiring any interruption to use (e.g., other than removing a sculpted ice nugget 104 from first cavity portion 116 and placing a new ice billet 102 between the mold segments 110, 120). Furthermore, relatively little of material may be required for such rapid and repeated ice shaping. In addition, the heating of the entire mold body 106 may be achieved with a single electrical supply cord.

[0060] This written description uses examples to disclose the invention, including the best mode, and also to enable any person skilled in the art to practice the invention, including making and using any devices or systems and performing any incorporated

methods. 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 include structural elements that do not differ from the literal language of the claims, or if they include equivalent structural elements with insubstantial differences from the literal languages of the claims.

WHAT IS CLAIMED IS:

1. An electric ice press defining an axial direction, the electric ice press comprising:
a mold body comprising a first mold segment and a second mold segment, the first mold segment and the second mold segment being movable relative to each other along the axial direction and defining a mold cavity, the first mold segment defining a heater cavity; and
an annular heater positioned within the heater cavity for heating the first mold segment.
2. The electric ice press of claim 1, wherein the annular heater defines an outer diameter and the mold cavity defines a cavity diameter, wherein the outer diameter is greater than or equal to the cavity diameter.
3. The electric ice press of claim 1, wherein the annular heater defines an inner diameter and the mold cavity defines a cavity diameter, wherein the inner diameter is less than or equal to the cavity diameter.
4. The electric ice press of claim 1, wherein the annular heater defines an outer diameter, an inner diameter, and a diameter ratio of the outer diameter divided by the inner diameter, wherein the diameter ratio is between about 1 and 3.
5. The electric ice press of claim 4, wherein the diameter ratio is between about 1.5 and 4.
6. The electric ice press of claim 1, wherein the annular heater defines an outer diameter, a heater thickness, and an aspect ratio equal to the heater thickness divided by the outer diameter, wherein the aspect ratio is between about 0.4 and 0.8.
7. The electric ice press of claim 6, wherein the aspect ratio is greater than 0.5.

8. The electric ice press of claim 1, wherein the annular heater defines a central passage, the electric ice press further comprising:

a thermal fuse and a thermostat positioned within the central passage.

9. The electric ice press of claim 1, wherein the heater cavity is a first heater cavity, the annular heater is a first annular heater, the second mold segment defines a second heater cavity, and the electric ice press further comprises:

a second annular heater positioned within the second heater cavity for heating the second mold segment.

10. The electric ice press of claim 9, wherein the first annular heater and the second annular heater are identical.

11. The electric ice press of claim 1, wherein the annular heater is a ceramic heater.

12. The electric ice press of claim 1, further comprising:

a guide rail extending from the first mold segment toward the second mold segment along the axial direction; and

a sleeve defined within the second mold segment for slidably receiving the guide rail.

13. The electric ice press of claim 1, wherein the first mold segment defines a first cavity portion of the mold cavity and the second mold segment defines a second cavity portion of the mold cavity, wherein the first cavity portion is an upper hemispherical void, and wherein the second cavity portion is a lower hemispherical void.

14. An electric ice press defining an axial direction, the electric ice press comprising:

a mold body comprising a first mold segment and a second mold segment, the first mold segment and the second mold segment being movable relative to each other along the axial direction and defining a mold cavity, the first mold segment defining a first heater cavity and the second mold segment defining a second heater cavity;

a first annular heater positioned within the first heater cavity for heating the first mold segment; and

a second annular heater positioned within the second heater cavity for heating the second mold segment.

15. The electric ice press of claim 14, wherein each of the first annular heater and the second annular heater defines an outer diameter and the mold cavity defines a cavity diameter, wherein the outer diameter is greater than or equal to the cavity diameter.

16. The electric ice press of claim 14, wherein each of the first annular heater and the second annular heater defines an inner diameter and the mold cavity defines a cavity diameter, wherein the inner diameter is less than or equal to the cavity diameter.

17. The electric ice press of claim 14, wherein each of the first annular heater and the second annular heater defines an outer diameter, an inner diameter, and a diameter ratio of the outer diameter divided by the inner diameter, wherein the diameter ratio is between about 1 and 5.

18. The electric ice press of claim 14, wherein each of the first annular heater and the second annular heater defines an outer diameter, a heater thickness, and an aspect ratio equal to the heater thickness divided by the outer diameter, wherein the aspect ratio is between about 0.4 and 0.8.

19. The electric ice press of claim 14, wherein the first annular heater and the second annular heater are identical.

20. The electric ice press of claim 14, wherein each of the first annular heater and the second annular heater is a ceramic heater.

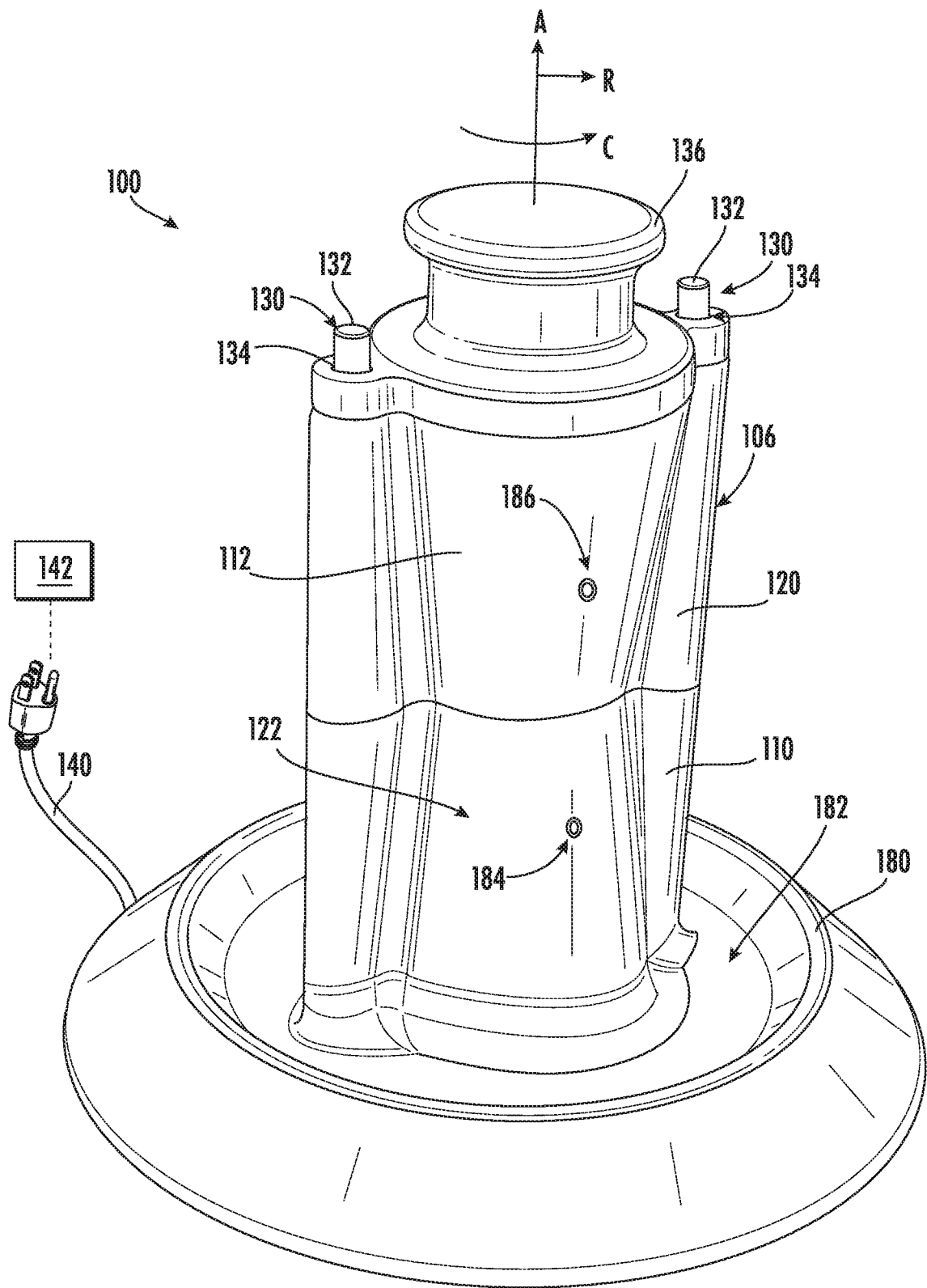
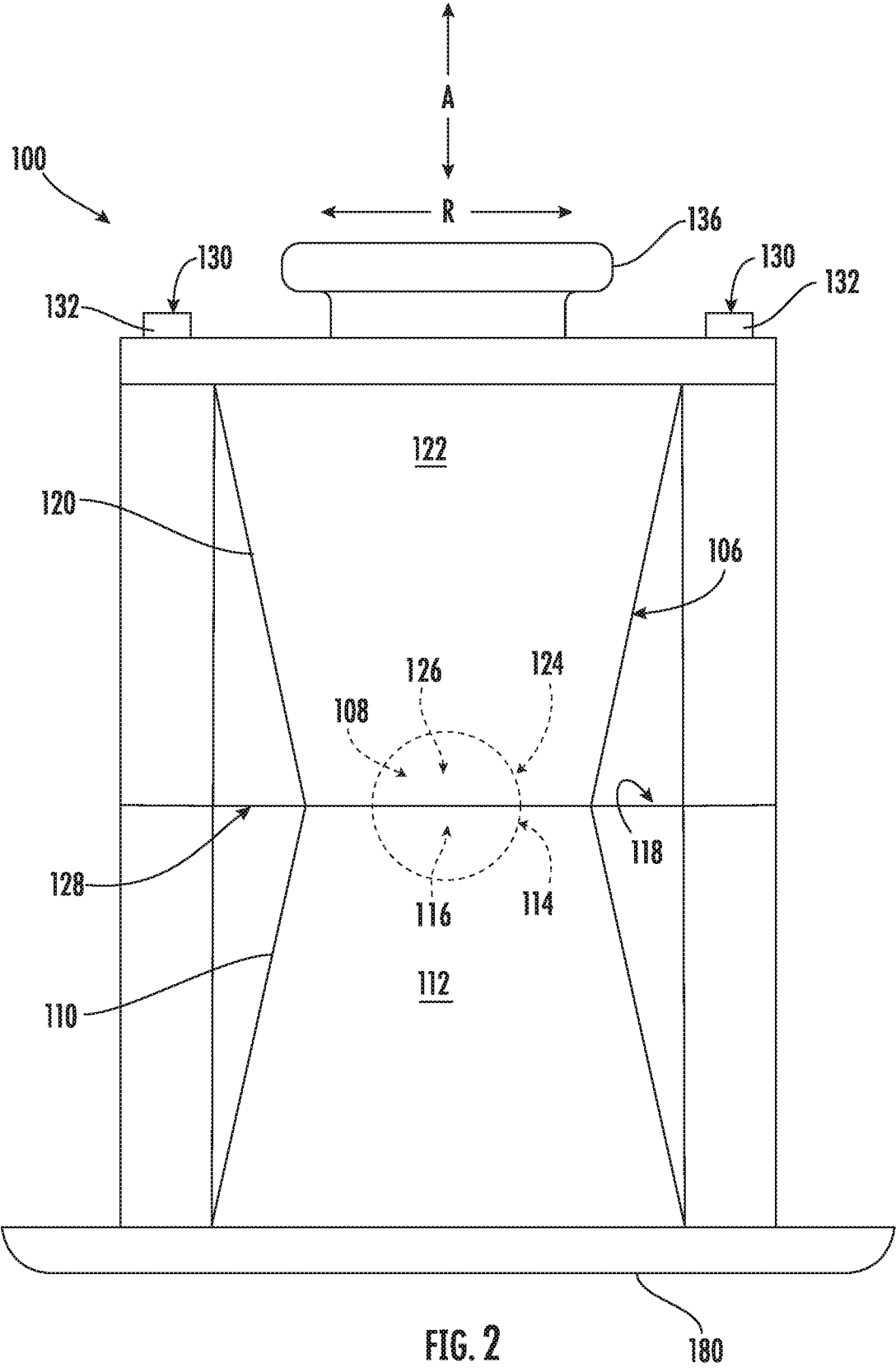
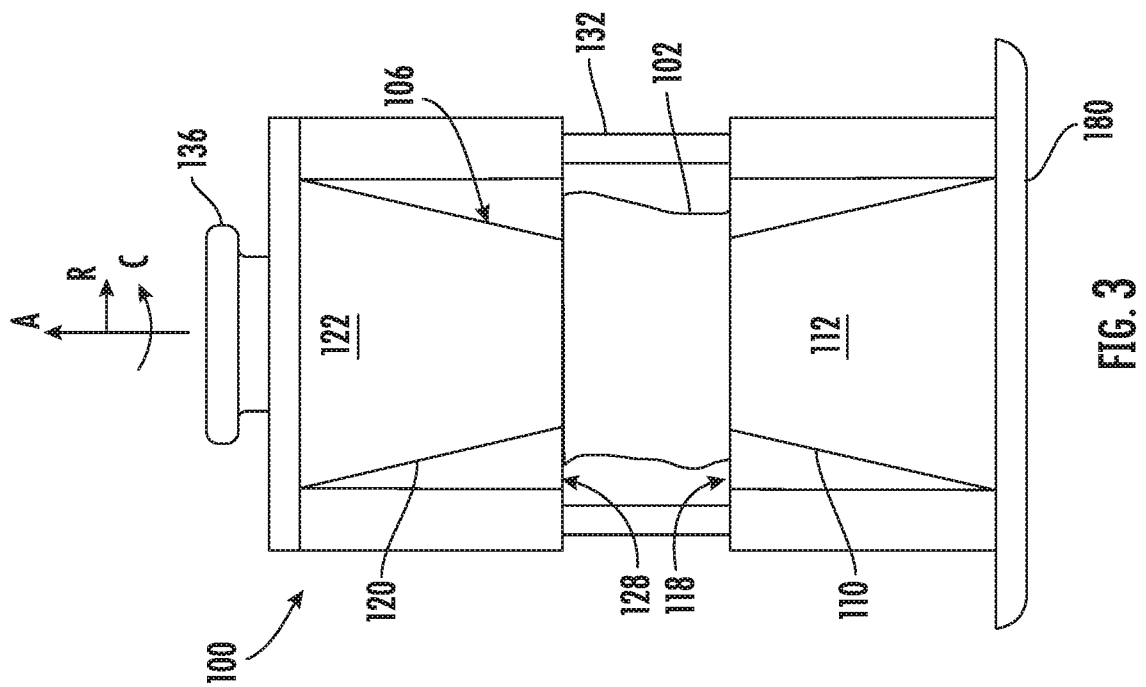
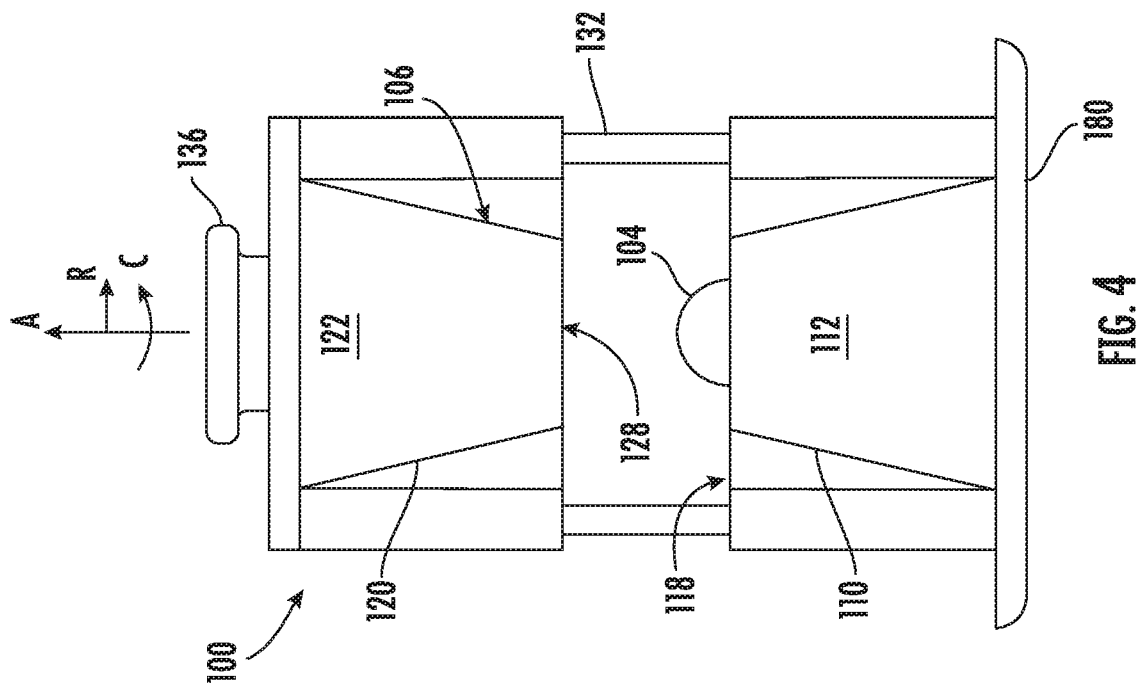


FIG. 1





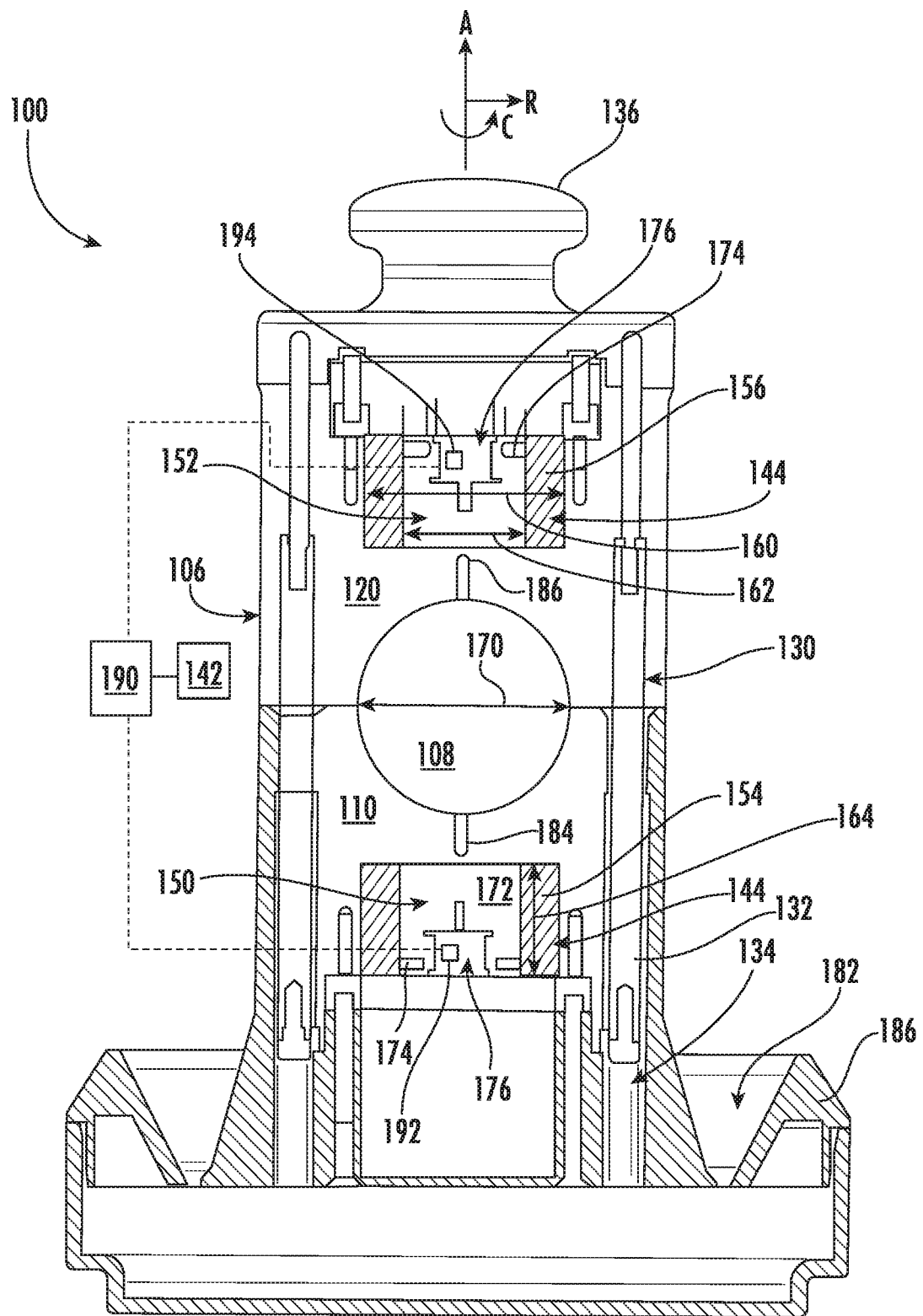


FIG. 5

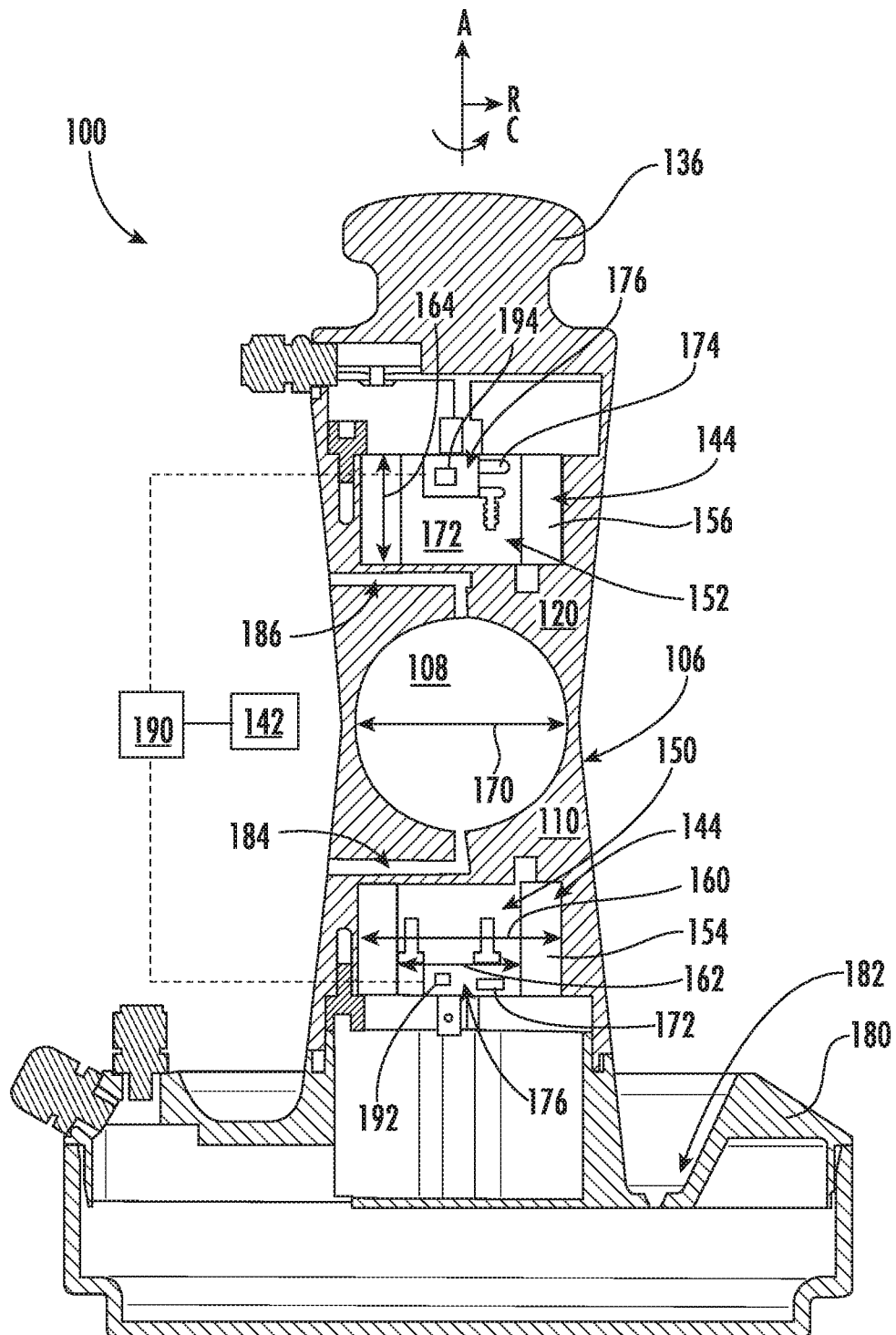


FIG. 6

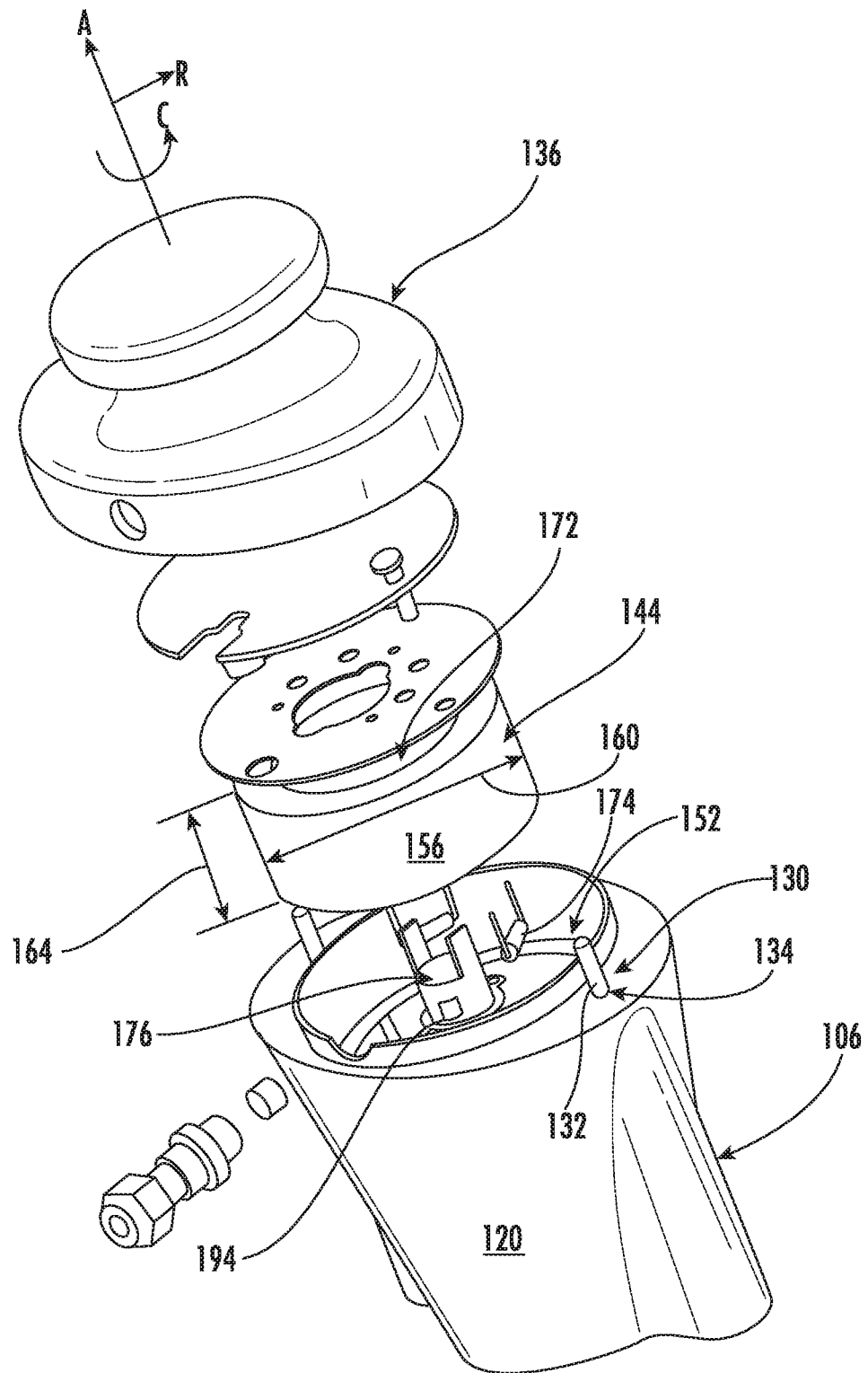


FIG. 7

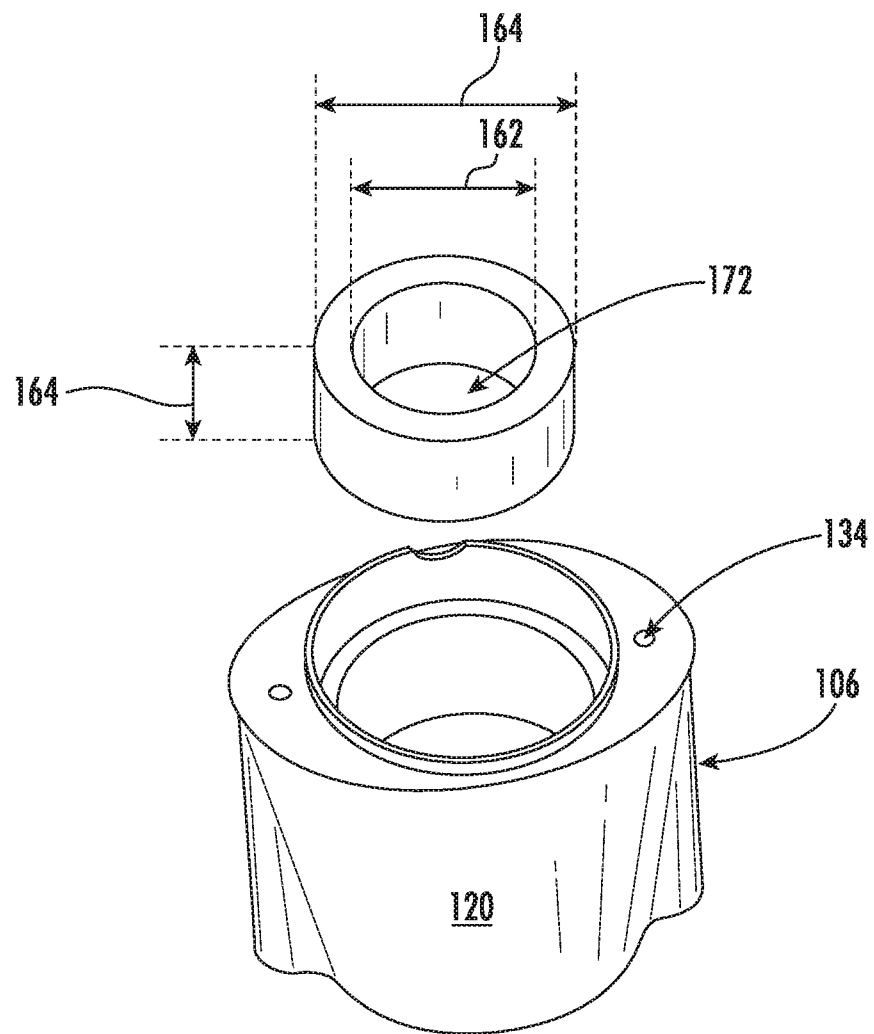


FIG. 8

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2020/128637

A. CLASSIFICATION OF SUBJECT MATTER

F25C 5/14(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

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

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

CNABS,CNTXT,TWABS,DWPI,SIPOABS,CNKI: HAIER, YANBo, ice, press+, mold?, heat+, ceramic, annular,ring, sleeve, sensor?, shap+

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 2019264970 A1 (HAIER US APPLIANCE SOLUTIONS, INC.) 29 August 2019 (2019-08-29) description, paragraphs [0021]-[0055], figures 1-6	1-20
Y	CN 205718125 U (ZHEJIANG JINHUA WEIDA COSMETIC PACKAGING) 23 November 2016 (2016-11-23) description, paragraph [0013], figure 1	1-20
Y	CN 211782140 U (ANHUI FUDA ELECTROMECHANICAL TECHNOLOGY) 27 October 2020 (2020-10-27) description, paragraphs [0020]-[0026], figures 1-6	1-20
A	CN 211650851 U (LV, Li) 09 October 2020 (2020-10-09) the whole document	1-20
A	CN 211526790 U (JIANGSU FOCUSUN REFRIGERATION TECHNOLOGY) 18 September 2020 (2020-09-18) the whole document	1-20
A	KR 20090118500 A (유홍상) 18 November 2009 (2009-11-18) the whole document	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

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“E” earlier application or patent but published on or after the international filing date

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“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

23 July 2021

Date of mailing of the international search report

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2020/128637

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CN	211782140	U	27 October 2020	None	
CN	211650851	U	09 October 2020	None	
CN	211526790	U	18 September 2020	None	
KR	20090118500	A	18 November 2009	None	