



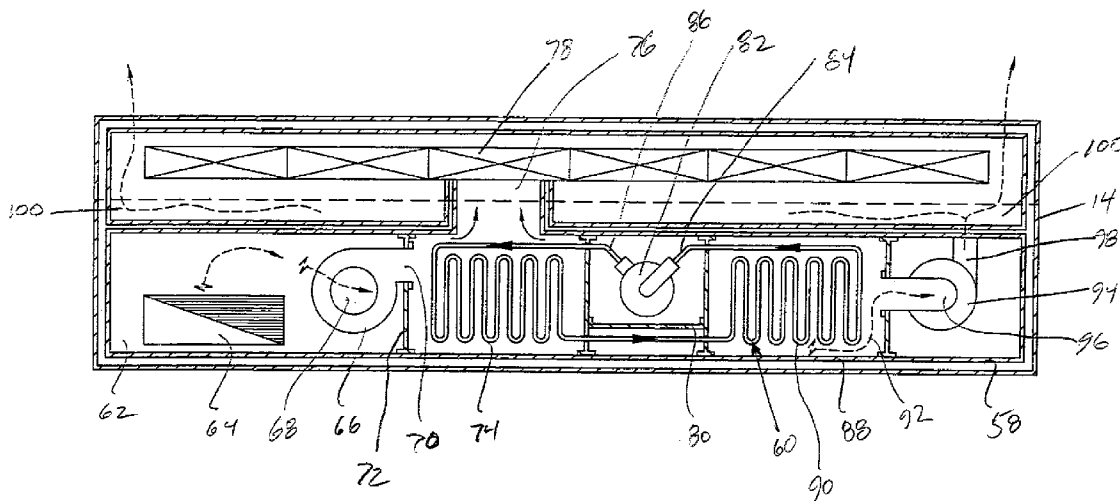
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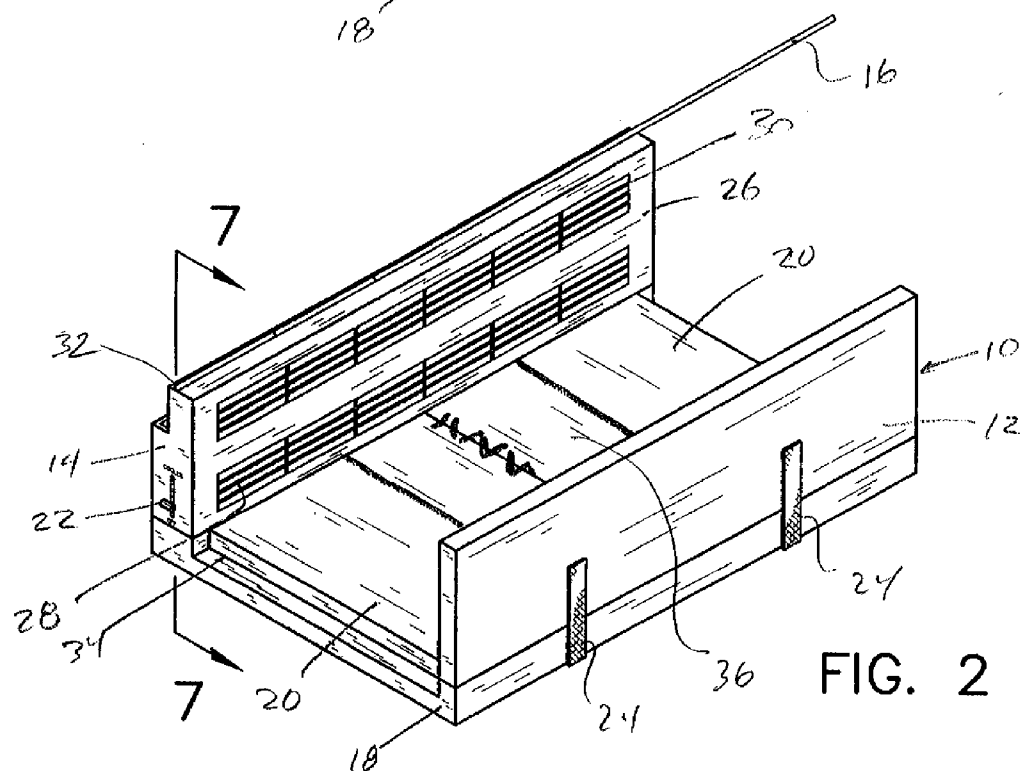
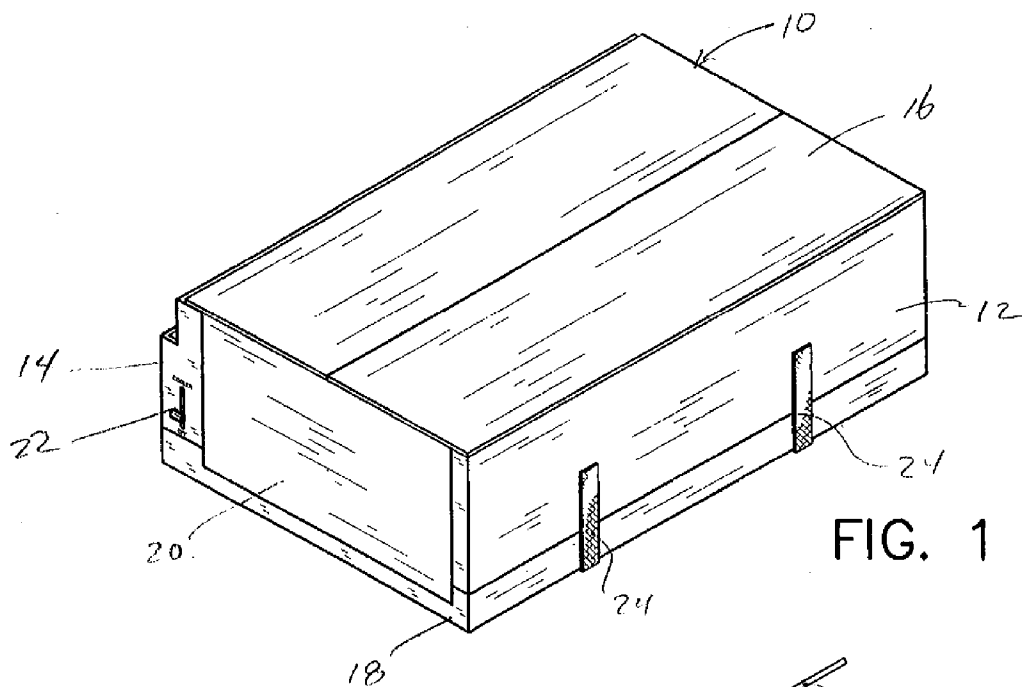
(19) **United States**(12) **Patent Application Publication**
Trotter(10) **Pub. No.: US 2015/0292783 A1**(43) **Pub. Date: Oct. 15, 2015**(54) **COLLAPSIBLE SOLAR REFRIGERATOR**(52) **U.S. Cl.**CPC **F25B 27/007** (2013.01)(71) Applicant: **Spencer Trotter**, Albuquerque, NM
(US)(72) Inventor: **Spencer Trotter**, Albuquerque, NM
(US)

(57)

ABSTRACT(21) Appl. No.: **14/322,278**(22) Filed: **Jul. 2, 2014****Related U.S. Application Data**(60) Provisional application No. 61/842,024, filed on Jul. 2,
2013.**Publication Classification**(51) **Int. Cl.**
F25B 27/00 (2006.01)

A portable refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks comprising a chiller circuit, and a front wall, a rear wall, a top wall, a base, and at least a pair of sidewalls combined together to enclose a storage space when the portable refrigerator is in the functional mode, wherein the storage space is controllably cooled by the chiller circuit, and wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable to form a compact package when the portable refrigerator is in the collapsed mode, and wherein the top wall comprises one or more solar panels thereon.





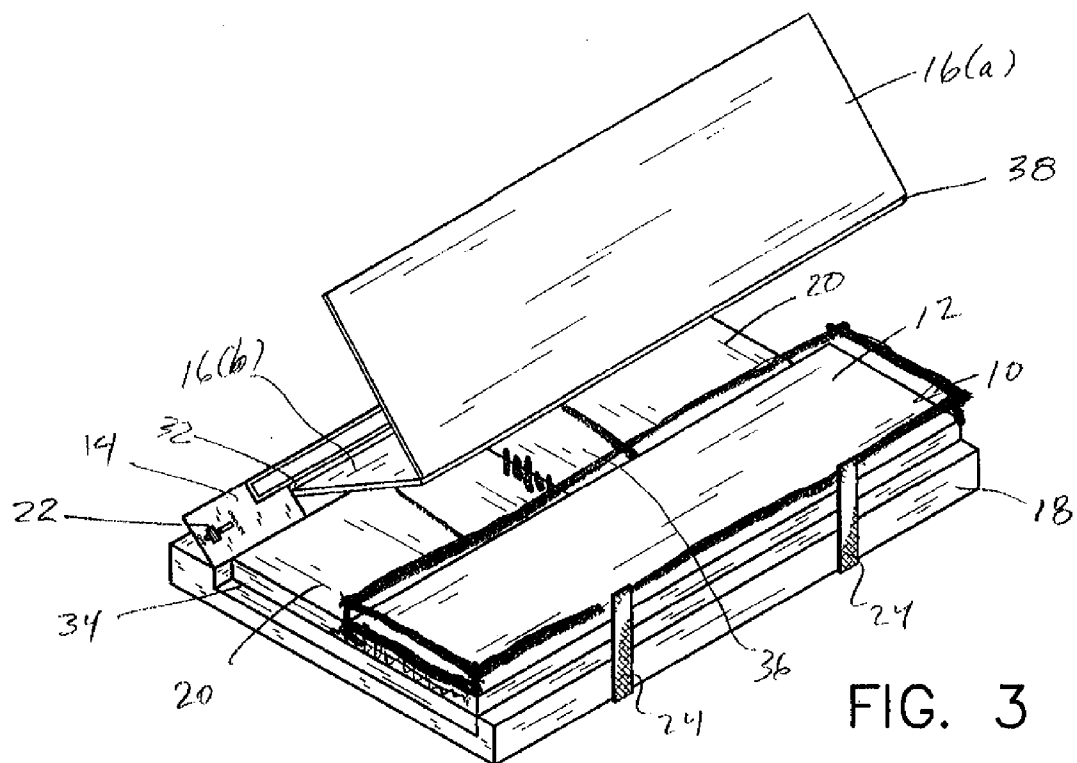


FIG. 3

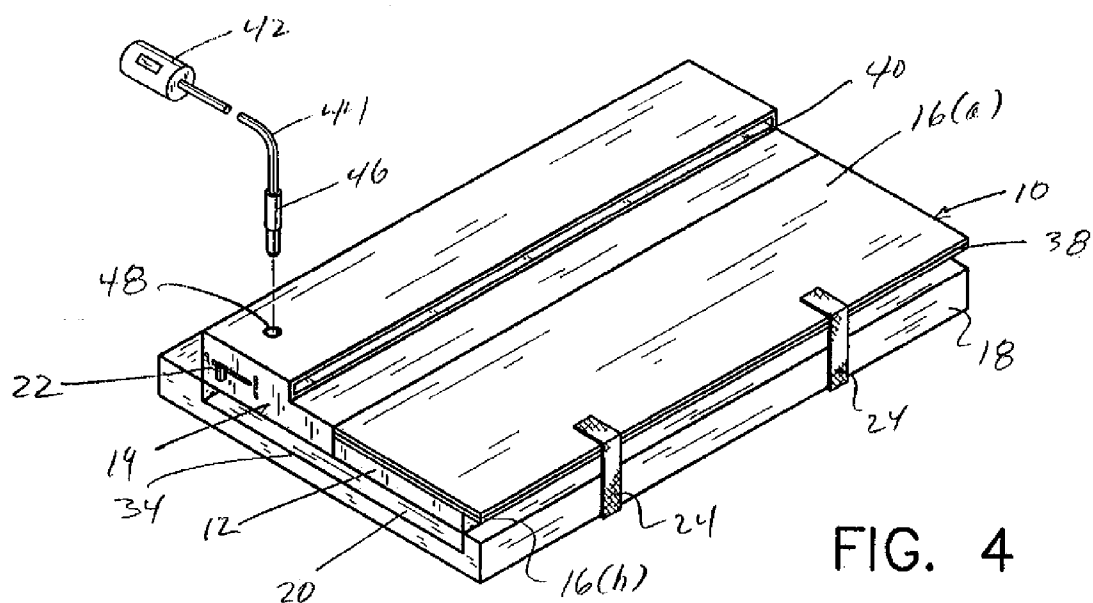


FIG. 4

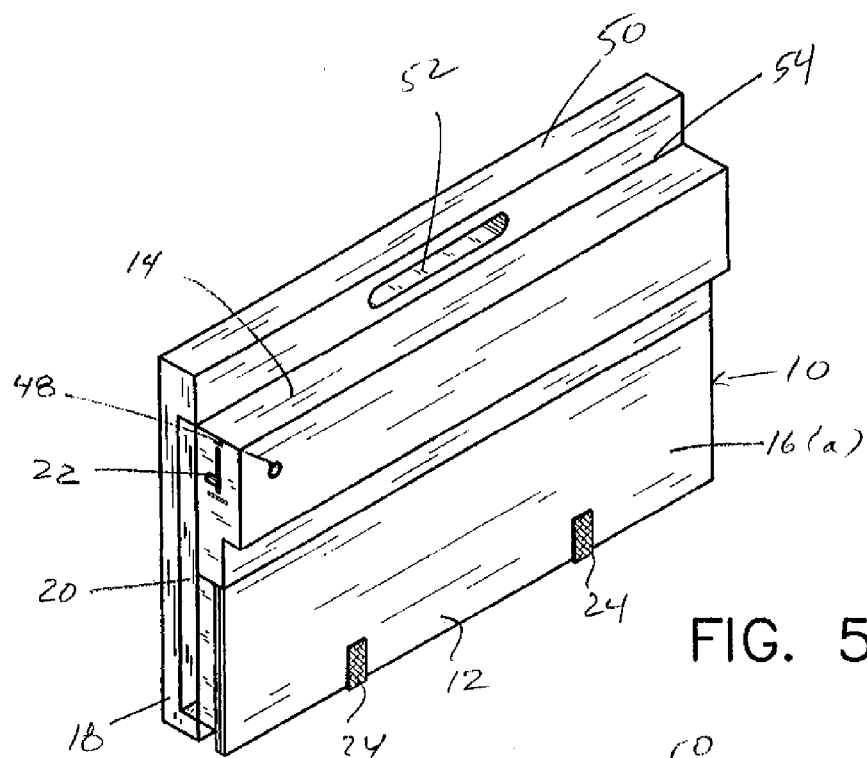


FIG. 5

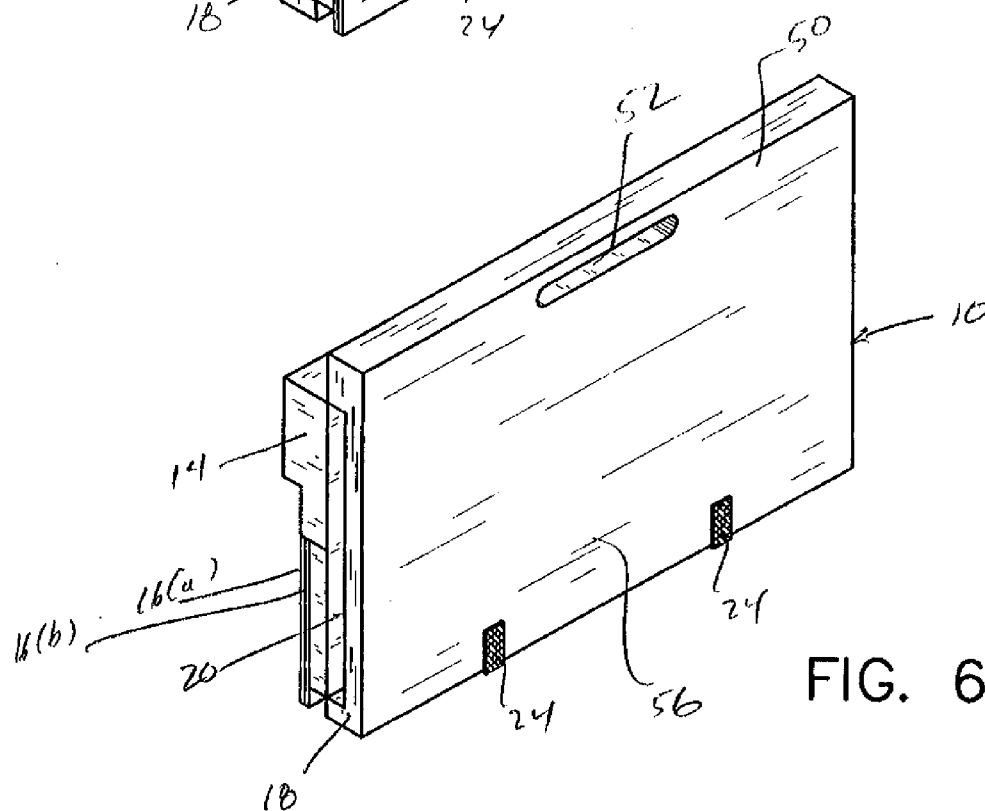
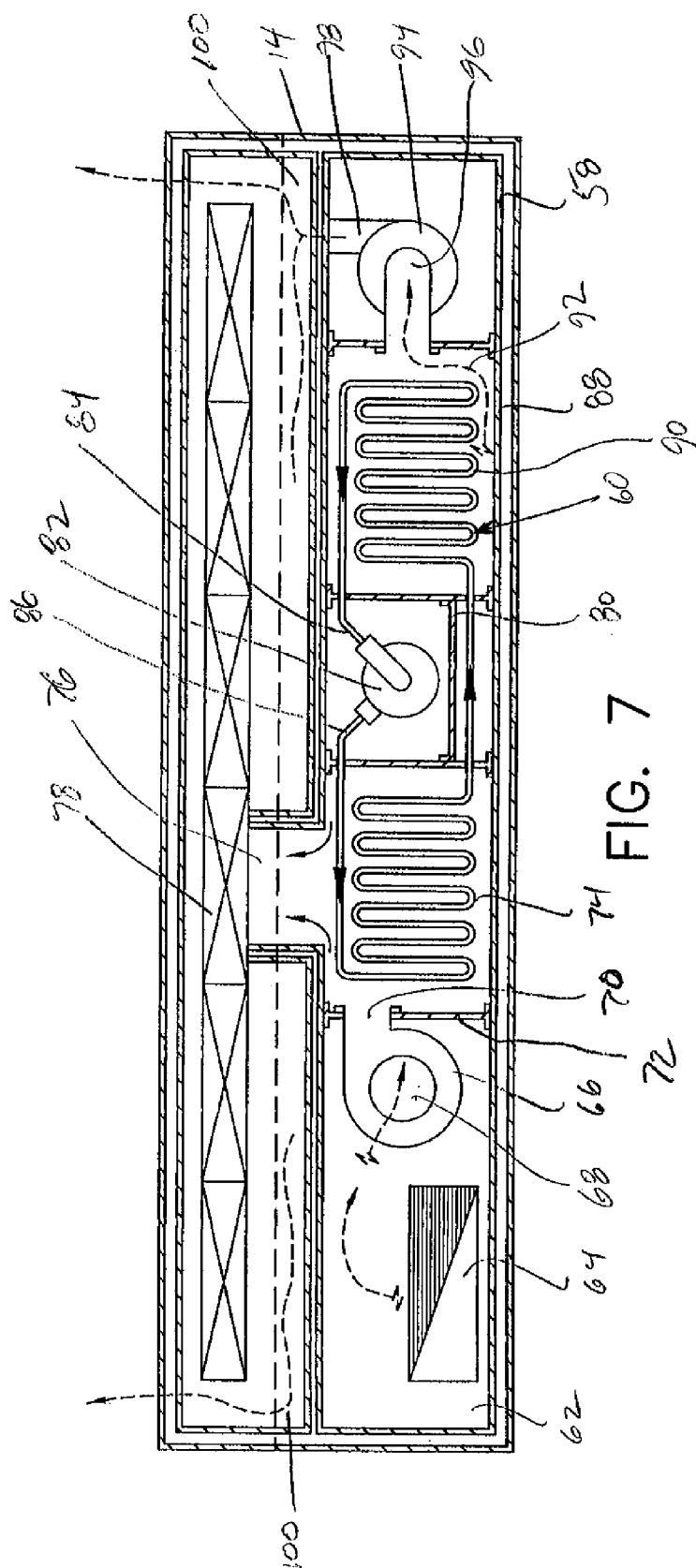


FIG. 6



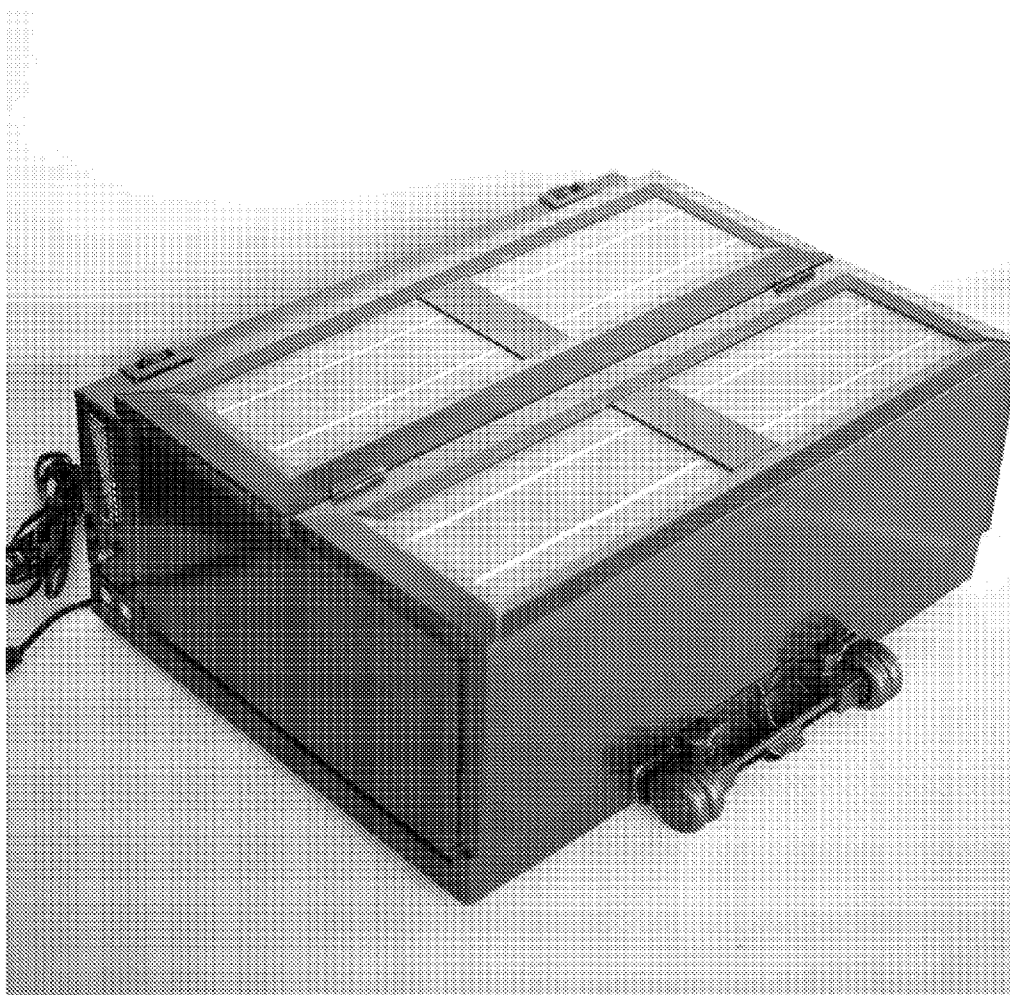


FIG. 8 A

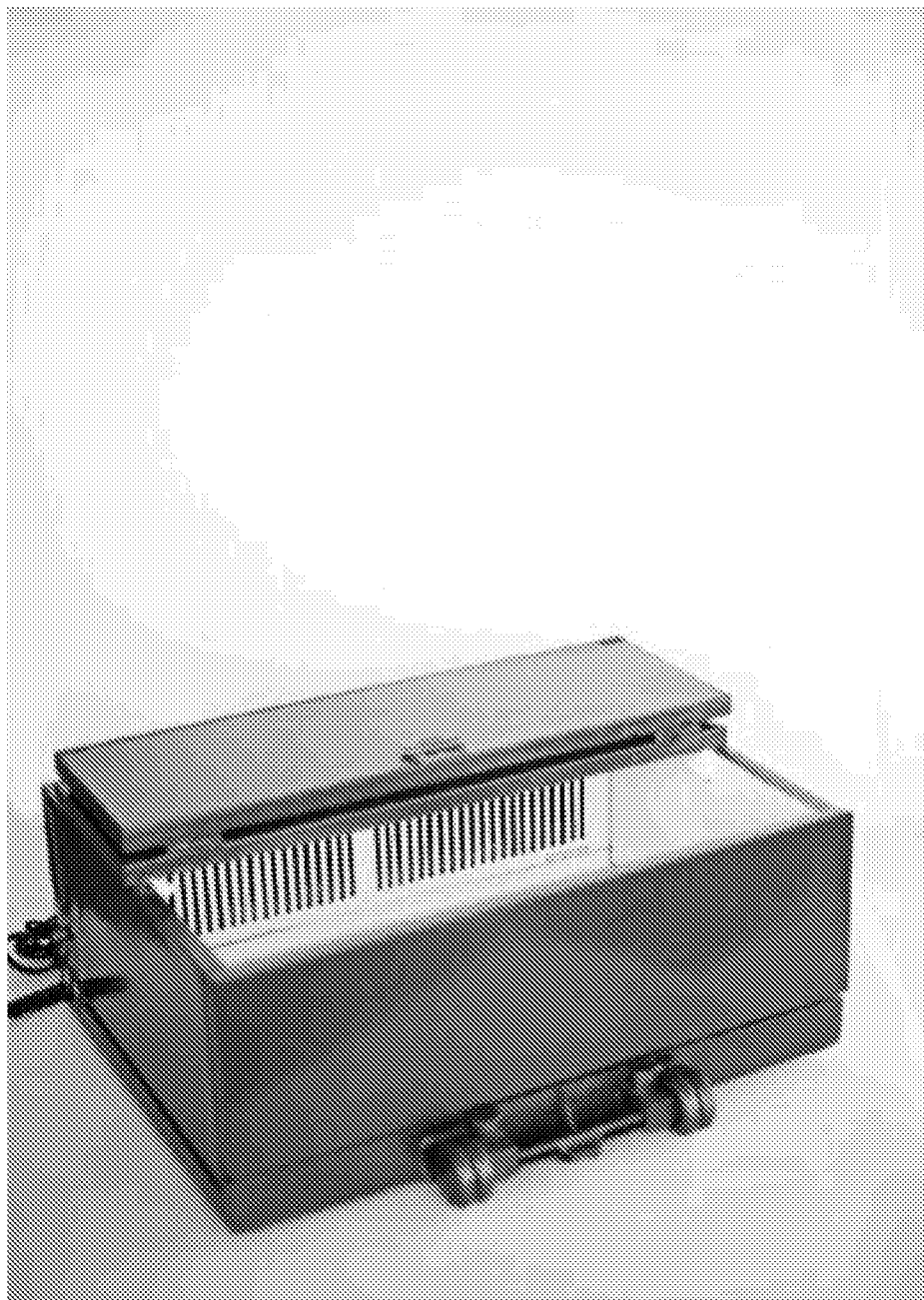


FIG. 8 B

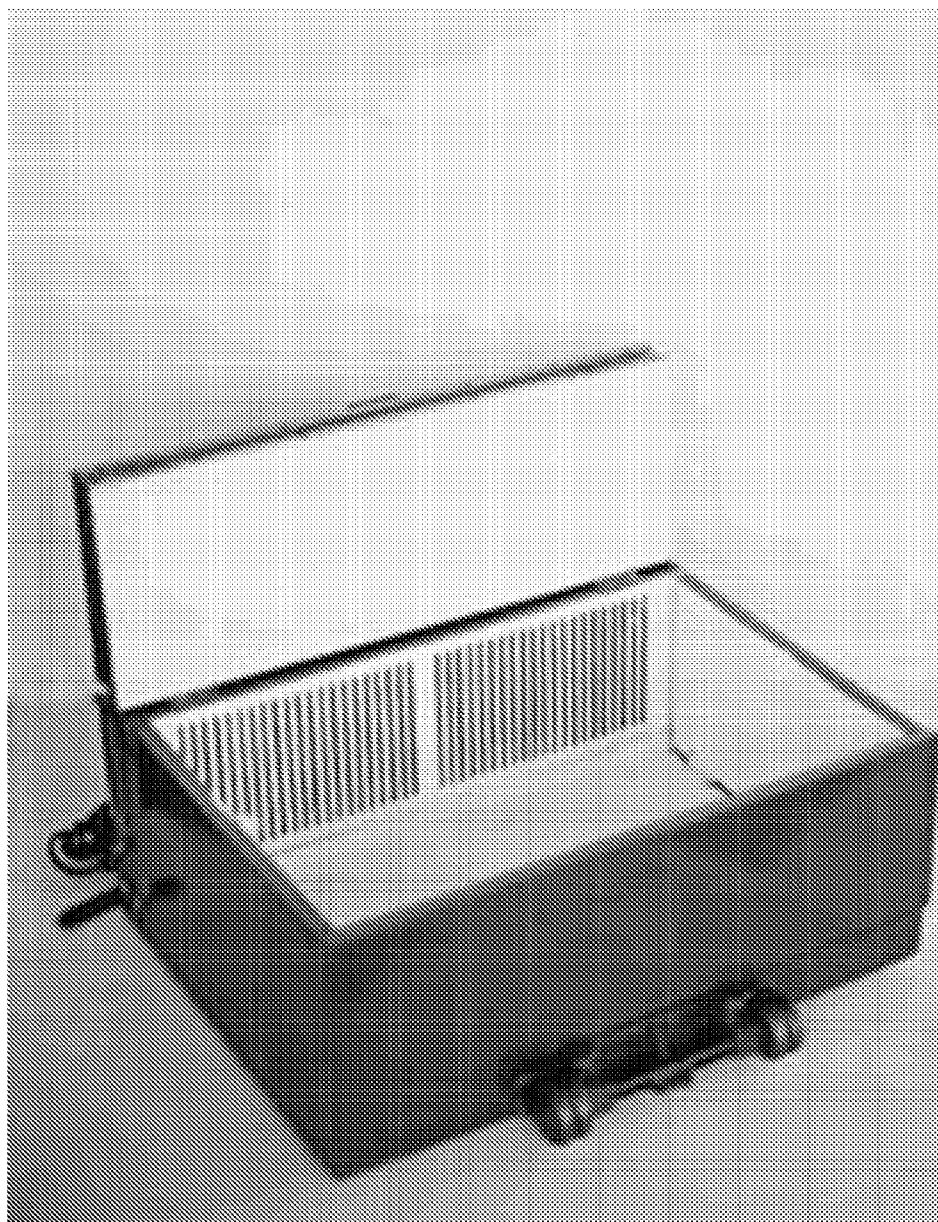


FIG. 8 C

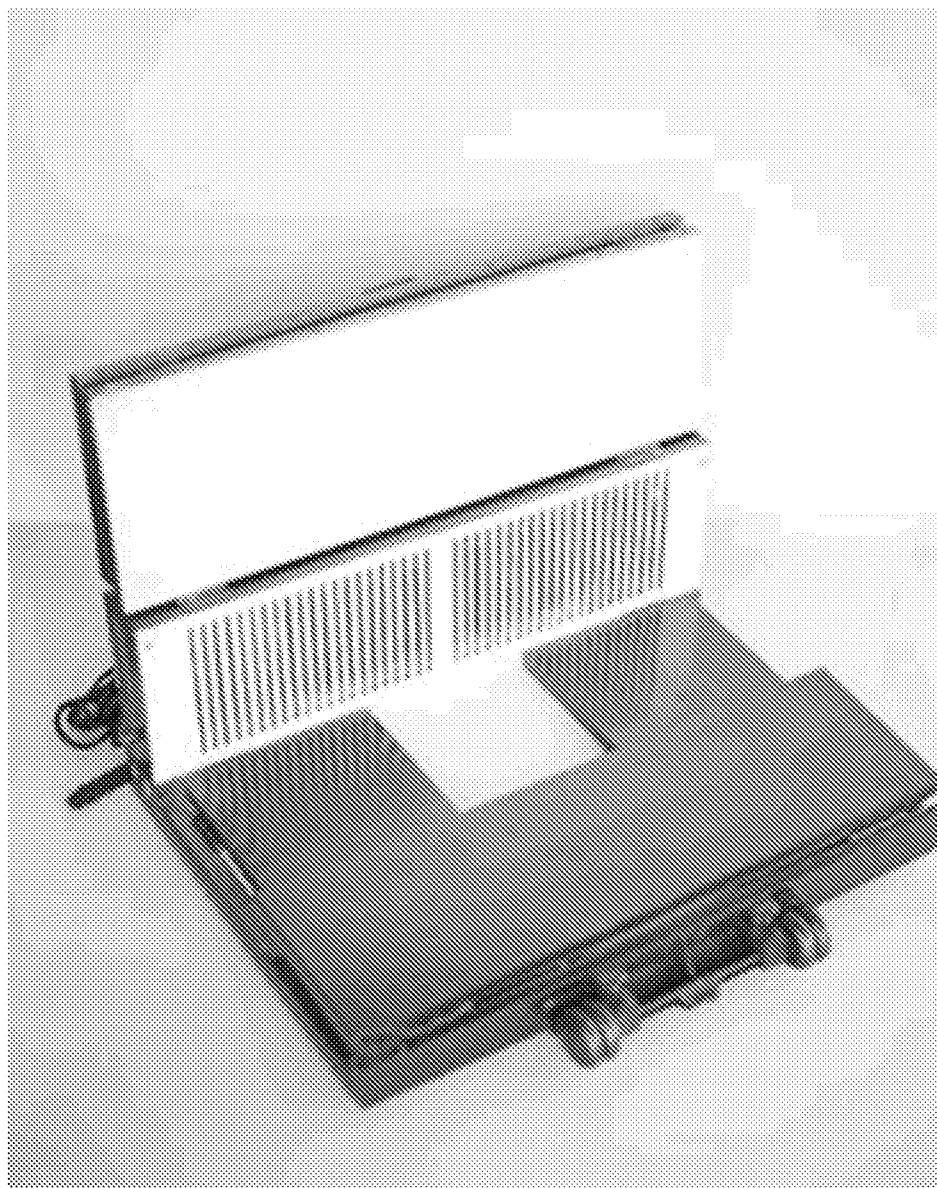


FIG. 8 D



FIG. 8 E

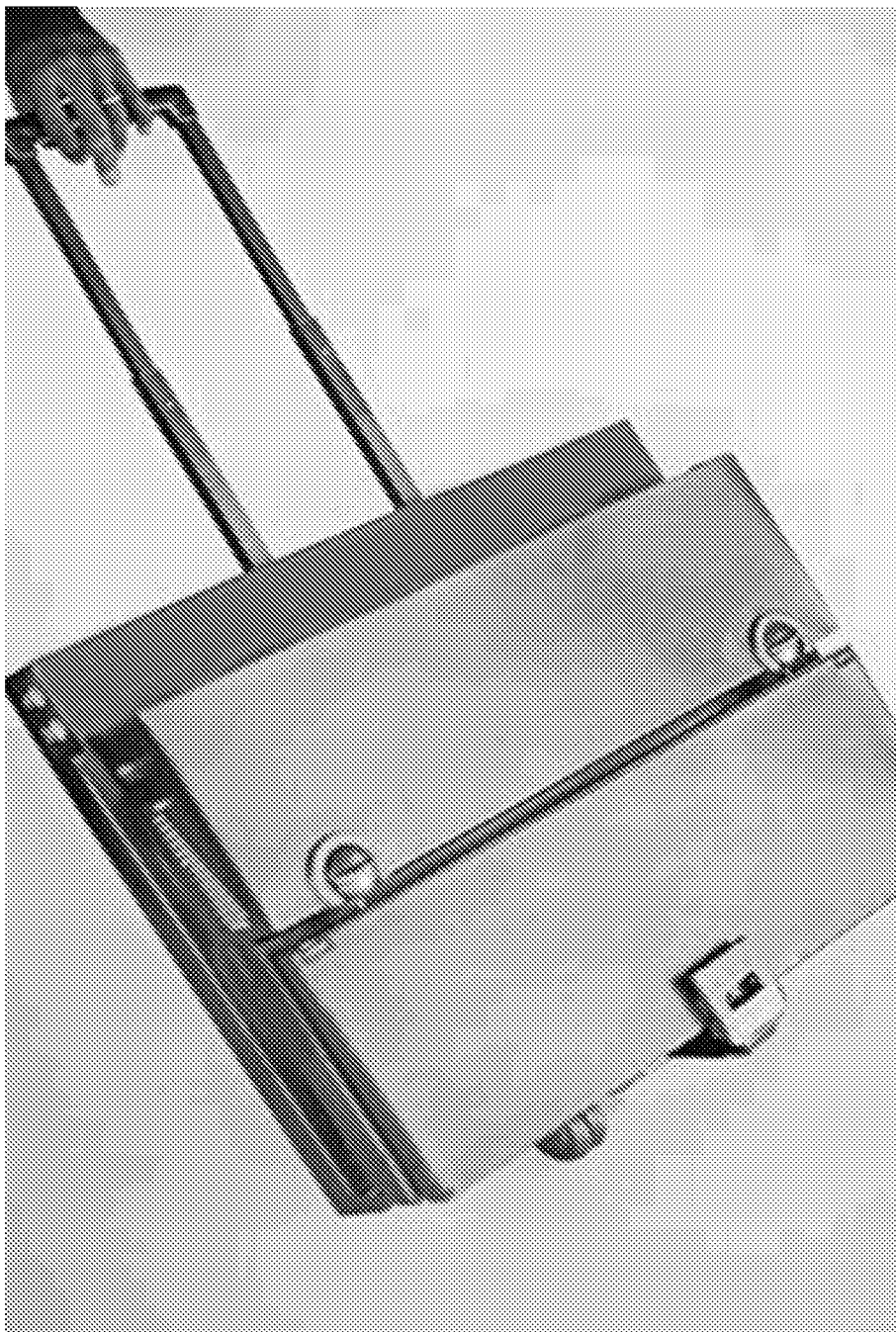


FIG. 8 F



FIG. 8 G

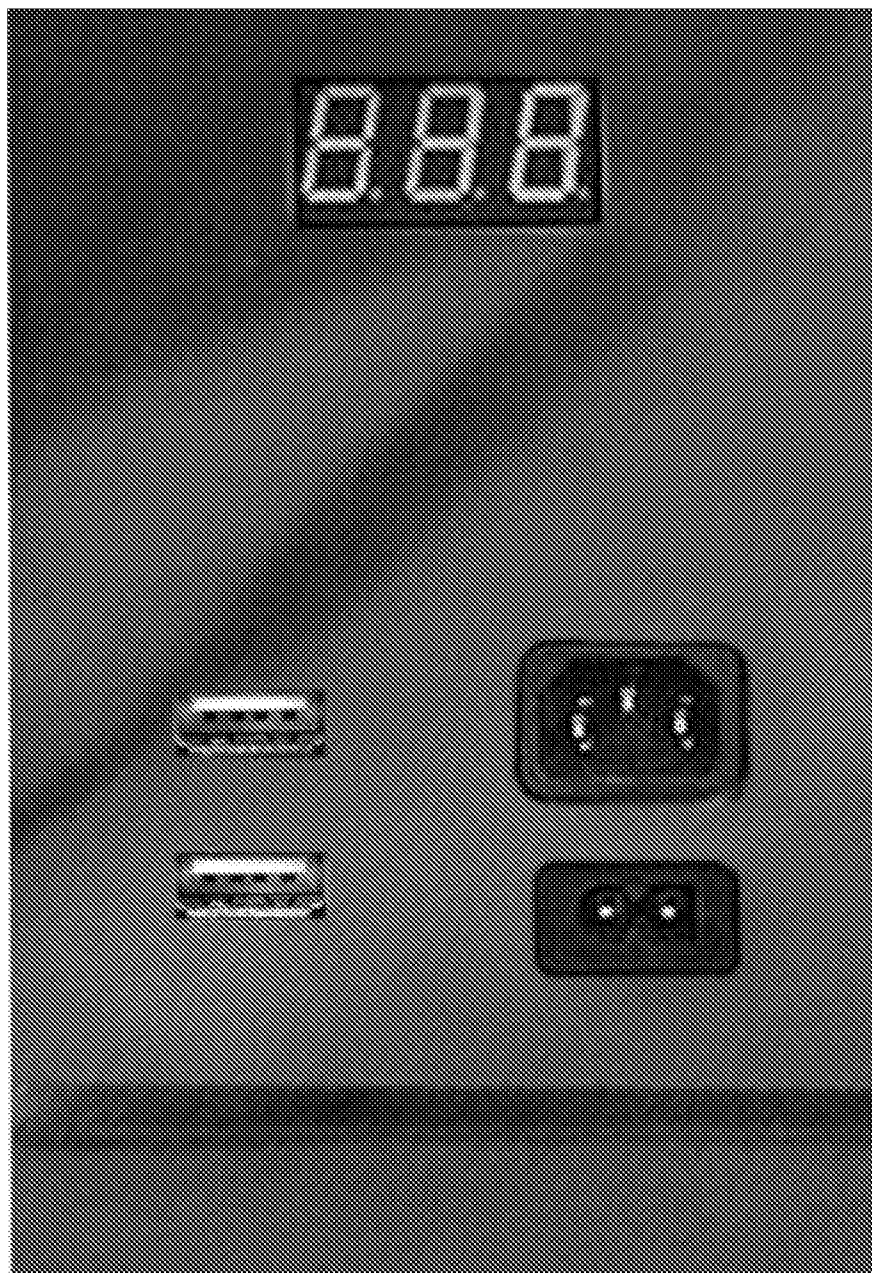


FIG. 8 H

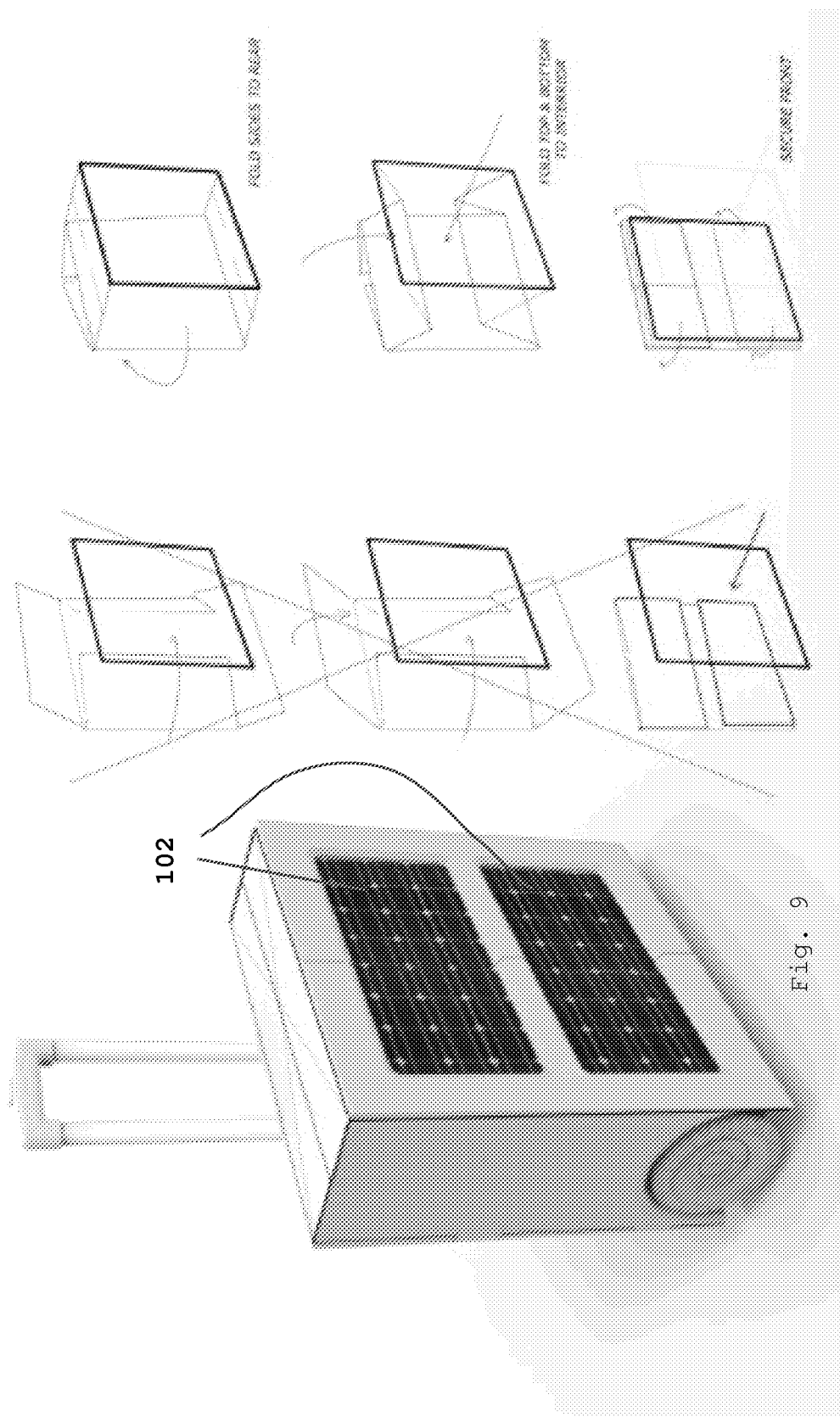


Fig. 9

COLLAPSIBLE SOLAR REFRIGERATOR**CROSS-REFERENCE TO RELATED APPLICATIONS**

[0001] This application claims priority to and the benefit of the filing of U.S. Provisional Patent Application Ser. No. 61,842,024, entitled "Collapsible Refrigerator", filed on Jul. 2, 2013, and the specification and claims thereof are incorporated herein by reference.

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

[0002] Not Applicable.

INCORPORATION BY REFERENCE OF MATERIAL SUBMITTED ON A COMPACT DISC

[0003] Not Applicable.

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[0004] Not Applicable.

BACKGROUND OF THE INVENTION

[0005] 1. Field of the Invention (Technical Field)

[0006] The present invention relates to portable refrigeration apparatuses and methods.

[0007] 2. Description of Related Art

[0008] Since the development of modern refrigeration systems, there has been a constant quest to improve the efficiency of these units in order to reduce size. Improvements in efficiency did transpire and the systems that are offered today are vastly improved over those in existence in the early 1900s. Advances in coolant chemistry and technology, in condenser and evaporator systems, and in the materials used to provide the insulated housing have all contributed to designs for coolers, refrigerators, chiller systems, and the like.

[0009] In recent years, the popularity of portable chiller systems has arisen, perhaps as a result of the extremely mobile American society. These coolers typically look like a tradition ice chest type that a person might use for camping or other recreational pursuits. In the case of the portable chiller type, however, the cooler contains a chiller circuit that is capable of providing refrigeration so long as the power supply to the unit is maintained. Normally, such portable chiller systems utilize both AC and DC power sources, such that when the user is on the road or at a camp site the DC source is taken from the car or motorhome and that mode is used to maintain the portable chiller. Otherwise, if the user happens to be in a location where AC power is handy, such as a hotel room or at a marina with shore power, the portable chiller can be maintained using that power source.

[0010] In any event, the portable chillers referred to still maintain the bulky size and heft of large ice chests even if the size of the chilling systems have been minimized. Advances have been made with respect to ice chests and portable coolers where they have been fabricated from soft-sided materials and can be compacted very easily for storage. However, these constructions do not provide as much insulation as the conventional ice chests and their use is a compromise at best in terms of efficiency versus convenience. In addition, if the soft-sided coolers were fitted with the mechanicals for chilling, the overall structure would be difficult to handle, since part would be rigid and inflexible and part would be com-

pactable and crushable. While such units would fulfill part of the equation for storage purposes, the overall efficiency and effect would not meet the expectations of those users who desired to have the equivalent of a portable chiller that would adequately refrigerate their foodstuffs and drinks.

[0011] In the prior art there have been numerous versions of a portable chiller. These include approaches that utilize traditional chilling circuits whereby a coolant such as a Freon or a Freon substitute, is circulated between an evaporator loop and a condenser loop. In addition, there have been chiller circuits developed that are quite adaptable for portable use, using a thermoelectric chilling/heating system. Both types have been found in the portable chillers that are known and each has its advantages. However, none of the portable chillers in the prior art are truly compactable or collapsible without some concurrent sacrifice in efficiency, convenience or durability.

[0012] Notwithstanding the advances in chilling systems, there still remains a long felt need for a portable chiller that is very efficient, that retains the durability of solid wall construction and that is compactable or collapsible for convenience and for easy storage. The benefits and attributes of the present invention address this long felt need as well as other deficiencies that are known in the prior art.

BRIEF SUMMARY OF THE INVENTION

[0013] The present invention is of a portable refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks, comprising: a chiller circuit; and a front wall, a rear wall, a top wall, a base, and at least a pair of sidewalls combined together to enclose a storage space when the portable refrigerator is in the functional mode; wherein said storage space is controllably cooled by the chiller circuit; and wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable to form a compact package when the portable refrigerator is in the collapsed mode; and wherein the top wall comprises one or more solar panels thereon. In the preferred embodiment, the chiller circuit is housed within the rear wall. The front wall, the rear wall, the top wall, the base and the side walls are comprised of a rigid construction. The portable refrigerator further includes a handle for carrying the portable refrigerator when it is in the collapsed mode. The chiller circuit is powered by a DC power supply. The top wall is segmented into two portions that are foldable with respect to each other. The front wall, the rear wall, the sidewall and the top wall are each foldable at their place of contact with a living hinge.

[0014] The invention is further of a portable refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks, the portable refrigerator comprising: a chiller circuit; and a front wall, a rear wall, a top wall, a base, and at least a pair of side walls comprised of rigid panels which combine together to enclose a storage space when the portable refrigerator is in the functional mode; wherein said storage space is controllably cooled by the chiller circuit; and wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable at their place of contact with a living hinge, forming a folded compact package when the portable refrigerator is in the collapsed mode; and wherein the top wall comprises one or more solar panels thereon. In the preferred embodiment, the top wall is segmented into two portions that are foldable with respect to each other. The chiller circuit is powered by a DC

power supply. The portable refrigerator further includes a handle for carrying the portable refrigerator when it is in the collapsed mode. The chiller circuit is housed within the rear wall.

[0015] The invention is additionally of a collapsible refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks, the collapsible refrigerator comprising: a chiller circuit powered by an electric power supply; and a front wall, a rear wall, a top wall, a base, and at least a pair of side walls comprised of rigid panels which combine together to enclose a storage space when the collapsible refrigerator is in the functional mode; wherein said storage space is controllably cooled by the chiller circuit; and wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable at their place of contact with a living hinge, forming a folded compact package when the collapsible refrigerator is in the collapsed mode; and wherein the collapsible refrigerator is secured in the collapsed mode and may be stored; and wherein the top wall comprises one or more solar panels thereon. In the preferred embodiment, the collapsible refrigerator is secured by hook-and-loop strips when in the collapsed mode. A handle is provided for carrying when in the collapsed mode. The chiller circuit is housed within the rear wall. The top wall is segmented into two portions that are foldable with respect to each other. The chiller circuit is comprised of a coolant system employing an evaporator portion and a condenser portion. The chiller circuit is comprised of a condenser-based cooling system. The front wall, the rear wall, the top wall, the base and the side walls are comprised of a rigid construction.

[0016] Further scope of applicability of the present invention will be set forth in part in the detailed description to follow, taken in conjunction with the accompanying drawings, and in part will become apparent to those skilled in the art upon examination of the following, or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained by means of the instrumentalities and combinations particularly pointed out in the appended claims.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

[0017] The accompanying drawings, which are incorporated into and form a part of the specification, illustrate one or more embodiments of the present invention and, together with the description, serve to explain the principles of the invention. The drawings are only for the purpose of illustrating one or more preferred embodiments of the invention and are not to be construed as limiting the invention. In the drawings:

[0018] FIG. 1 is an isometric view of the portable refrigerator of the present invention as shown in the functional mode.

[0019] FIG. 2 is an isometric view of the portable refrigerator of FIG. 1, as shown in the first stage of transition from the functional mode to the collapsed mode.

[0020] FIG. 3 is an isometric view of the portable refrigerator of FIG. 2 in the next sequential step in the transition of the invention from the functional mode to the collapsed mode.

[0021] FIG. 4 is an isometric view of the portable refrigerator of FIG. 3 in the next sequential step in the transition of the invention from the functional mode to the collapsed mode.

[0022] FIG. 5 is an isometric view of the portable refrigerator of the FIGS. 1-4 as shown in the fully collapsed mode and as viewed from the top of the invention.

[0023] FIG. 6 is an isometric view of the portable refrigerator of FIG. 5 as shown from the bottom side.

[0024] FIG. 7 is a cross sectional view of the portable refrigerator of FIG. 2, taken along Section 7-7.

[0025] FIGS. 8(a)-(h) show another embodiment of the invention as described in Example 2, below.

[0026] FIG. 9 shows a further embodiment of the invention as described in Example 3, below.

DETAILED DESCRIPTION OF THE INVENTION

[0027] The present invention is of a novel solar portable refrigerator wherein the refrigerator is collapsible for storage, comprising foldable panels for a top, side walls, a front, a rear and where all of the panels are attached to a base. One of the panels further includes a chiller circuit that is capable of recirculating the air contained with the refrigerator and cooling it to a selected set point. When in the collapsed mode, the collapsible refrigerator is securable and can be easily handled by the user and stored in a convenient manner. The top preferably comprises one or more solar panels, preferably detachable.

[0028] A portable chiller of the present invention is shown in the drawings and is discussed in detail within this section. The terms "chiller" or "refrigerator" are essentially interchangeable as used within this specification. Typically, the term "chiller" is meant to convey a chiller circuit which is the conventional approach for coolant-based refrigeration. Chiller circuits employ a coolant supply that is plumbed to run from an evaporator section where the heat is taken up, to a condenser section where heat is blown off, the end result being the ability to cool (or heat) a subject volume. Chiller circuits can be scaled to fit virtually any cooling requirement and in industrial or commercial applications the amount of chilling power is great enough that it is conventionally measured in "tons" of cooling. Conversely, smaller units are in use in the ways described above and essentially work in the same manner and use the same essential chemistry and technology with the scale of cooling power being the only substantive difference.

[0029] In the present case, the chiller of the present invention is a reduced version of the type of chiller circuit that would commonly be associated with refrigerators. The fact that the present invention is meant to operate as a device for the cold storage of foodstuffs means that in essence it is a small refrigerator; nonetheless, it is also an example of a chiller operation. Using alternate technology for the chilling purposes of the present invention is entirely feasible and would not be prohibited. The use of thermoelectric cooling, for example, is an acceptable alternative although the components for thermoelectric chilling will not be shown since they would merely substitute in place of the chiller circuit that is shown, using the same architecture for the supply air and return air systems. Nonetheless it is understood that thermoelectric chilling would be a feasible alternate to the embodiments of the invention as taught herein.

[0030] Turning now to FIG. 1, a collapsible refrigerator 10 is shown in the functional mode, i.e., it is fully expanded and is ready for use in receiving foodstuffs and/or drinks and can be powered to provide a refrigerated function. The collapsible refrigerator 10 includes the front wall 12, the rear wall 14, the top wall(s) 16, the base 18, the side wall(s) 20, and the

controls 22. There are also shown Velcro fastening strips 24 running from the base 16 to the front wall 12. It is understood and seen from the drawings that the collapsible refrigerator 10 encloses a space defined interior to the front wall 12, the rear wall 14, the top wall(s) 16, the base 18, the side wall(s) 20, that is useable for the storage of foodstuffs and the like. This space may be termed the storage space for the purposes within this application.

[0031] In FIG. 2, the collapsible refrigerator 10 is shown in the first step of the transition from the functional mode to the collapsed mode, where the side walls 20 have been folded over onto the floor 36. The interior rear wall 26 is shown, with the return air vent 28, the supply air vent 30, the top wall living hinge 32 and the sidewall living hinge 34.

[0032] FIG. 3 continues the stages in transition from the functional mode to the collapsed mode, where the collapsible refrigerator 10 can now be seen with the mid-top wall living hinge 38, the exhaust vent 40, the DC supply 42, the DC supply line 44, the DC jack 46 and the DC input 48. The mid-top living hinge 38 separates two of the panels that make up the top wall 16, and which are identifiable as 16(a) and 16(b).

[0033] Turning now to FIGS. 5 and 6, the collapsible refrigerator 10 of the present invention is shown in the collapsed mode, with the handle section 50, the handle 52, the rear living hinge 54 and the bottom 56.

[0034] Lastly, FIG. 7 portrays the chiller circuit for the collapsible refrigerator with the identification of the major components. Specifically, the chiller circuit 60 includes the chiller housing 58, the return air plenum 62, the return air duct 64, the chilled air blower 66, the chilled air intake 68, the chilled air exhaust 70, the evaporator housing 72, the evaporator coils 74, the supply air plenum 76, the supply air duct 78, the condenser housing 80, the condenser 82, the condenser inlet 84, the condenser outlet 86, the hot air exhaust housing 88, the condenser coils 90, the hot air exhaust flow 92, the hot air exhaust blower 94, the hot air exhaust intake 96, the hot air exhaust 98 and the hot air exhaust plenum 100.

[0035] It can now be appreciated that the usage of the collapsible refrigerator 10 of the present invention proceeds in a specific way and with specific benefits. In the functional mode, the front wall 12, rear wall 14, top wall 16, base 18 and the side walls 20 are all in the position as shown in FIG. 1 and serve to form an enclosure that would be useable for the storage of foodstuffs and/or drinks. In this mode, the DC supply 42, via the DC line 44, the DC jack 46 is brought to the collapsible refrigerator 10 and is supplied through the DC input 48 to the unit. The DC supply as shown is actually a plug that is compatible with insertion into the typical cigarette lighter outlet. In an alternate embodiment, the DC supply could result from a DC transformer of the type that is plugged into an AC power 20 source and this would also service the present invention in entirely the same manner. In the functional mode the user is free to situate the collapsible refrigerator wherever it would be convenient and where a compatible power source would be available. The benefits of this attribute allow the unit to be used in a car, truck, boat, camper, cottage, hotel room, and the like.

[0036] The front wall 12, rear wall 14, top wall 16, base 18 and the side walls 20 are made up of solid or semi-solid construction. For instance, they may be comprised of the same construction that is found in the plastic ice chests used for short-term cold storage which typically have plastic panels that sandwich insulating materials therein or merely

enclose air space. They could also be constructed from solid panels such as structural foam or even solid plastic or metal, and still achieve the compactable objectives set forth herein although the comparative insulating properties of each may vary in acceptability. The wall constructions that are known in use with modern ice chests are famous both for their insulation properties which would assist the storage of foodstuffs within the collapsible refrigerator of the present invention, as well as promote a very substantial and strong housing for the collapsible refrigerator. Unlike some of the prior art coolers, that have soft-sided construction, the uniqueness of the solid or semi-solid construction of the present invention offer great advantage in strength, in the protection of the contents, and in overall durability. Whether the selection is a solid or semi-solid construction the result is rigid panels that are used to form the various walls (and base) of the present invention. Normally this type of construction would not be subject to compactability but for the teachings of the preferred embodiments of the present invention.

[0037] Given the character of the construction of the collapsible refrigerator herein, the fact that it has been designed to fold into a very small package is a major convenience for the user. Following the progression of the collapsing process, the unit shown in FIG. 1, transitions to the version in FIG. 2 where the side walls 20 have been folded inwardly towards the center, and lay on the floor 36. The folding of such panels is facilitated through the use of living hinges such as the sidewall living hinge 34. A living hinge is usually associated with plastic construction where a thin plastic connection is retained between two foldable pieces. The durability of plastics is such that a type of plastic and thickness can be selected for this purpose and will result in excellent service and lifetime. The preferred use of the living hinges in the present invention allows the construction to be fabricated easily and cost effectively. In an alternate mode, other types of hinges can be used, including piano types hinges, however, these are considered to be inferior for applications of this type.

[0038] Turning to FIG. 3, the front wall 12 is folded inwardly towards the center of the unit, and it is simultaneously released from contact with the Velcro® (hook-and-bop) strips 24 which adhere to corresponding Velcro components (not shown) mounted on the front wall 12. The top wall 16, is foldable onto the front wall 12, as shown, with the individual panels 16(a) and 16(b) being simultaneously being folded as shown to provide a more compact package as at the same time the rear wall 14 is simultaneously being folded inwardly, towards the center of the unit and also towards the front wall 12 which is already resting on top of portions of the side walls 20.

[0039] FIG. 4 shows the collapsible refrigerator in the last stage of the transition from a functional mode to the collapsed mode. As can be seen, the front wall 12 is sandwiched between the side walls 20 and the segments forming the top wall 16(a) and 16(b). The rear wall 14 is in the final position resting on top of the side walls 20 and nested against the rear edge of the top wall 16. Similar to the living hinge 34 for the side walls, the top wall living hinge 32 allows the rear wall to collapse against the top wall segments in the last stage of the transition. The DC jack 46 is withdrawn from the DC input 48 at some time prior to reaching the collapsed mode.

[0040] The collapsible refrigerator 10 of the present invention, shown in the collapsed mode in FIGS. 5 and 6, displays the handle portion 50 which extends along what would have been the bottom side of the rear wall 14 when the rear wall

was upright in the functional mode. In the central part of the handle portion is a handle **52** which is shown as a through hole suitable for grasping by a user. In lieu of a formed handle, the present embodiment could be provided with a loop type handle that would be fastened to the handle portion **50**. The Velcro strips **24** have been reattached to corresponding components on the underside of the top wall segment **16(a)**. This attachment secures the top wall **16** and the rear wall **14** in the stored position and by extension, these keep the sidewalls **20** retained underneath.

[0041] In the collapsed mode, the unit is extremely compact as compared to its size in the functional mode. In fact, in the preferred embodiment, the collapsible refrigerator would be approximately 30" wide, 12" tall and about 18" deep. This would provide ample storage space for the user, although different sized units could easily be provided if demands for smaller or larger capacities were necessary. In the case of the preferred embodiment, the collapsible refrigerator would approximate the size of a closed laptop computer when in the collapsed mode. The preferred embodiment would then be compatible with many of the available storage or carrying cases and it would fit wherever space was anticipated for items like a laptop would be reserved. A storage or carrying case could be supplied with the invention and it would be useful for storing the DC supply and related accessories.

[0042] Turning now to FIG. 7, the chiller circuit **60** of the present invention is shown. It is understood that the chiller circuit is preferably designed to run on 12 volt DC current (preferably supplied via solar energy stored in a battery, the energy supplied by solar panels **102** as shown in FIG. 9). In use, the chiller circuit is thermostatically controlled by the control **22** which is located on the exterior of the collapsible refrigerator. The control is adjustable and may be set for a range of temperatures, including freezing. The control, no matter what setting, will be able to call the chiller circuit into action when the set point for the desired temperature is breached. The action of the chiller circuit would immediately commence the operation of the chilled air blower **66**, the hot air exhaust blower **94** and the condenser **82**. The chilled air blower will circulate the air contained within the collapsible refrigerator and pass it over the evaporator coils **74** by bringing it into the chilled air intake **68** where it picks it up from the return air plenum **62**, and then distributes it into the evaporator housing **72** after being discharged from the chilled air exhaust **70**. This air flow is chilled when it passes over the evaporator coils and then continues through the supply air plenum **76** into the supply air duct **78** where it is discharged into the interior of the area enclosed by the front wall, rear wall, base, top wall, and side walls of the collapsible refrigerator.

[0043] The condenser **82**, when activated as part of the chiller circuit, pumps the coolant (typically Freon or a Freon equivalent) through the evaporator coils where the coolant is optimized for taking up heat from the air flows passing over the coils. The coolant then proceeds to the condenser coils where the heated coolant is cooled by the passage of the airflows generated by the hot air exhaust blower **94**. These air flows are brought in through vents (not shown) in the hot air exhaust housing **88** and are drawn into the hot air exhaust blower intake **96** and then discharged through the hot air exhaust **98** through the hot air exhaust plenum **100** and then to the outside. This airflow is indicated by the airflow path **92**. The net effect of this exhausting of the hot air is to reduce the heat content of the coolant as it flows through the condenser

coils. The coolant continues to flow through the circuit, reaching the condenser inlet **84**, where it recommences the process all over again.

[0044] The circulation of the coolant through the chiller circuit, continuously transfer heat form the recirculated air within the collapsible refrigerator, lowering the air temperature until it reaches the selected set point as determined by the user. The chiller circuit is contained within its own housing which protects the components from damage and also seals those parts of the system that are directing airflows.

[0045] As alluded to above, the chiller circuit of the type shown can be replaced with a thermoelectric chiller without detracting from the function of the present invention. Both may be considered chiller circuits for the purposes of this discussion, however the preferred embodiment is deemed to be the chiller circuit disclosed in FIG. 7.

[0046] In the preferred embodiment, and as readily understood by one of ordinary skill in the art, the apparatus according to the invention can include a general or specific purpose computer or distributed system programmed with computer software implementing the control system described above, which computer software may be in any appropriate computer language, including C++, FORTRAN, BASIC, Java, assembly language, microcode, distributed programming languages, etc. The apparatus may also include a plurality of such computers/distributed systems (e.g., connected over the Internet and/or one or more intranets) in a variety of hardware implementations. For example, data processing can be performed by an appropriately programmed microprocessor, computing cloud, Application Specific Integrated Circuit (ASIC), Field Programmable Gate Array (FPGA), or the like, in conjunction with appropriate memory, network, and bus elements.

INDUSTRIAL APPLICABILITY

[0047] The invention is further illustrated by the following non-limiting examples.

EXAMPLE 1

[0048] To recap, the present invention is a collapsible/foldable portable solar refrigerator/freezer and or warmer that can also collapse and or fold up three different ways for portability. The invention is useful for camping, hiking, road trips, shopping, runs off of one's car, or detachable solar panel the collapsible portable solar car fridge/freezer is powered by a 25 watt or more solar panel and or a deep cycle solar battery. While in use the fridge/freezer can be powered by the batteries stored charge for up to 9 hr, with a 22-amp or more deep cycle battery or it can be powered directly by the sun through the solar panel. There is a switch that allows one to pick which power method they prefer to use.

[0049] The battery can be charged in approximately 0.2 hours while plugged into a car cigarette lighter, while at the same time powering the collapsible portable solar fridge/freezer. The battery can be charged in approximately 0.8 hours by the solar panel alone. Therefore it can keep replenishing itself day after day and keep running if needed. The solar panel is also detachable to be placed in the sun light through the car window or outside of the car. It can also be stored away separately when it is not needed.

[0050] There is also preferably an inverter outlet that allows one to plug in devices (i.e., cell phone, handheld game, etc.). The inverter goes up to 300 watts or more.

[0051] The invention incorporates a highly efficient compressor that can be powered by a solar battery or by the 12V electrical system of an automobile. However, its applications and points of use are much wider.

[0052] An embodiment of the present invention comprises a rectangular “mini refrigerator” with an outer housing made from 1 inch thick, high density insulated material. It measures 30 inches long, 18 inches wide and 12 inches tall. The sections of the housing are hinged together to create the fold-up design and the two-piece lid is hinged in the middle of the cover. A sliding power switch and thermostat control is located on the left, outer side of the housing and a 12-volt power cord is located on the bottom. Running horizontally along the back interior part of the appliance are an air-supply and air-return grille, each measuring 28 inches long and 2 inches wide. Located on the underside is a rectangular port for discharging warm air, a return-air plenum and return-air duct are found on the back. A supply-air fan (also located on the back) discharges air into the evaporator-coil section, and into the supply-air duct. The supply-air duct connects to the supply-air grille, or to an evaporator or cooling coil. Other components located on back panel include a swing compressor, condenser coil, heat-ejection discharge duct, and a heat-ejection discharge plenum. The center, back portion features a carrying handle.

[0053] To use the device, an individual simply places it in a vehicle trunk storage area, plugs it into lighter receptacle, places groceries inside and closes lid. To put away the appliance the user folds the panels downward onto the base and using hook-and-loop fastener strips attached at the front, secures the lid closed.

[0054] The battery is preferably rechargeable, and can be charged and will run for six hours when the refrigerator is not plugged in. There will also be a solar panel that can be attached on top of the refrigerator that will allow the appliance to continue to charge and function while in the sun. This will be perfect for outdoor outings and hauling the cooler in the back of vehicles. This will be a breakthrough in shipping medicines by vehicle to places where aircraft cannot reach.

[0055] The thermostat control will be able to go as low as 0 degrees and as high as 120 degrees Fahrenheit. The unit will be able to carry medicines/foods at the required temperatures because of the temperature variations.

[0056] The first option for the collapsible car refrigerator/freezer provides an extra layer of protection and insulation in extreme conditions.

[0057] The transit bag covers the entire collapsible portable refrigerator/freezer with appropriate cut-outs for the power cord, temperature controls and vents (for heat ventilation). It will have a solar panel integrated on top of the unit that will power and store power for the unit when the car is off or when the unit is out of the car in the sunlight. Access to the collapsible refrigerator/freezer will still be easy because you will be able to unzip the bag on the sides and unclamp the top. The outer layer of the reflective insulated material offers top heat protection from direct sunlight and long wave radiation.

[0058] Another option for material is a hard type of PVC that covers the insulation, which insulates the same way. Alternatively, aluminum metal weather resistant material may be employed. Instead of zippers the device preferably has clamps on the sides and on the top to hold the device together.

[0059] This is a dual voltage unit that is designed to operate on both 12-24 volt or standard 110 volt circuit. Advanced

motor design and insulation actually permit this unit to draw fewer amps. This embodiment is useful for boaters, campers, hunters, medical transportation/storage, recreational vehicles, cabins, and “off the grid” application. The embodiment preferably comprises the following:

[0060] Can operate as portable freezer or refrigerator depending on temperature setting

[0061] Uses 12 volt cigarette lighter plug-CE approved

[0062] Tri-Voltage power (AC or DC)

[0063] Volume: 43 qt/equivalent to 60 12 oz cans

[0064] Cooling/freezing ability from 40 degrees F. to 0 degrees F.

[0065] Variable automatic temperature control

[0066] Operates at angles up to 30 degrees off level

[0067] Refrigerant: CFC free 134A

[0068] “Swing” compressor technology (lightest weight compressor freezer available)

[0069] Tough powder coated steel exterior

[0070] 12 volt power lead: 9' detachable

[0071] Energy requirements: DC 12/24 volts, 2.7 amps

[0072] AC 110 volts

[0073] Power consumption: 0.7 amps in refrigeration mode; 2.5 amps in freezer mode

[0074] Fuse—10A thermal fuse

EXAMPLE 2

[0075] Another embodiment of the present invention is shown in FIGS. 8(a)-(h). USE charging ports are added, as shown in FIG. 8(h). The characteristics of this embodiment are as follows:

[0076] Portable collapsible freezer-refrigerator-warmer

[0077] 80 or 30 quart storage capacity

[0078] Easy-to-read control panel

[0079] AC and DC power adapters included for household or vehicle use

[0080] Compressor-based cooling for fast freezing

[0081] Insulated lid

[0082] Retractable handle for easy transport

[0083] Rounded edges for added safety

[0084] Durable, rugged design

[0085] Built-in detachable solar cells **102** that charge the ion-lithium smart battery for all night usage

[0086] Anywhere Fridge 80 or 30 Quart 12 Volt AC & DC Portable Fridge/Freezer/warmer

[0087] Fast freeze function rapidly cools unit to -8° F.

[0088] Temperature range: -8° F. to 75° F.

[0089] AC power lead with 8' detachable power cord included

[0090] DC power lead with 8' detachable power cord included

[0091] 2 built-in USB charging ports

[0092] Input voltage: 220V AC/12/24 V DC/60 Hz

[0093] Power: 60 W/1 A

[0094] Weight: from 20 to 40 lbs

[0095] The Ion Lithium battery inside of the Anywhere Fridge™ is replaceable at the end-of-life. The solar panels will continue to keep things cold even if the battery dies as long as they are in direct sunlight. The Anywhere Fridge is designed to alert you when the battery running low.

[0096] Considering that each country/region may have different plug designs, i.e., EU voltage such as 220-230, the Anywhere Fridge is preferably compatible with the requirements in any region.

[0097] The Anywhere Fridge has a temperature gauge for the user to adjust the internal temperature. The chosen temperature and the current temperature is also displayed. The unit is equipped with a rapid cooling system called Fast Freeze; this system allows the unit to freeze within 2-3 minutes of full power operation. The internal temperature of the Anywhere Fridge is not adversely affected by the external temperature/weather. Note that the Anywhere Fridge, once in operational mode, is sealed shut until one opens the latch.

[0098] The Anywhere Fridge does not need to be plugged in, as it is solar powered. The solar panels will run the unit all day while it is charging its battery to run all night. Accordingly, the Anywhere Fridge is self-sustaining, but it can be plugged in, in order to run and charge the battery simultaneously.

[0099] The Anywhere Fridge employs a fully hermetic compressor with integrated control electronic voltage protection and is adjustable for consumer or starter battery by means of a slide switch. An electronic fuse/automatic reverses pole protection.

[0100] Chill or freeze your goods while traveling with the Anywhere Fridge 80 or 30 Quart 12 Volt AC and DC Portable Fridge/Freezer/Warmer. This portable refrigerator and freezer/warmer puts the strength and insulation of a home freezer into a compact rugged appliance. Insulated metal walls keep your food cold for hours, holding a stable temperature under most conditions—even without electricity; It includes a retractable handle for comfort and it collapses flat like a briefcase for easy transport. This portable unit is great for boaters, campers, hunters, medical transportation/storage, recreational vehicles, cabins and all your outdoor applications.

[0101] The full range digital thermostat that is adjustable from -8° to 75° F. One can cool the fridge/freezer's compartment down to -8° Fahrenheit in a matter of minutes. This portable refrigerator/freezer/heater allows one to chill or freeze or keep one's goods warm while traveling. Insulated metal walls keep one's goods cold long after electrical power is gone.

[0102] The battery can be charged in approximately 0.2 hours while plugged into a car cigarette lighter, while at the same time powering the collapsible portable solar fridge/freezer. The battery can be charged in approximately 0.9 hours by the solar panel alone. Therefore it can keep replenishing itself day after day and keep running if needed. The solar panel is also detachable to be placed in the sun light through the car window or outside of the car. It can also be stored away separately when it is not needed.

EXAMPLE 3

[0103] Another embodiment of the present invention, including a different wheel assembly, illustrating the manner of folding, and showing solar cells 102 (preferably detachable), is shown in FIG. 9.

[0104] The preceding examples can be repeated with similar success by substituting the generically or specifically described elements of this invention for those used in the preceding examples.

[0105] Note that in the specification and claims, "about" or "approximately" means within twenty percent (20%) of the numerical amount cited.

[0106] Although the invention has been described in detail with particular reference to these preferred embodiments, other embodiments can achieve the same results. Variations

and modifications of the present invention will be obvious to those skilled in the art and it is intended to cover in the appended claims all such modifications and equivalents. The entire disclosures of all references, applications, patents, and publications cited above are hereby incorporated by reference.

What is claimed is:

1. A portable refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks, the portable refrigerator comprising: a chiller circuit; and

a front wall, a rear wall, a top wall, a base, and at least a pair of sidewalls combined together to enclose a storage space when the portable refrigerator is in the functional mode;

wherein said storage space is controllably cooled by the chiller circuit; and

wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable to form a compact package when the portable refrigerator is in the collapsed mode; and

wherein the top wall comprises one or more solar panels thereon.

2. The portable refrigerator of claim 1, wherein the chiller circuit is housed within the rear wall.

3. The portable refrigerator of claim 1, wherein the front wall, the rear wall, the top wall, the base and the side walls are comprised of a rigid construction.

4. The portable refrigerator of claim 1, wherein the portable refrigerator further includes a handle for carrying the portable refrigerator when it is in the collapsed mode.

5. The portable refrigerator of claim 1, wherein the chiller circuit is powered by a DC power supply.

6. The portable refrigerator of claim 1, wherein the top wall is segmented into two portions that are foldable with respect to each other.

7. The portable refrigerator of claim 1, wherein the front wall, the rear wall, the and the top wall are each foldable at their place of contact with a living hinge.

8. A portable refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks, the portable refrigerator comprising: a chiller circuit; and

a front wall, a rear wall, a top wall, a base, and at least a pair of side walls comprised of rigid panels which combine together to enclose a storage space when the portable refrigerator is in the functional mode;

wherein said storage space is controllably cooled by the chiller circuit; and

wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable at their place of contact with a living hinge, forming a folded compact package when the portable refrigerator is in the collapsed mode; and

wherein the top wall comprises one or more solar panels thereon.

9. The portable refrigerator of claim 8, wherein the top wall is segmented into two portions that are foldable with respect to each other.

10. The portable refrigerator of claim 8, wherein the chiller circuit is powered by a DC power supply.

11. The portable refrigerator of claim 8, wherein the portable refrigerator further includes a handle for carrying the portable refrigerator when it is in the collapsed mode.

12. The portable refrigerator of claim **8**, wherein the chiller circuit is housed within the rear wall.

13. A collapsible refrigerator transitionable between a functional mode and a collapsed mode for use in the cold storage of foodstuffs or drinks, the collapsible refrigerator comprising:

a chiller circuit powered by an electric power supply; and a front wall, a rear wall, a top wall, a base, and at least a pair of side walls comprised of rigid panels which combine together to enclose a storage space when the collapsible refrigerator is in the functional mode;

wherein said storage space is controllably cooled by the chiller circuit; and

wherein the front wall, the rear wall, the top wall and the side walls are inwardly foldable at their place of contact with a living hinge, forming a folded compact package when the collapsible refrigerator is in the collapsed mode; and

wherein the collapsible refrigerator is secured in the collapsed mode and may be stored; and

wherein the top wall comprises one or more solar panels thereon.

14. The collapsible refrigerator of claim **13**, wherein the collapsible refrigerator is secured by hook-and-loop strips when in the collapsed mode.

15. The collapsible refrigerator of claim **13**, further comprising a handle for carrying when in the collapsed mode.

16. The collapsible refrigerator of claim **13**, wherein the chiller circuit is housed within the rear wall.

17. The collapsible refrigerator of claim **13**, wherein the top wall is segmented into two portions that are foldable with respect to each other.

18. The collapsible refrigerator of claim **13**, wherein the chiller circuit is comprised of a coolant system employing an evaporator portion and a condenser portion.

19. The collapsible refrigerator of claim **13**, wherein the chiller circuit is comprised of a condenser-based coding system.

20. The portable refrigerator of claim **13**, wherein the front wall, the rear a the top wall, the base and the side walls are comprised of a rigid construction.

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