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- (54) Title: NATURALLY REFRIGERATED COOLER AND ICE BIN

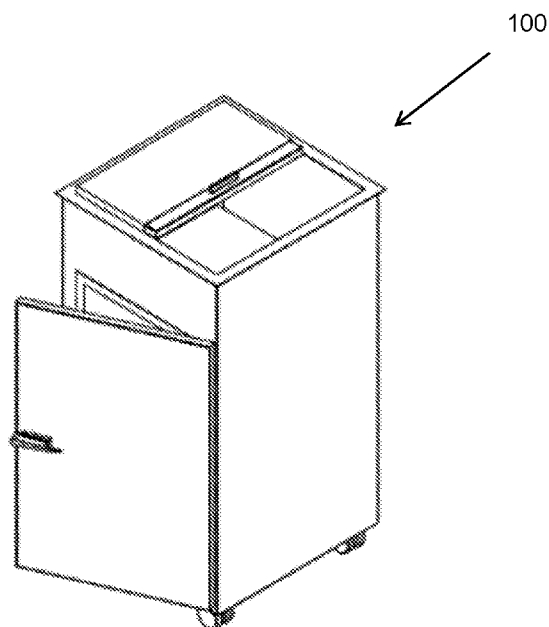


FIG. 1

- (57) Abstract: An apparatus, system and method for natural refrigeration comprising a naturally refrigerated cooler and ice bin containing an ice bin with a refrigerator compartment suspended within it. The ice bin and cooler compartment are configured such that when ice cubes and the resulting cold water are loaded into the ice bin, the ice cubes and resulting cold water surround the refrigerator compartment and act to remove heat from inside the refrigerator compartment.

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Naturally Refrigerated Cooler and Ice Bin

RELATED APPLICATIONS

[0001] This application claims the benefit of priority of United States Provisional Patent Application No. 61/902,639, filed November 11, 2013, which is hereby incorporated by reference in its entirety.

BACKGROUND OF INVENTION

[0002] Refrigerated coolers, refrigerators, coolers or other similar apparatus are commonly used to keep food and beverages cold for storage prior to being used and/or consumed. Such refrigerators or refrigerated coolers are commonly employed in restaurants, bars, pubs, fast food establishments, concessions, convenience stores, kiosks, boats, recreational vehicles, portable concession carts, residential households, outdoor kitchens, and the like. However, conventional refrigerated coolers or refrigerators rely on electrical components and gases to facilitate the cooling process and to maintain a constant temperature in the ambient range to keep food products and beverages cold. This reliance on electrical components and gases limits their use geographically to locations where electricity is available and also creates an environmental burden.

[0003] Conventional portable coolers, ice boxes, ice chests and like portable cooling apparatus are typically configured as a simple insulated container. Ice cubes or gel packs are commonly employed inside of such insulated containers to facilitate cooling of the items as well as maintain cold temperatures. Portable coolers, or ice chests, are typically used at picnics, campsites, recreational vehicles, boats, outdoor events, outdoor cooking events or any other areas in need of refrigeration but without readily available electricity. However, conventional portable coolers are an impractical substitute for conventional refrigerated coolers in commercial applications.

[0004] Conventional ice bins, insulated ice wells or ice well coolers typically employ either insulated or non-insulated boxes, sinks or coolers to store and dispense ice cubes for use in beverages or other food and beverage related purposes. Ice bins are commonly used in bars, pubs, restaurants, kiosks, concessions, convenience stores, portable concession carts and the like for the purpose of food or beverage service. However, their functionality is conventionally limited to the provision of service ice.

[0005] Accordingly, a need exists for an integrated naturally refrigerated cooler and ice bin to provide a refrigerated cooler and service ice bin without the use of conventional electrical refrigeration components or gases.

SUMMARY

[0006] It is to be understood that this summary is not an extensive overview of the disclosure. This summary is exemplary and not restrictive, and it is intended to neither identify key or critical elements of the disclosure nor delineate the scope thereof. The sole purpose of this summary is to explain and exemplify certain concepts of the disclosure as an introduction to the following complete and extensive detailed description.

[0007] In certain exemplary aspects, the present disclosure describes a naturally refrigerated cooler and ice bin designed to provide a refrigerated cooler as well as a service ice bin without the use of conventional electrical refrigeration components or gases. In certain further aspects, the naturally refrigerated cooler and ice bin can be an all-in-one unit that utilizes ice cubes loaded into an ice bin as the coolant method for the refrigerated cooler.

[0008] In other aspects, the present disclosure provides for a large vertical ice bin with a refrigerator compartment. Here, the refrigerator compartment can be used as the refrigerated cooler and can be suspended inside the lower portion of this large ice bin. It is contemplated that the ice bin and refrigerator compartment can be designed such that ice cubes, and the resulting cold water from the melting of the ice cubes, surround the refrigerator compartment from all sides with the exception of the front. In a further aspect, the front side of the refrigerator compartment can be used to access the items inside through the use of an insulated access door. In light of the present disclosure, one skilled in the art will appreciate that heat from within the refrigerator compartment can be transferred through the refrigerator compartment walls via thermal contact with the ice cubes and cold water. Thus, natural cold water convection moves heat from the refrigerator compartment through the refrigerator compartment walls to the ice cubes and cold water surrounding the refrigerator compartment and, finally, to the top of the ice bin.

[0009] In other aspects, the refrigerator compartment can be constructed of a highly thermally conductive material to facilitate the thermal conductivity of the refrigerator compartment to the ice cubes and cold water surrounding it. In a further aspect, the refrigerator compartment can be accessed through a front door similar to a conventional

refrigerator. Here, it is contemplated that the front door can be also insulated to provide a thermal barrier and sealed using a gasket. In further aspects, the refrigerator compartment can contain shelves or remain open in design.

[0010] In other aspects, the large ice chamber of the ice bin can be located vertically above the refrigerator compartment. This ice bin can be top loading with direct access to the top, back, right and left side of the inner compartment cooler. The inner compartment can be also suspended from the bottom of the ice bin providing a reservoir underneath the refrigerator compartment with direct access to the left, right and back side of the ice bin.

[0011] In other aspects, the outer ice bin walls (*i.e.*, the entire exterior of the unit) can be double walled and insulated to provide a thermal barrier to restrict heat loss from the ice bin. In even further aspects, materials used for the walls can include, for example and without limitation, 304 Stainless Steel, molded plastic, steel (outer wall only), galvanized steel (outer wall only), vinyl-lined aluminum or other suitable material used to provide a thermally insulated barrier as well as waterproof structure.

[0012] In other aspects, a sliding, removable or flip up door can be used to access the top of the ice bin. It is contemplated that the ice bin top access door can be or can not be insulated. In other aspects, the top of the ice bin can include, for example and without limitation, a draft tower with drain collection pan, cold water dispensing unit, cold drain pan tray, or the like.

[0013] In other aspects, a valve can be located at the bottom of the unit and can be used to discharge the water from the ice bin. Such a valve can be hooked up to external plumbing or simply used as a dump valve. In further aspects, the valve can comprise, for example and without limitation, a ball joint valve, a gate valve, a tee valve or any other valve device operable to restrict water in external or internal plumbing.

[0014] In other aspects, it is contemplated that condensation from within the refrigerator compartment can be directed through a drain from within the refrigerator compartment and plumbed to the valve located on the outside of the unit. In an additional or alternate embodiment, it is contemplated that the condensation from the refrigerator compartment can be directed to a water reservoir located within or connected to the ice bin.

[0015] In other aspects, a draft (or draught) version of a naturally refrigerated cooler and ice bin is contemplated and comprises a draft tower with draft lines that can be inserted

through the top of the refrigerator compartment, upwards through the top of the ice bin to a draft tower and dispensing faucet. In a further aspect, the draft tower and dispensing faucet can be located either on top or on the top side of the ice bin. In a further aspect, the draft lines can be fed through a draft line tube constructed of a highly thermally conductive material and into the draft tower. It is contemplated that the draft line tube can be in direct contact with the ice cubes and cold water inside of the ice bin. In light of the present disclosure, one skilled in the art will appreciate that heat from the beverage, lines, surrounding air and draft line tube can be thermally transferred into the ice bin. Accordingly, the present disclosure provides an apparatus and system that can be used to cool the draft lines for an optimal direct draw draft system. Here, the liquid (or beverage) can be stored in kegs, boxes, liter cylinders or the like. It is further contemplated that these items can be stored inside the refrigerator compartment and linked through draft lines to the draft tower and faucet through the above-mentioned draft line tube. Such a draft version of a naturally refrigerated cooler and ice bin can be used to store and dispense beer, wine, cocktail or any other beverage served through a draft tower.

[0016] In other aspects, a cold plate can be provided on the top of the refrigerator compartment, inside of the ice bin in order to enable the use of a soda system or any other beverage system that utilizes a cold plate cooling design.

[0017] In other aspects, a cold water dispenser can be provided in the naturally refrigerated cooler and ice bin. It is contemplated that the cold water dispenser comprises a hand pump, a pressure chamber, an in-line filter, a water line and a dispensing means. In a further aspect, the water line is configured to take water from the bottom of the ice bin, filter it through an in-line filter, and dispense the cold water from the top or the side of the ice bin. It is contemplated that a hand pump will provide the necessary pressure to pull the water through the water lines and filter to the dispensing unit.

[0018] In a further aspect, the present disclosure provides for a naturally refrigerated cooler with ice bin configured to be an environmentally friendly and energy saving appliance. The naturally refrigerated cooler and ice bin of the present disclosure does not utilize power or gas related refrigeration components. In a further aspect, the present disclosure provides an ergonomic, space-saving, multipurpose design such that the naturally refrigerated cooler with ice bin can provide many years of trouble-free service.

[0019] In a further aspect, it is contemplated that the naturally refrigerated cooler with ice bin can be provided in many sizes, configurations and designs such as, for example and without limitation, a free standing rolling design, a slip-in design similar to a conventional stove/oven, a drop-in counter design and the like.

[0020] In further aspects, it is contemplated that the naturally refrigerated cooler with ice bin can be adapted for many applications such as, for example and without limitation, restaurants, fast food establishments, bars, pubs, coffee houses, concessions, convenience stores, gas stations, kiosks, portable concession carts, recreational vehicles, outdoor kitchens, residential kitchens, poolside, events, tradeshow, convention booths or virtually any place, portable or fixed, that requires refrigeration.

[0021] Additional features and advantages of exemplary implementations of the invention will be set forth in the description which follows, and in part will be obvious from the description, or may be learned by the practice of such exemplary implementations. The features and advantages of such implementations may be realized and obtained by means of the instruments and combinations particularly pointed out in the appended claims. These and other features will become more fully apparent from the following description and appended claims, or may be learned by the practice of such exemplary implementations as set forth hereinafter.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The accompanying drawings, which are incorporated in and constitute a part of this specification, illustrate aspects and together with the description, serve to explain the principles of the methods and systems.

[0023] Figure 1 illustrates a top perspective view of one exemplary implementation of a naturally refrigerated cooler and ice bin in a basic configuration (*i.e.*, an ice bin with a refrigerator compartment) in a free standing rolling design.

[0024] Figures 2A and 2B illustrate one exemplary implementation of a naturally refrigerated cooler and ice bin in a basic configuration (*i.e.*, an ice bin with a refrigerator compartment) in a free standing rolling design. Figure 2A is a side elevational view of the naturally refrigerated cooler and ice bin of Figure 1 and Figure 2B is a cross-sectional view of the naturally refrigerated cooler and ice bin taken across line A-A of Figure 2A showing the

refrigerator compartment, the inner ice bin space (or void) that can be filled with ice, and the insulated inner and outer ice bin walls.

[0025] Figures 3A and 3B illustrate one exemplary implementation of a naturally refrigerated cooler and ice bin in a basic configuration (*i.e.*, an ice bin with a refrigerator compartment) in a free standing rolling design. Figure 3A is a top elevational view of the naturally refrigerated cooler and ice bin of Figure 1 and Figure 3B is a cutout view of the naturally refrigerated cooler and ice bin taken across lines A-A of Figure 3A showing the refrigerator compartment, the inner and outer ice bin walls with insulation, and the refrigerated cooler door having a double wall with insulation. Insulation is indicated with hash lines.

[0026] Figures 4A-4C illustrate one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design. Figure 4A is a top elevational view of the naturally refrigerated cooler and ice bin, Figure 4B is a cutout view of the naturally refrigerated cooler and ice bin taken across lines A-A of Figure 4A, and Figure 4C is an enlarged view of a portion of the cutout view of Figure 4B. The cutout view shows a refrigerator compartment with support rails. In one aspect, the support rails can be used to support and suspend the refrigerator compartment from the bottom of the ice bin. The suspension rail design can also incorporate ports (or holes) that can allow water to freely pass under the refrigerator compartment between the rails. While Figures 4A and 4B exemplarily show two rails, it is anticipated that additional rails can be utilized depending on the size of the unit and the weight capacity desired in the refrigerator compartment.

[0027] Figure 5 illustrates a partial cutaway view of one exemplary implementation of a naturally refrigerated cooler and ice bin in a basic configuration (*i.e.*, an ice bin with a refrigerator compartment) in a free standing rolling design. This view shows a refrigerator compartment and a drain located at the bottom of the ice bin below the refrigerator compartment. In certain aspects, this drain can be either 1 ½ inch or 2 inch depending on application. Such a drain assembly can be configured to extend through the bottom of the inner ice bin wall, through the insulation and exit through the outer ice bin wall. In other aspects, this drain can be threaded to receive an elbow and a drain valve such as, but not limited to, agate valve, a ball joint valve, a tee valve or the like. In an even further aspect, the drain can be seated in a water tight epoxy in order to form a permanent seal.

[0028] Figure 6 illustrates a front side elevational view of one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design.

[0029] Figure 7 illustrates a side elevational view of one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design.

[0030] Figure 8 illustrates a top elevational view of one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design.

[0031] Figure 9 illustrates an top perspective view of one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design.

[0032] Figures 10A-10C illustrate a one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design. Figure 10A is a top elevational view of the naturally refrigerated cooler and ice bin, Figure 10B is a cutout view of the naturally refrigerated cooler and ice bin taken across lines A-A of Figure 10A, and Figure 10C is an enlarged view of a portion of the cutout view of Figure 10B. The draft line tube can penetrate the top of the refrigerator compartment and can be sealed with a gasket and inner/outer flange design. This can create a water tight seal and can allow draft lines to be run freely from the inside of the refrigerator compartment to the draft tower located on top of the ice bin. In another aspect, the draft line tube can be constructed of a thermally conductive material (*e.g.* aluminum) and can be positioned in direct contact with the ice cubes inside of the ice bin. In another aspect, the draft line tube can be configured to continue up inside of the draft tower prior to the connector to the draft tower faucet. In another aspect, the draft line tube can be used to keep the draft line and liquid in the lines cold, resulting in a cooled direct draw draft configuration.

[0033] Figure 11 illustrates an top perspective view of one exemplary aspect of a naturally refrigerated cooler and ice bin in a cold plate configuration (*i.e.*, an ice bin with refrigerator compartment having a cold plate installed on top of the refrigerator compartment in direct contact with the ice). In this aspect, tube connectors can be provided on the outside of the ice

bin, each tube connector providing a connection point through which to run a single supported soda type through the cold plate.

[0034] Figures 12A and 12B illustrate one exemplary aspect of a naturally refrigerated cooler and ice bin in a cold plate configuration (*i.e.*, an ice bin with refrigerator compartment having a cold plate installed on top of the refrigerator compartment in direct contact with the ice). Figure 12A is a side elevational view of the naturally refrigerated cooler and ice bin and Figure 12B is a cross-sectional view of the naturally refrigerated cooler and ice bin taken across line A-A of Figure 12A.

[0035] Figure 13 illustrates a partially transparent perspective view of one exemplary aspect of a naturally refrigerated cooler and ice bin in a draft configuration (*i.e.*, an ice bin with refrigerator compartment with draft line tube and draft tower) in a free standing rolling design. Here, the refrigerator compartment can be suspended inside of the ice bin and supported by a plurality of ported support rails. The free standing rolling design can be configured to support at least four wheels (some locking), legs, level glides or some other component that can be operably connected to the bottom of the ice bin. In one aspect, the wheels, legs, level glides, or the like can be mounted onto caster plates and affixed to the ice bin with bolts. It is contemplated that nuts can be welded to the inside of the outer wall of the bottom of the ice bin (within the insulation). One skilled in the art will appreciate that such a design enables the wheels, legs, level glides, or the like to be readily replaced with a bolt on/off design.

[0036] Figure 14 is a graph depicting the measured temperature at T1, T2 and T3 over a period of seven days when the refrigerator compartment was empty.

[0037] Figure 15 is a graph depicting the measured temperature at T1, T2, T3 and T4 over a period of six days when the refrigerator compartment contained a half barrel keg maintained at room temperature.

[0038] Figure 16 is a graph depicting the measured temperature at T1, T2, T3 and T4 over a period of six days when the refrigerator compartment contained a cold, half barrel keg of beer.

DETAILED DESCRIPTION

[0039] The present invention can be understood more readily by reference to the following detailed description, examples, drawing, and claims, and their previous and following description. However, before the present devices, systems, and/or methods are disclosed and described, it is to be understood that this invention is not limited to the specific devices, systems, and/or methods disclosed unless otherwise specified, as such can, of course, vary. It is also to be understood that the terminology used herein is for the purpose of describing particular aspects only and is not intended to be limiting.

[0040] The following description of the invention is provided as an enabling teaching of the invention in its best, currently known aspect. To this end, those skilled in the relevant art will recognize and appreciate that many changes can be made to the various aspects of the invention described herein, while still obtaining the beneficial results described herein. It will also be apparent that some of the desired benefits described herein can be obtained by selecting some of the features described herein without utilizing other features. Accordingly, those who work in the art will recognize that many modifications and adaptations to the present invention are possible and can even be desirable in certain circumstances and are a part described herein. Thus, the following description is provided as illustrative of the principles described herein and not in limitation thereof.

[0041] Reference will be made to the drawings to describe various aspects of one or more implementations of the invention. It is to be understood that the drawings are diagrammatic and schematic representations of one or more implementations, and are not limiting of the present disclosure. Moreover, while various drawings are provided at a scale that is considered functional for one or more implementations, the drawings are not necessarily drawn to scale for all contemplated implementations. The drawings thus represent an exemplary scale, but no inference should be drawn from the drawings as to any required scale.

[0042] In the following description, numerous specific details are set forth in order to provide a thorough understanding described herein. It will be obvious, however, to one skilled in the art that the present disclosure may be practiced without these specific details. In other instances, well-known aspects of refrigeration systems and coolers have not been described in particular detail in order to avoid unnecessarily obscuring aspects of the disclosed implementations.

[0043] As used in the specification and the appended claims, the singular forms “a,” “an” and “the” include plural referents unless the context clearly dictates otherwise. Ranges may be expressed herein as from “about” one particular value, and/or to “about” another particular value. When such a range is expressed, another aspect includes from the one particular value and/or to the other particular value. Similarly, when values are expressed as approximations, by use of the antecedent “about,” it will be understood that the particular value forms another aspect. It will be further understood that the endpoints of each of the ranges are significant both in relation to the other endpoint, and independently of the other endpoint.

[0044] “Optional” or “optionally” means that the subsequently described event or circumstance may or may not occur, and that the description includes instances where said event or circumstance occurs and instances where it does not.

[0045] Throughout the description and claims of this specification, the word “comprise” and variations of the word, such as “comprising” and “comprises,” means “including but not limited to,” and is not intended to exclude, for example, other additives, components, integers or steps. “Exemplary” means “an example of” and is not intended to convey an indication of a preferred or ideal aspect. “Such as” is not used in a restrictive sense, but for explanatory purposes.

[0046] Disclosed are components that can be used to perform the disclosed methods and systems. These and other components are disclosed herein, and it is understood that when combinations, subsets, interactions, groups, etc. of these components are disclosed that while specific reference of each various individual and collective combinations and permutation of these may not be explicitly disclosed, each is specifically contemplated and described herein, for all methods and systems. This applies to all aspects of this application including, but not limited to, steps in disclosed methods. Thus, if there are a variety of additional steps that can be perdefined it is understood that each of these additional steps can be perdefined with any specific aspect or combination of aspects of the disclosed methods.

[0047] Implementations described herein are directed toward devices, systems and methods for natural refrigeration. More particularly, the present disclosure is directed to a natural refrigeration system. For example, one or more implementations described herein provide a naturally refrigerated cooler and ice bin 100 designed to provide a refrigerated cooler as well as a service ice bin without the use of conventional electrical refrigeration components

or gases. In other aspects, the present disclosure is directed to a naturally-refrigerated cooler and ice bin that is configured as an integrated or all-in-one unit that utilizes ice cubes loaded into the ice bin 102 as a coolant.

[0048] Referring now to Figures 1-13, the varying modalities of the present disclosure are directed towards apparatus, systems and method for natural refrigeration. In one aspect, the modalities described herein all comprise a naturally refrigerated cooler and ice bin 100 designed to provide a refrigerated cooler as well as a service ice bin without the use of conventional electrical refrigeration components or gases. In other aspects, the present disclosure provides for a naturally refrigerated cooler and ice bin containing no electrical components, no gases or none of the powered components of a conventional refrigerator or refrigerated cooler. Instead, the cooler comprises a large ice bin 102 having a refrigerator compartment 108 suspended within it. The ice bin and cooler compartment are configured such that when the ice cubes and the resulting cold water are loaded into the ice bin, the ice cubes and resulting cold water surround the refrigerator compartment and act to remove heat from inside the refrigerator compartment. It is contemplated that the refrigerator compartment can be accessed from the front similar to a conventional refrigerator. In light of the present disclosure, one skilled in the art will appreciate that naturally refrigerated cooler and ice bin of the present disclosure can provide service ice and a refrigerated cooler, and can be further adapted for the inclusion of one or more of a draft dispensing cooler (for draft products like beer, wine, cocktails, etc.), a cold plate for soda systems, a hand pump and filter to provide cold drinking water, and the like. In other aspects, the disclosure is directed to a naturally-refrigerated cooler and ice bin that is configured as an integrated or all-in-one unit that utilizes ice cubes loaded into the ice bin as a coolant.

[0049] Referring now to Figures 1 through 4, a naturally refrigerated cooler with ice bin 100 having a basic configuration in a free standing rolling design is shown. In one aspect, the basic configuration consists of an ice bin 102 having a refrigerator compartment 108. In another aspect, a free standing rolling design is provided. In light of the present disclosure, one skilled in the art will appreciate that a free standing rolling design is just one of a myriad of configurations that can embody the naturally refrigerated cooler and ice bin of the present disclosure. The example of a free standing rolling design is used herein for the sake of clarity. However, other designs such as, for example and without limitation, a drop-in design used to insert into a counter top, a slip-in design used to slide into a cutout of a countertop and the like are included within the scope of the present disclosure.

[0050] In other aspect and as shown in Figure 1, the ice bin 102 can be configured to be top loading. In a further aspect, the top of the ice bin can comprise a means for access such as, for example and without limitation, insulated sliding doors, folding doors, pull out doors, a draft tower with a pull out door, a flip up door with a cold water dispenser, and the like.

[0051] In other aspects and as shown in Figure 1, access to the refrigerator compartment 108 can be provided through a refrigerator cooler door 116.

[0052] In other aspects and as shown in Figures 2A and 2B, the design of the naturally refrigerated cooler and ice bin 100 comprises an ice bin 102 with a refrigerator compartment 108 suspended within it. The exterior wall can be a double wall design comprising an exterior wall 104, an interior wall 106, and insulation 105 disposed therebetween. In some aspects, the exterior wall can be constructed of 304 stainless steel, steel, galvanized steel, vinyl-lined aluminum or any other metal, plastic, wood, or ceramic material known to one skilled in the art to be suitable. In other aspects, the interior wall can be constructed of 304 stainless steel, formed plastic, or other material known to provide a high thermal barrier as well as capable of sealing to be water tight. In other aspects, the insulation 105 between the exterior and interior wall can comprise "foam in place" polyurethane, "pour in place" polyurethane, extruded polystyrene or other suitable insulation material known in the art. In further aspects, it is contemplated that this double wall design can be found on all four sides and the bottom of the ice bin.

[0053] In other aspects, the refrigerator compartment 108 can be suspended within the bottom portion of the inside of the ice bin 102. When ice is loaded through the top of the ice bin, the ice will fill in the void around the refrigerator compartment from the top, left, right and back side. In further aspects, cold water generated by the melting of the ice can fill the void under the refrigerator compartment. In some aspects, the only portion of the refrigerator compartment not in direct contact with the ice and/or cold water can be at least a portion of the front surface which can, in turn, comprise a refrigerator cooler door 116. In some aspects, the refrigerator compartment can be constructed of a thermally conductive material configured to facilitate heat transfer from the contents inside of the refrigerator compartment to the ice and cold water of the surrounding ice bin. In a further aspect, the thermally conductive material can be, for example and without limitation, aluminum and the like. In operation, the heat drawn from the refrigerator compartment will rise towards the top of the ice bin resulting in colder temperatures at the lower part of the ice bin. In light of the present disclosure, one

skilled in the art will appreciate that the cold water convection and heat transfer process described herein provides for natural refrigeration of the refrigerator compartment and the maintenance of that cold temperature for extended periods of time.

[0054] In other aspects, support rails 110 can operate to keep the refrigerator compartment 108 suspended from the floor of the ice bin 102. In further aspects, the support rails can be configured as a structural element to further support the weight of the contents of the refrigerator compartment. Figure 4B shows a close up view of one exemplary embodiment of the support rails. In some aspects, the support rails can have ports or holes configured to allow water to flow freely across the bottom of the ice bin. In operation, the flow of cold water through the ports can facilitate heat transfer across the bottom of the ice bin, through to the sides and up to the top of the ice bin. In some aspects, the support rails can start from about 2 to about 4 inches from the inner ice bin walls 106 and end about 2 to about 4 inches from the back of the ice bin inner walls. In operation, this can allow water to easily flow around the support rails, for example, when draining the unit.

[0055] In other aspects and as shown in Figures 2 and 5, an ice bin drain 112 can be provided in the bottom of the ice bin 102. In one aspect, the ice bin drain can be about 1 ½ inches to about 2 inches in diameter or any other diameter configured to accommodate any other contemplated application. In some aspects, the drain can have a flange and a threaded end as is common in standard plumbing applications. In other aspects, the drain can be epoxy welded into the inner wall 106 of the ice bin for a permanent and waterproof installation. In other aspect, an elbow and a valve such as, for example and without limitation, a gate valve, a ball joint valve, a tee valve or the like can be installed and configured to facilitate water removal from the ice bin. In other aspects, the drain can be connected to onsite plumbing in order to drain directly to a sewer line or floor drain.

[0056] In other aspects and as shown in Figures 2A and 2B, wheels 114 can be utilized to provide mobility in the free standing rolling design. In some aspects, the naturally refrigerated cooler and ice bin 100 can have four wheels, legs, level glides, or the like. In further aspects, more than four wheels, legs, level glides, or the like can be employed for larger units.

[0057] In other aspects and as shown in Figures 6-10, the naturally refrigerated cooler and ice bin 100 can further comprise a draft configuration. The draft configuration comprises the ice bin 102 and suspended cooler of the basic configuration and also comprises a draft line tube

122 and draft tower 118 positioned on top of the ice bin. In some aspects, the draft line tube can be constructed of a highly thermally conductive material such as, for example and without limitation, aluminum. In other aspects, the draft line tube can be used to run draft lines from the refrigerator compartment 108 to the draft tower. In yet other aspects, the draft line tube can have a flange and gasket coupled to one end and configured to seat the tube to the top of the refrigerator compartment. Here, an access hole can provide the draft line tube access to the refrigerator compartment, and an inner flange with gasket can secure the draft line tube and can provide a waterproof seal. In some aspects, draft lines can run from the refrigerator compartment, through the draft line tube, to the draft tower and connect to a faucet 120 installed on the draft tower. The draft line tube can be in direct contact with the ice in the ice bin. In operation, this contact transfers heat from the draft line tube, the draft lines and the liquid inside those draft lines to the ice inside of the ice bin. In light of the present disclosure, one skilled in the art will appreciate that this heat transfer can keep the liquid on the draft line tubes cold facilitating a direct draw draft setup.

[0058] In another aspect, the naturally refrigerated cooler and ice bin 100 comprise a fresh water assembly disposed inside the ice bin 102 to a dispensing faucet 120 located on top of the naturally refrigerated cooler and ice bin. In an aspect, the fresh water assembly further comprises an in-line pickup tube, an in-line water filter, a pumping mechanism (manual, battery operated or electrically operated) and a faucet.

[0059] In yet other aspects and as shown in Figures 11, 12A and 12B, the naturally refrigerated cooler and ice bin 100 can further comprise a cold plate configuration that provides a cooling means for soda system delivery. In one aspect, the cold plate 124 can be formed from, for example and without limitation, a ported aluminum plate with copper coils and the like. In this aspect, a separate coil can be provided for each different soda product (i.e. coke, diet coke, sprite, mountain dew, etc.). Each coil can have an inlet and outlet that can be connected on the outside of the ice bin 102. In other aspects, the cold plate can be mounted on top of the refrigerator compartment 108. In other aspects, the coils can be run through the inner ice bin wall 106, insulation 105 and the outer ice bin wall 104 to the exterior of the unit. Here, the coils can then be connected to an external soda delivery system.

[0060] In another aspect, the coils comprise a stainless steel coil assembly used to run a variety of liquids for the purpose of in-line cooling.

[0061] Accordingly, Figures 1-13, and the corresponding text, provide a number of different devices, systems, methods and mechanisms for apparatus, systems and methods for natural refrigeration. In addition to the foregoing, implementations described herein can also be described in terms acts and steps in a method for accomplishing a particular result.

[0062] The refrigerated cooler and ice bin described herein may be better understood with reference to the Examples set forth below:

EXAMPLE

[0063] The duration of time that the refrigerated cooler and ice bin 100 of the present disclosure can maintain refrigerated temperatures under various conditions was tested. The refrigerated cooler and ice bin was stored at room temperature (approximately 74 °F) for the duration of the tests described herein. One load of ice was inserted into the ice bin 102. Additional ice was not added as the ice melted. The temperature was taken at four locations :T1, T2, T3 and T4. The temperature at T1, located at the top of the ice bin, inside of the ice compartment, was measured using a thermometer. The temperature at T2, located at the bottom of the ice bin and inside of the ice compartment, was measured using a digital thermometer. The temperature at T3, located inside the refrigerator compartment 108, was measured using the door thermometer. The temperature at T4, the temperature of the liquid placed within the refrigerator compartment 108, was measured using a hand-held thermometer where applicable. Moreover, the water that was generated as a result of the melting ice was not discharged from the naturally refrigerated cooler and ice bin during testing.

[0064] The following three tests were performed: (1) the refrigerator compartment 108 did not contain any fluids or any other content; (2) the refrigerator compartment contained a half barrel keg of beer maintained at room temperature prior to placement within the refrigerator compartment; and (3) the refrigerator compartment contained a previously-cooled, half barrel keg of beer. Figures 14-16 show the results of these tests, respectively.

[0065] Figure 14 is a graph depicting the measured temperature at T1, T2 and T3 over a period of seven days when the refrigerator compartment 108 was empty. After placement of the ice into the ice bin 102, the temperatures at T1, T2 and T3 were 30.0 °F, 20.0 °F and 43.0 °F, respectively. On day four, the ice melted below the top of the refrigerator compartment with temperatures of 31.8 °F, 28.0 °F and 34.5 °F at T1, T2 and T3, respectively.

[0066] Figure 15 is a graph depicting the measured temperature at T1, T2, T3 and T4 over a period of six days when the refrigerator compartment 108 contained a half barrel keg maintained at room temperature. After placement of the ice into the ice bin 102, the temperatures at T1, T2, T3 and T4 were 27.5 °F, 27.8 °F, 62.0 °F and 65.0 °F, respectively. On day four, the ice melted below the top of the refrigerator compartment with temperatures of 33.8 °F, 27.6 °F, 36.0 °F and 33.0 °F at T1, T2, T3 and T4, respectively.

[0067] Figure 16 is a graph depicting the measured temperature at T1, T2, T3 and T4 over a period of six days when the refrigerator compartment 108 contained a cold, half barrel keg of beer. After placement of the ice into the ice bin 102, the temperatures at T1, T2, T3 and T4 were 27.8 °F, 27.6 °F, 50.0 °F and 33.0 °F, respectively. On day four, the ice melted below the top of the refrigerator compartment with temperatures of 32.5 °F, 28.0 °F, 36.0 °F and 32.0 °F at T1, T2, T3 and T4.

[0068] The present invention can thus be embodied in other specific forms without departing from its spirit or essential characteristics. The described aspects are to be considered in all respects only as illustrative and not restrictive. The scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes that come within the meaning and range of equivalency of the claims are to be embraced within their scope.

CLAIMS

What is claimed is:

1. A naturally refrigerated cooler and ice bin, comprising:
 - a housing having a top, a bottom, a front, a back and two side walls, wherein each wall is defined at least partially by an insulated wall, wherein the insulated wall further comprises an exterior wall, an interior wall and insulation disposed between the exterior and interior wall and wherein the bottom wall has a drain disposed therein;
 - a refrigerator compartment disposed within and dimensioned as to be spaced a predetermined distance from at least the top, bottom, back and two side walls of the housing, wherein the space between a bottom surface of the refrigerator compartment and the bottom wall of the housing is adapted to be filled with at least one of ice and cold water; and
 - at least one support rail mounted to the bottom wall of the housing and the bottom surface of the refrigerator compartment, wherein the at least one support rail is adapted to accommodate the flow of at least one of ice and cold water;
 - wherein the space between the housing and the refrigerator compartment at least partially defines an ice bin.
2. The naturally refrigerated cooler and ice bin of Claim 1, wherein the top wall of the housing further comprises an access door adapted to allow a user to access the ice bin.
3. The naturally refrigerated cooler and ice bin of Claim 2, wherein the access door is insulated.
4. The naturally refrigerated cooler and ice bin of Claim 1, further comprising an refrigerator compartment door mounted to at least a portion of the front wall of the housing and communicating with an interior of the refrigerator compartment.
5. The naturally refrigerated cooler and ice bin of Claim 4, wherein the refrigerator compartment access door is insulated.
6. The naturally refrigerated cooler and ice bin of Claim 1, wherein the exterior wall of the insulated wall comprises steel.
7. The naturally refrigerated cooler and ice bin of Claim 6, wherein the exterior wall of the insulated wall further comprises one of 304 stainless steel, galvanized steel, and vinyl lined aluminum. .

8. The naturally refrigerated cooler and ice bin of Claim 1, wherein the interior wall of the insulated wall comprises at least one of 304 stainless steel, and plastic.
9. The naturally refrigerated cooler and ice bin of Claim 8, wherein the interior wall comprises 304 stainless steel.
10. The naturally refrigerated cooler and ice bin of Claim 1, wherein the insulation of the insulated wall comprises a polymer.
11. The naturally refrigerated cooler and ice bin of Claim 1, wherein the refrigerator compartment comprises a thermally conductive material configured to facilitate heat transfer from contents placed within the refrigerator compartment to the at least one of ice and cold water disposed in the housing.
12. The naturally refrigerated cooler and ice bin of Claim 1, wherein the drain disposed in the bottom wall is adapted to be connected to onsite plumbing.
13. The naturally refrigerated cooler and ice bin of Claim 1, further comprising a plurality of wheels, legs, level glides or some other component operably coupled to the bottom wall of the housing.
14. The naturally refrigerated cooler and ice bin of Claim 1, further comprising a draft line tube communicating between the interior of the refrigerator compartment and a draft tower disposed on top of the top wall of the housing through an opening defined therein.
15. The naturally refrigerated cooler and ice bin of Claim 14, further comprising a faucet operably associated with the draft line and draft tower, wherein the faucet is operable to selectively dispense a liquid conducted via the draft line.
16. The naturally refrigerated cooler and ice bin of Claim 1, further comprising a cold plate assembly disposed on a top surface of the refrigerator compartment.
17. The naturally refrigerated cooler and ice bin of Claim 1, wherein the cold plate assembly further comprises a ported aluminum plate with a plurality of copper coils disposed therein.
18. The naturally refrigerated cooler and ice bin of Claim 1, further comprising a coil system assembly disposed inside of the ice bin.
19. The naturally refrigerated cooler and ice bin of Claim 18, wherein the coil system assembly further comprises a stainless steel coil assembly operable to run a variety of liquids for the purpose of in-line cooling.

20. The naturally refrigerated cooler and ice bin of Claim 1, further comprising a fresh water dispenser assembly disposed inside the ice bin and operably associated with a dispensing faucet located on top of the naturally refrigerated cooler.

21. The naturally refrigerated cooler and ice bin of Claim 20, wherein the fresh water dispenser assembly further comprises an in-line pickup tube, an in-line water filter, a pumping mechanism, all operably associated to conduct water to the dispensing faucet. .

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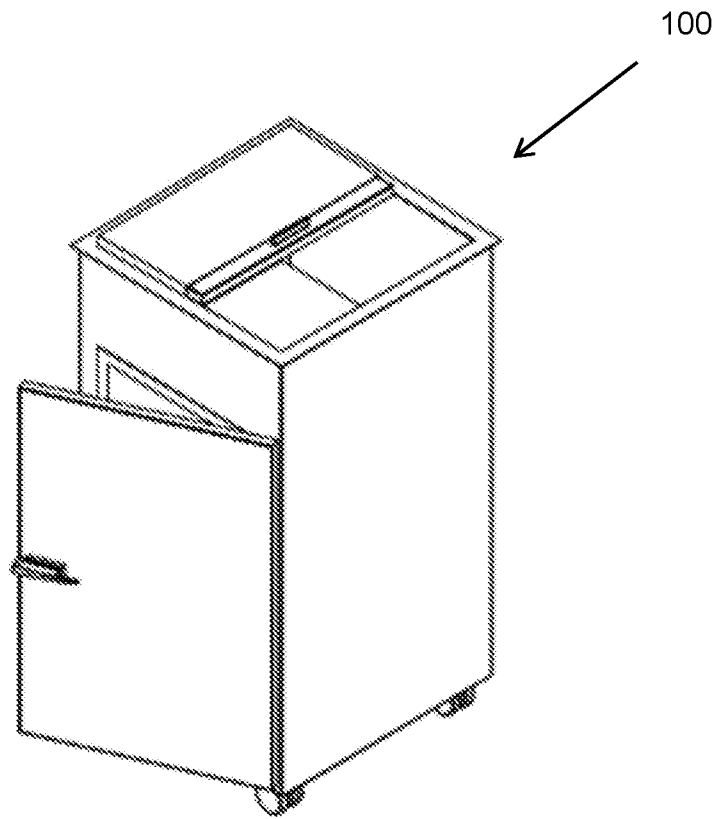


FIG. 1

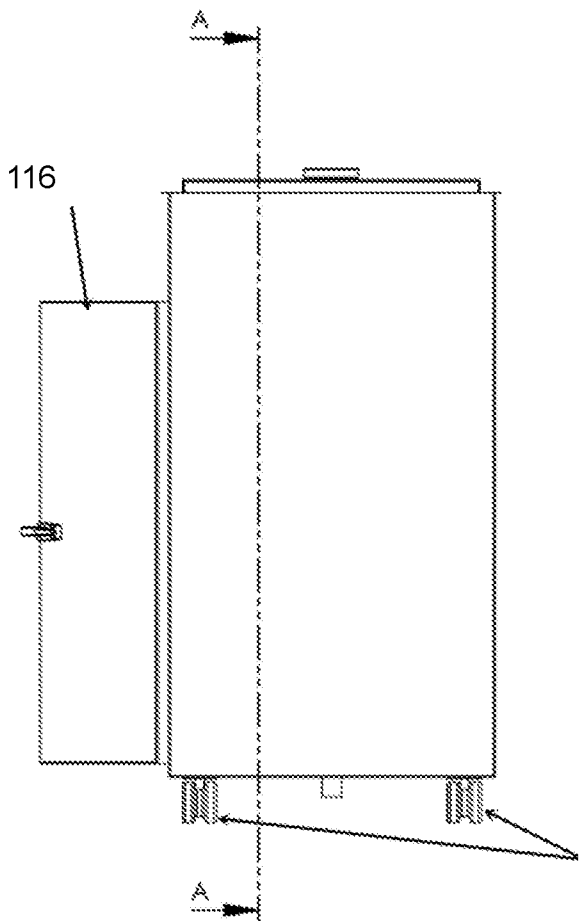


FIG. 2A

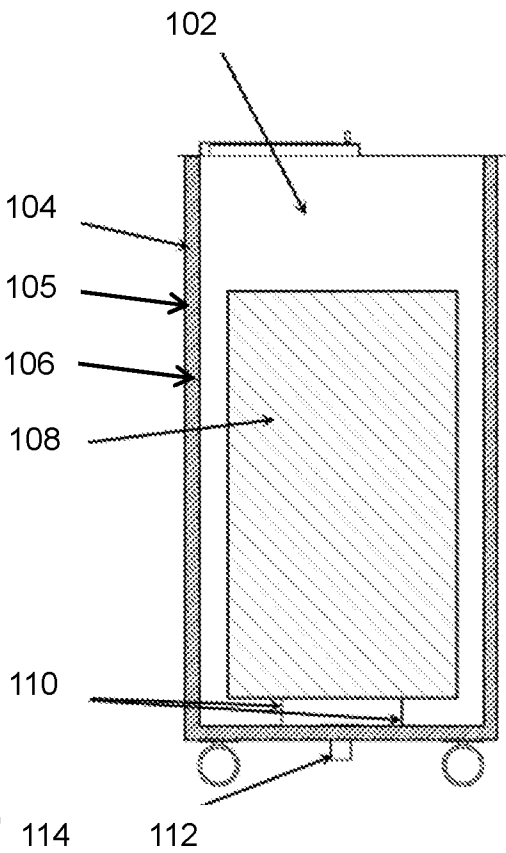


FIG. 2B

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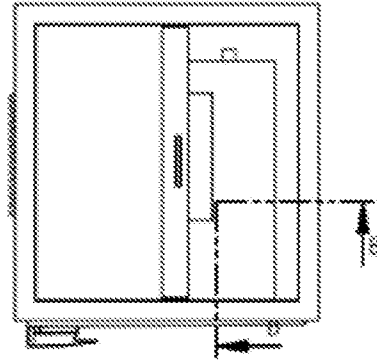


FIG. 3A

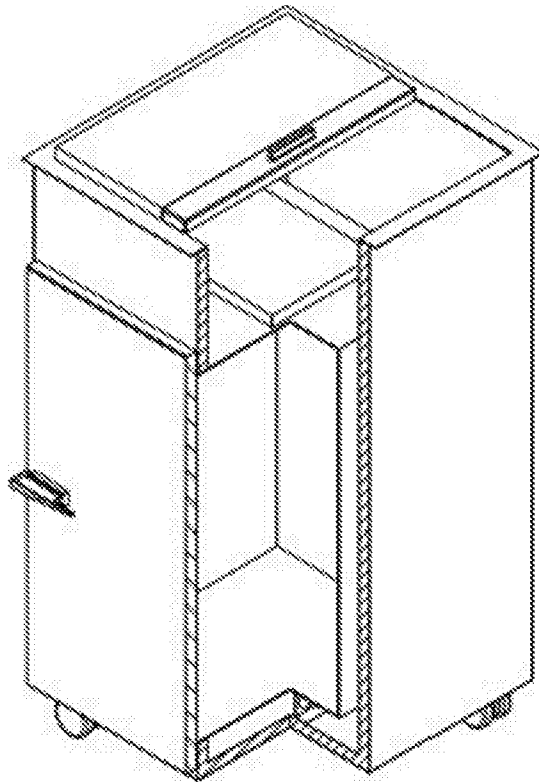


FIG. 3B

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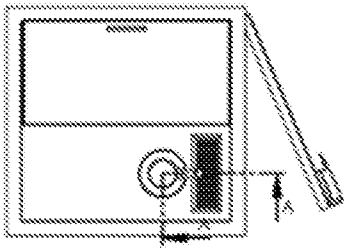


FIG. 4A

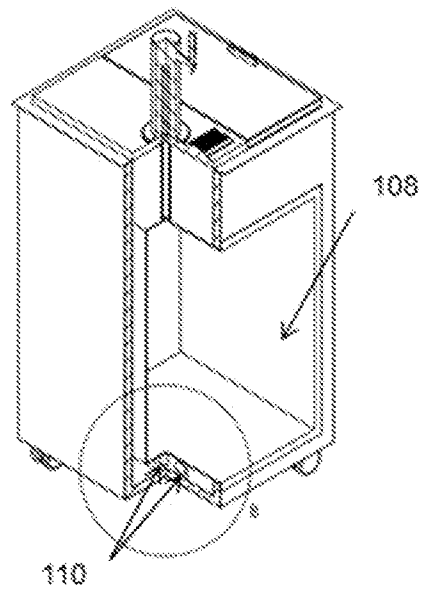


FIG. 4B

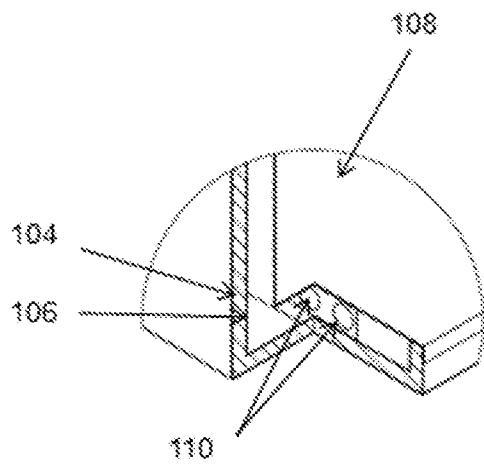


FIG. 4C

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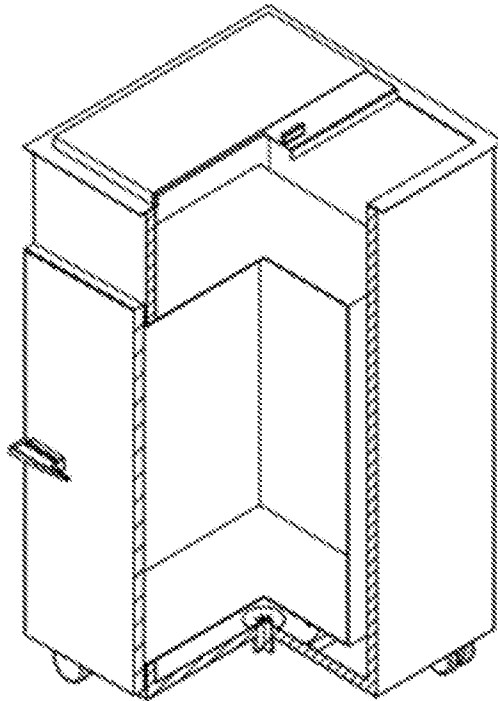


FIG. 5

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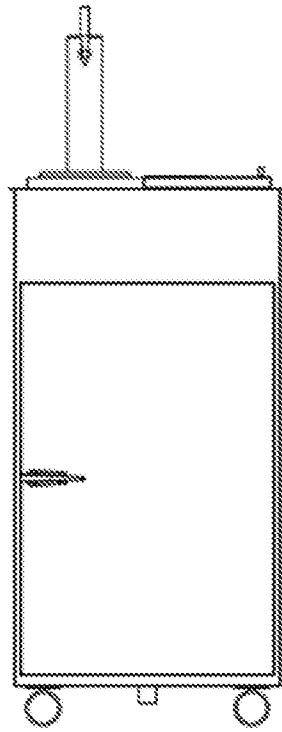


FIG. 6

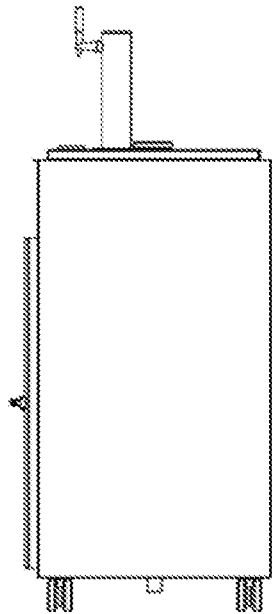


FIG. 7

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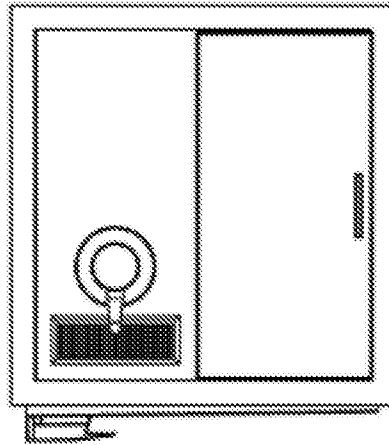


FIG. 8

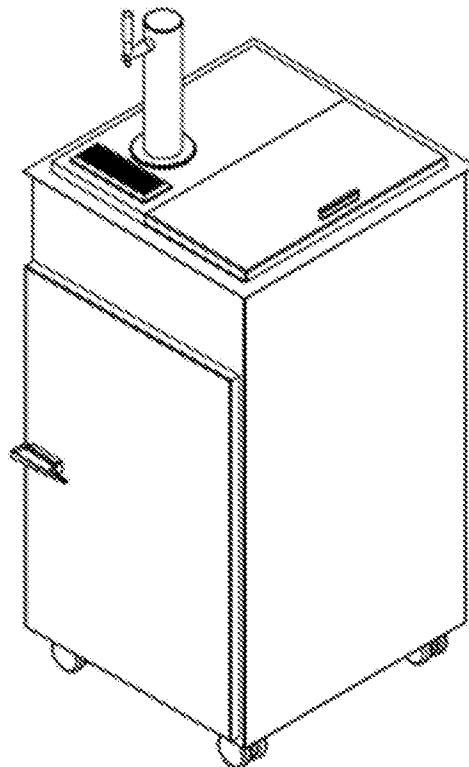


FIG. 9

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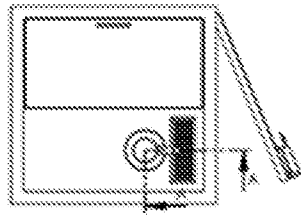


FIG. 10A

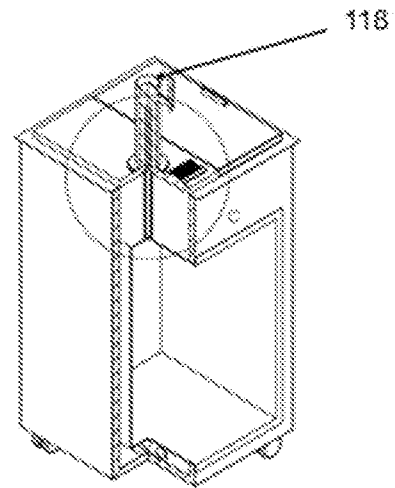


FIG. 10B

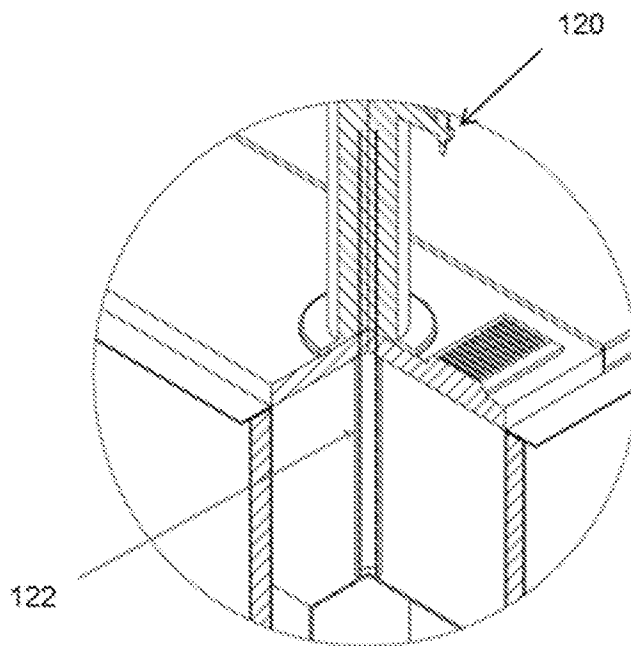


FIG. 10C

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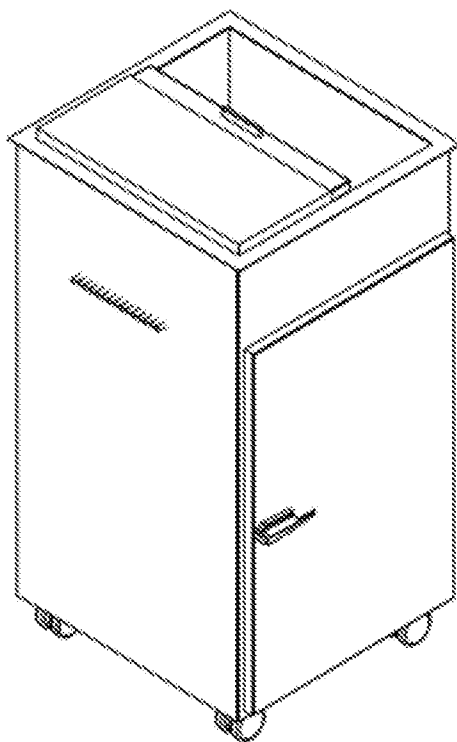


FIG. 11

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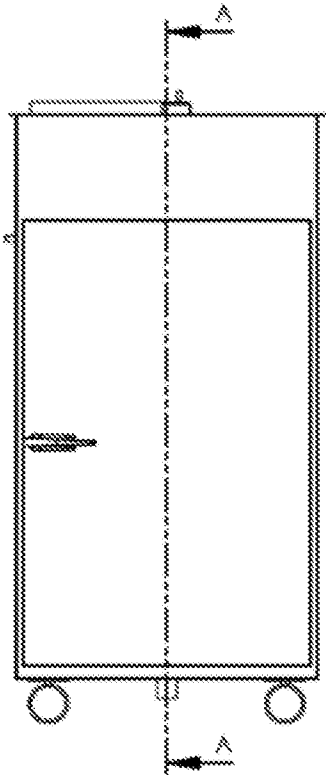


FIG. 12A

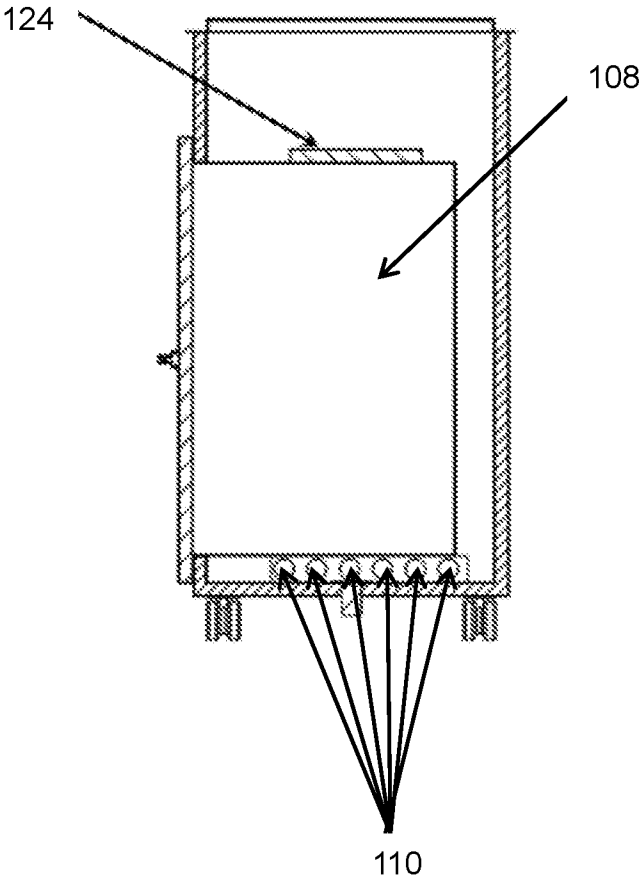


FIG. 12B

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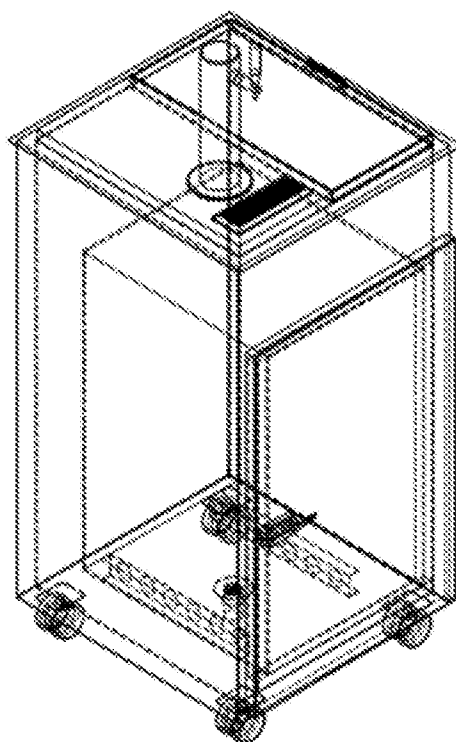


FIG. 13

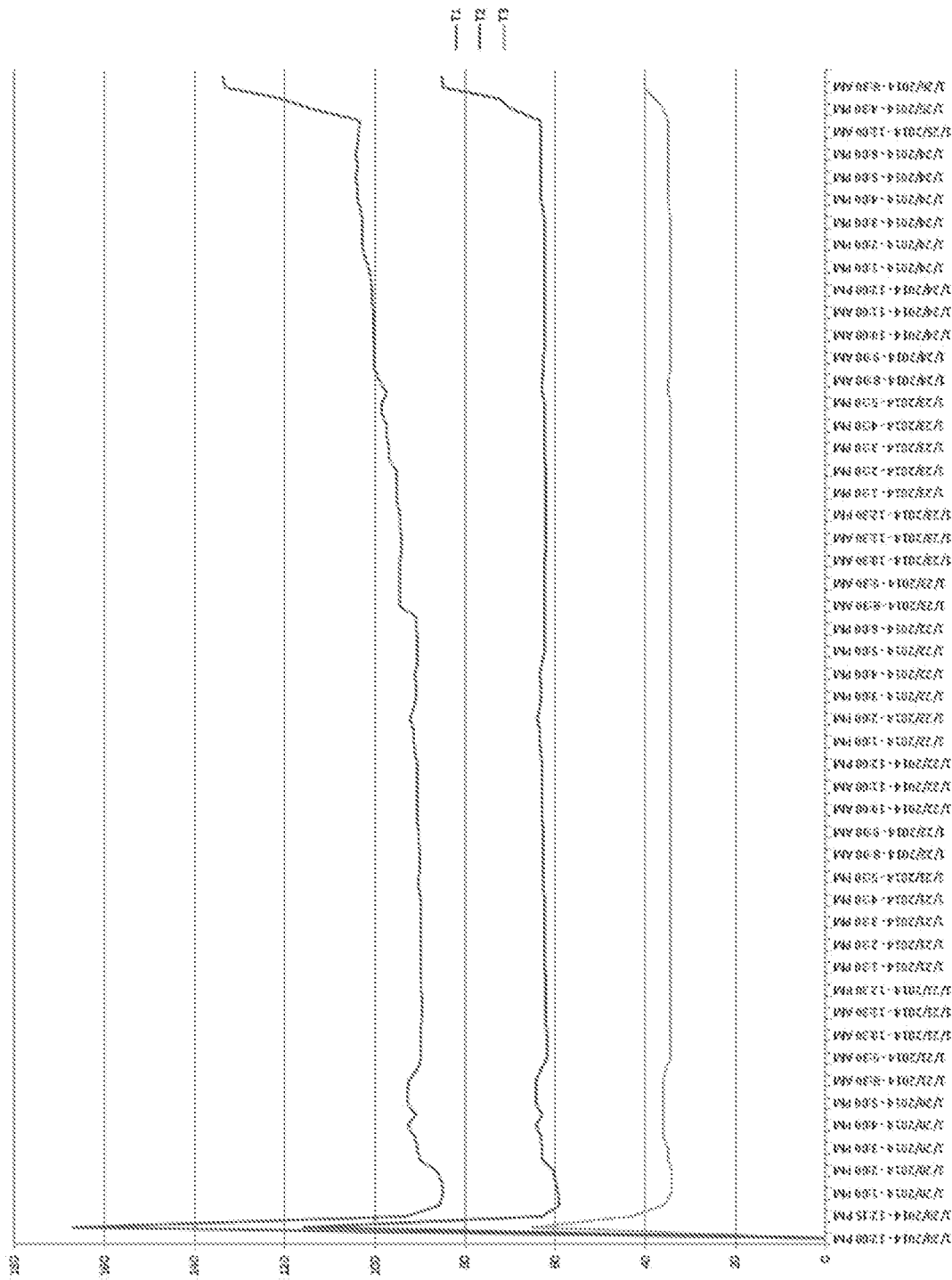
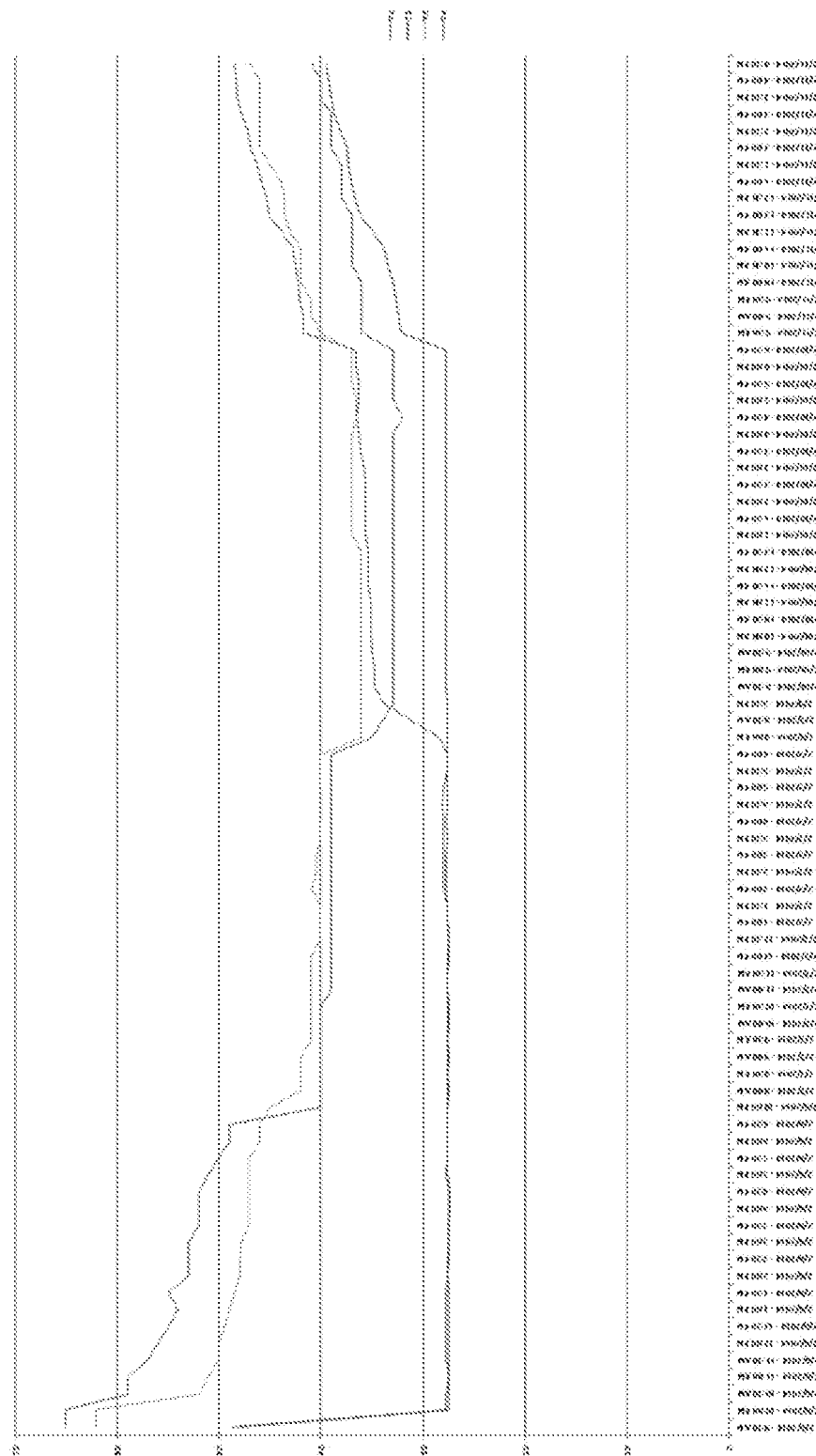


FIG. 14

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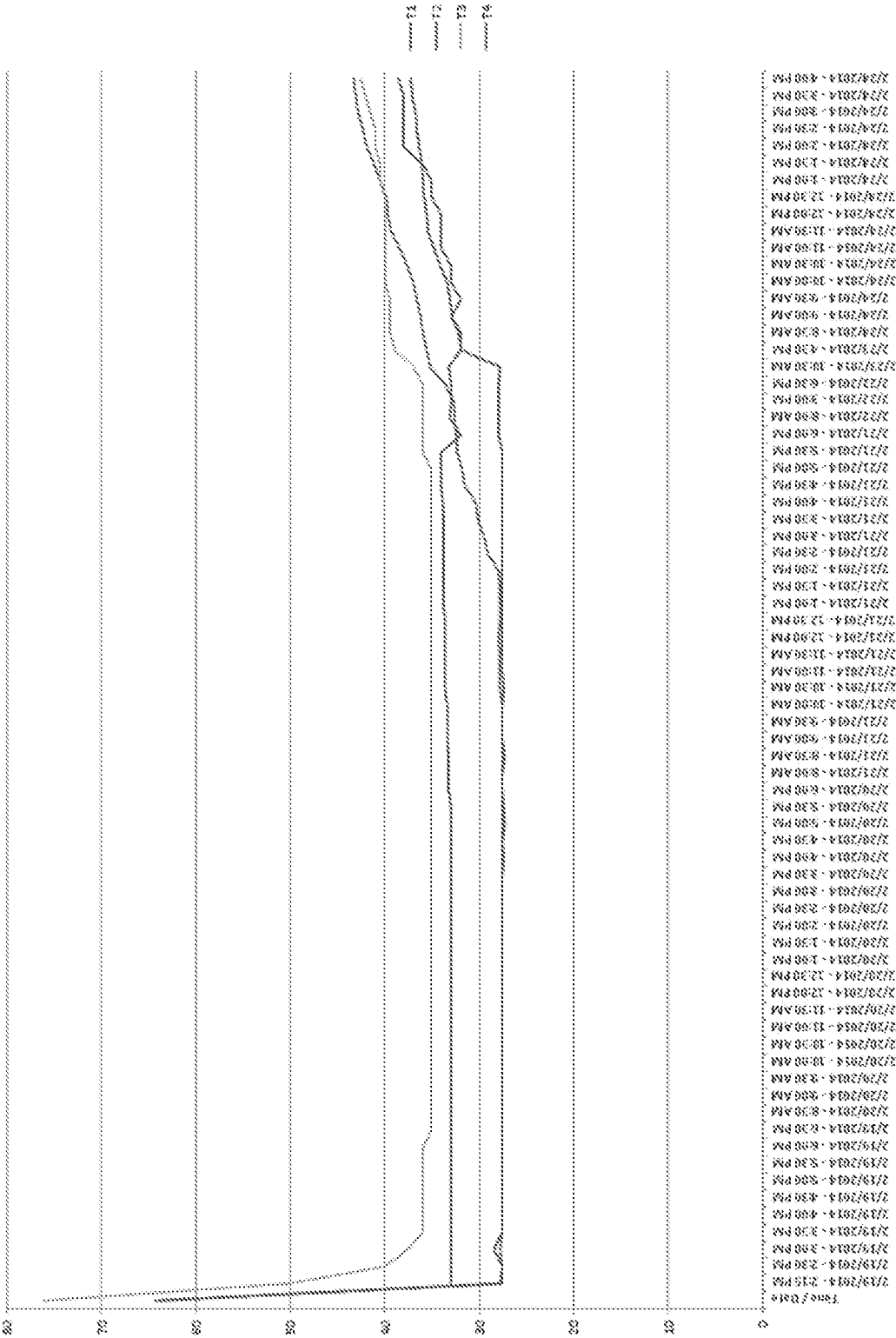


FIG. 16