Nov. 24, 1942. H. W. RIBBLE 2,303,000

COOLING APPARATUS

Filed March 9, 1939 2 Sheets-Sheet 1

Fig. 1.

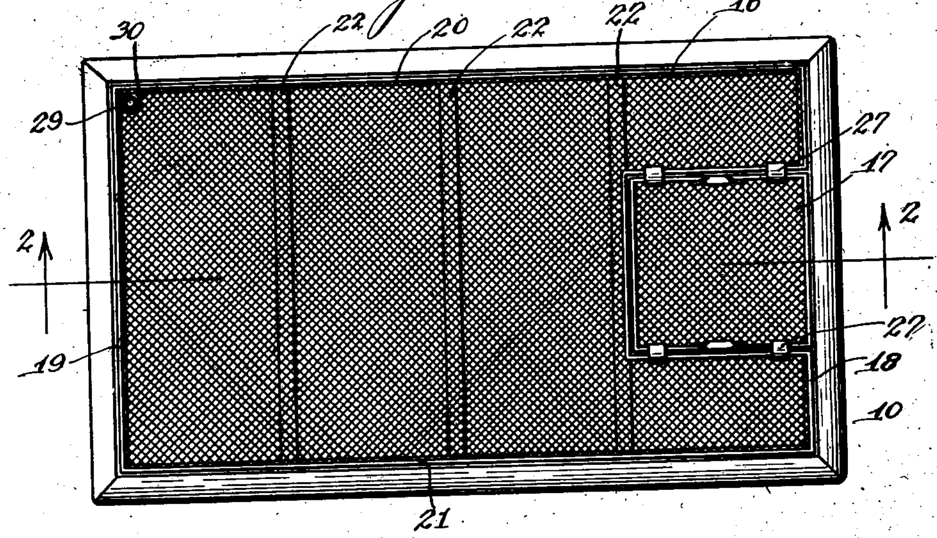

Fig. 2.

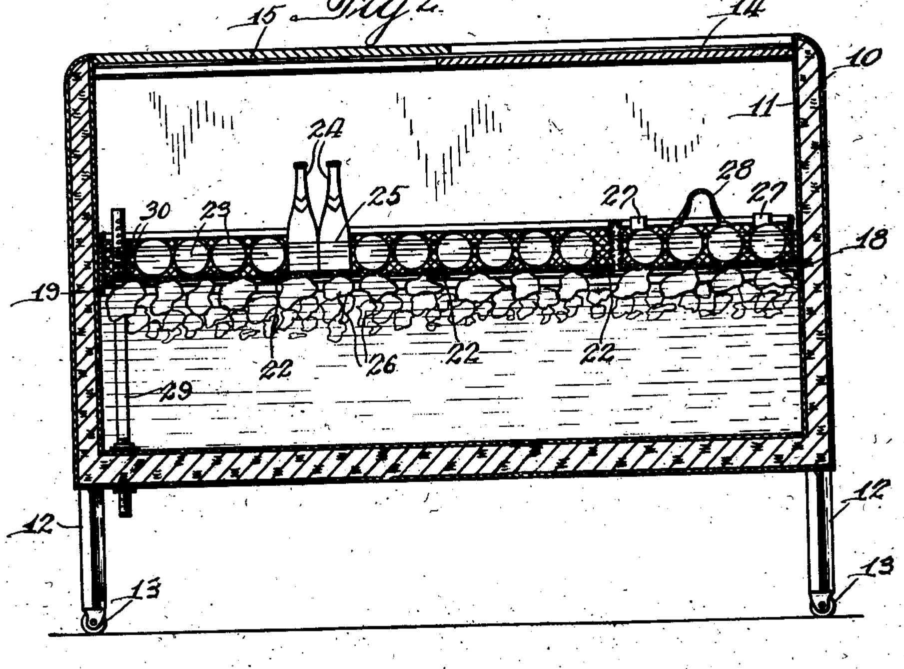

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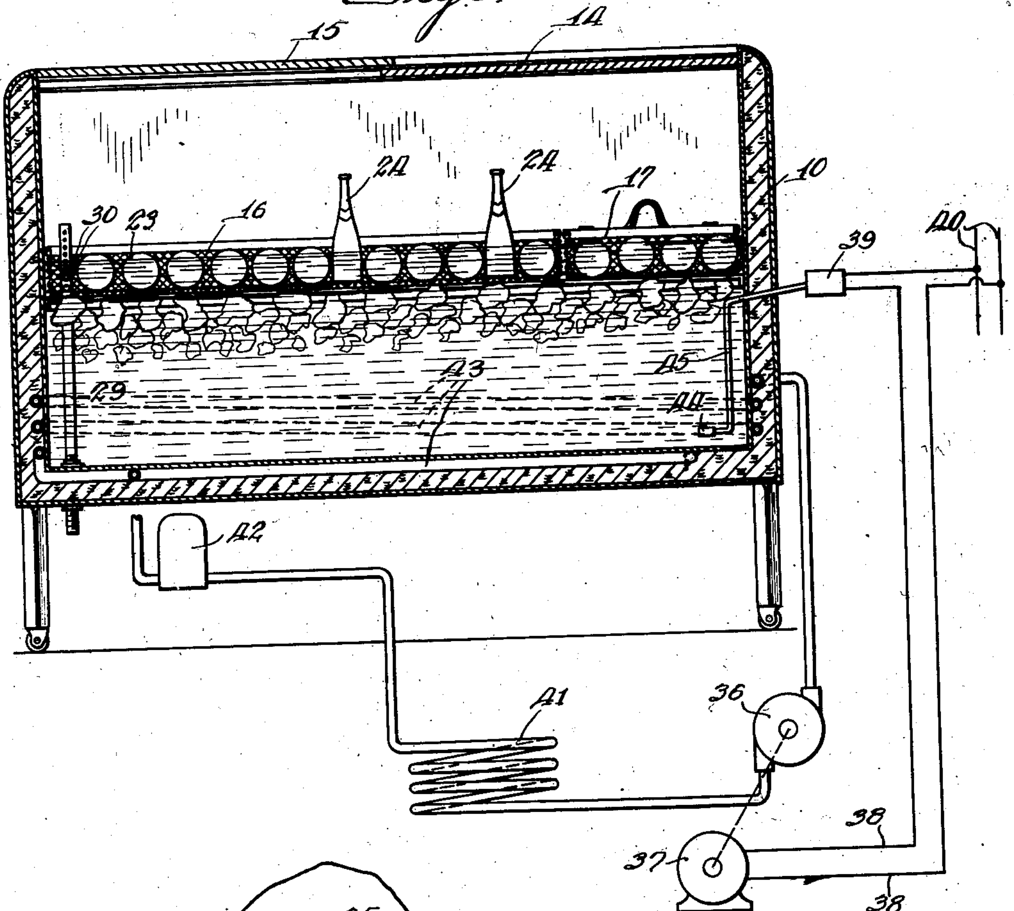
Fig. 3.



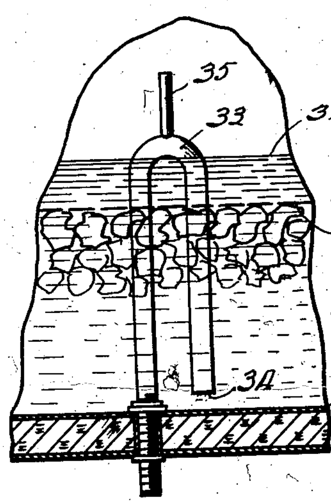


Fig. 4.

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COOLING APPARATUS

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Application March 9, 1939, Serial No. 260,713

3 Claims. (Cl. 62—104)

My invention relates to cooling apparatus, more particularly to apparatus for cooling articles or packages adapted to be at least partially immersed in a cooling medium bath, and has for an object the provision of an improved apparatus of this character.

Although my invention, as will be clearly apparent from the following description, is not limited thereto, it is particularly applicable to the cooling of beverage containers such as bottles, cans, and the like adapted to be wholly or partially immersed in a bath of water. Conventional ice-cooled units for cooling packages or articles of this character usually consist of a cabinet or housing adapted to contain a bath of water in which a quantity of cracked or crushed ice is deposited along with the articles or packages to be cooled. When such conventional units are first iced up, as at the beginning of a day's operation, it is the usual practice to deposit in the unit enough crushed ice to cover completely the articles that are to be cooled. Thus, when various brands of merchandise are being cooled in the same cabinet, it is necessary for the dealer to dig into the crushed ice with his hands in order to locate the particular brand desired.

Furthermore, such conventional units do not function in an entirely satisfactory manner so as properly to cool the articles immersed in the water bath. It is a well known fact that ice floats in a water bath, and it is equally well known that water reaches its maximum density point at a temperature between 39 and 40° F. rather than at its freezing temperature of 32° F. I have found that in conventional units of the type indicated above, the bottom portion of the water bath below the ice is maintained at a minimum temperature of approximately 40° F., which temperature is not sufficiently low for the most satisfactory cooling of beverage containers. This limitation on the temperature of the lower portion of the bath is due to the fact that if the temperature of this water increases, due to the transfer of heat from the articles being cooled, such heated water tends to rise, but upon coming in contact with the ice floating in the bath is cooled to its maximum density point of approximately 40° and again settles to the bottom of the bath.

In some localities consumer taste requires that carbonated beverages be cooled to a temperature substantially below 40° F., and prior attempts to achieve such low temperatures by mechanical refrigeration have in the large majority of cases been highly unsatisfactory due to the unintentional freezing of the contents of a large portion of the beverage-containing packages.

Accordingly, it will be seen that something is yet to be desired in cooling units of this character, and it is a further object of my invention to provide a cooling apparatus which overcomes the previously encountered objections to such cooling units, and which is effective to cool packages or articles wholly or partially immersed in a water bath to a temperature below 40° F. and to maintain the package or articles at a substantially constant temperature below 40° F. without any danger of freezing the contents of the packages or articles.

In carrying out my invention in one form, the articles to be cooled are wholly or partially immersed in the upper portion of a bath of water and a quantity of ice is forcibly retained in the lower portion of the bath against the tendency of the ice to float, so that the articles being cooled are disposed in the bath above the ice. With such an arrangement I have found that although the portion of the bath below the ice is maintained at a temperature of approximately 40° F., all of the water bath above the ice, i. e. the portion in which the articles are immersed, is maintained at a substantially constant temperature between 32½ to 33° F.

In order to carry out the above method of cooling, I provide a cabinet or housing adapted to contain a water bath of substantial depth, and a substantially horizontal foraminous partition is arranged in the housing below the level of the water bath. In operation, a quantity of ice is inserted below the partition either by providing a removable portion in the partition, through which ice may be inserted into the lower portion of a bath, or by providing means for freezing predetermined quantities of the water contained in the lower portion of a bath, and the articles to be cooled are supported on the partition so as to be wholly or partially immersed in the upper portion of the bath above the ice. In addition, overflow means are provided for maintaining at a substantially constant level the depth of the bath, and preferably the overflow means is so arranged as to withdraw excess water from the lower portion of the bath so that water thus disposed of is the warmer 40° water contained in the bottom of the bath rather than the colder 33° water at the top of the bath.

For a more complete understanding of my invention, reference should now be had to the drawings, in which:

Figure 1 is a plan view of an apparatus embodying my invention, the top of the cabinet or housing being moved in order to illustrate more clearly the constructional details;

Fig. 2 is a sectional view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view similar to Fig. 2 but illustrating another embodiment of my invention; and

Fig. 4 is a fragmentary sectional view illustrating a preferred form of overflow means for use in the apparatus of Figs. 1 and 2.

Referring now to Figs. 1 and 2 of the drawings, I have shown my invention as embodied in a cooling unit comprising a cabinet or housing 10 having side, end, and bottom walls that are insulated as shown, and that are provided with an inner water-tight lining 11, preferably formed of galvanized metal or similar material. As shown, the cabinet is preferably supported on suitable legs 12, each of which is provided with a caster or roller 13, and the top of the cabinet comprises a pair of sliding panels 14 and 15, such as are provided on conventional cooling units of the type well known in the art.

It will be apparent that the cabinet 10 as thus constructed is adapted to contain a water bath of substantial depth, and in order to divide the water bath into upper and lower portions I provide a substantially horizontal partition which extends entirely across the cabinet at a substantial distance from the bottom thereof. In the particular embodiment of my invention shown, this horizontal partition is composed of a pair of removable trays 16 and 17 which may be formed of any suitable foraminous material, but which, as shown, are formed of wire screens, the small tray 17 being adapted to fit within a suitable opening or aperture formed in the large tray 16.

Any suitable means may of course be provided for properly supporting the horizontal partition formed by the trays 16 and 17, and I have shown, for purposes of illustration, a plurality of angle irons 18, 19, 20, and 21 which are secured to the side and end walls of the cabinet so as to form a supporting ledge or shelf extending entirely about the cabinet. In addition, I provide a plurality of metal strips 22 which extend across the cabinet between the angle irons 20 and 21 so as to form additional supporting means for the large tray 16.

As heretofore indicated, the depth of the water bath contained in the cabinet or housing 10 should be greater than the height of the horizontal partition formed by the trays 16 and 17 so that this horizontal partition will divide the water bath into upper and lower portions. The purpose of the horizontal partition is two-fold in accordance with my invention, one purpose being to support the articles to be cooled either wholly or partially immersed in the upper portion of the water bath, and the other purpose being to retain the ice in the lower portion of the water bath against its tendency to rise to the surface.

In Fig. 2 I have shown for purposes of illustration a plurality of beverage-containing bottles supported on the trays 16 and 17, certain of these bottles, represented by the reference numeral 23, being disposed on their sides and certain other bottles, represented by the reference numeral 24, being placed in upright position, so that all of the bottles are either wholly or partially immersed in the water bath, the upper surface of which is represented by a line indicated by the reference numeral 25. As shown, this water bath contains a quantity of ice 26 which is disposed below the horizontal partition in the lower portion of the water bath and is forcibly retained in this position by the horizontal partition.

As heretofore explained, with the arrangement described, the upper portion of the water bath, that is, the entire bath above the horizontal partition, is maintained at a temperature of approximately 32½° or 33° F. so as to cool the beverage-containing bottles 23 and 24 to a temperature below 40° F. and to maintain the temperature of these articles at a substantially constant value below 40° F. I have found that this uniform temperature in the portion of the bath above the partition is maintained regardless of the depth of the portion of the bath above the partition. In an actual test the depth of this portion of the bath was varied between 1'' and 11'', and it was found that a uniform temperature was maintained even though the amount of ice contained in the lower portion of the bath below the partition varied from 200 pounds to 50 pounds.

Although various means may be utilized to provide for insertion of the ice beneath the horizontal partition, I prefer at present to utilize the arrangement shown in which the small tray 17 is adapted for ready removal, whether filled with articles or not, so as to permit insertion of the necessary amount of ice beneath the large tray 16. As shown, the small tray 17 is provided with suitable supporting hooks 27 which are adapted to engage the sides of the large tray 16, and with suitable handles 28 by means of which tray 17 may be lifted when it is desired to replenish the supply of ice. With this arrangement it is a very simple matter to remove the tray 17 and insert the ice through the opening thus provided, pushing the ice toward the opposite end of the cabinet so that it will not interfere with replacement of the tray 17. I have shown the ice 26 as constituting a number of relatively small pieces, but it should be understood that it is not necessary to utilize ice in this form, since large blocks of ice may be introduced through the opening provided by the small tray 17 without detracting from the efficiency of the cooling operation. It will be apparent, therefore, that considerable time and labor is saved, since in the conventional type of cooling unit heretofore discussed it is necessary to shave or chip the ice into fine pieces before depositing it in the cabinet.

Inasmuch as the ice is at all times forcibly retained in the lower portion of the bath, it will be apparent that melting of the ice does not tend to increase the depth of the bath but it will likewise be apparent that whenever additional ice is inserted below the horizontal partition the depth of the bath tends to increase an amount corresponding to the volume of the ice inserted. Therefore, in order to maintain substantially constant the depth of the bath, I provide overflow means such, for example, as the pipe or conduit 29 which is provided adjacent its upper end with a plurality of apertures (not shown) adapted to be closed by the insertion of suitable corks or plugs 30. In Fig. 2 all of the corks have been removed except the three lower ones, so as to maintain the depth of the bath at the level indicated by the line 25.

When overflow means of the type shown in Fig. 2 are provided, the excess water that is conducted through the conduit 29 to a suitable waste receptacle or disposal conduit, such as a sewer, is the colder water at the top of the bath, and accordingly I prefer in most cases to utilize overflow means of the type shown in Fig. 4. In Fig. 4 only a portion of the cabinet 10 is shown, the upper surface of the water bath being represented by a line 31, and a horizontal partition, formed for example by the trays 16 and 17, is represented by a broken line 32. The preferred form of overflow means here shown consists of a conduit having a return bend portion 33 intermediate its ends, so that the inlet end 34 thereof is located closely adjacent the bottom of the cabinet, with the outlet end of the conduit extending through the bottom of the cabinet for connection to suitable disposal means.

With the overflow conduit arranged as shown in Fig. 4, the maximum height of the water bath is determined by the height of the lower wall of the bend 33, and it will be apparent that whenever the depth of the bath tends to increase beyond this point the relatively warm water in the lower portion of the bath is caused to flow into the inlet 34 and through the bend portion of the overflow pipe until the level of the bath is again reduced to the proper point. In order to prevent the establishment of siphonic conditions in case the depth of the bath should suddenly be increased, the upper wall of the bend portion 33 of the overflow conduit is provided with a vent pipe 35 which establishes communication with the atmosphere and prevents the depth of the bath from being reduced by siphonic action below the line indicated by the reference numeral 31.

The provision of overflow means of the type shown in Fig. 4 not only contributes to the efficiency of the apparatus by removing relatively warm water from the bottom bath instead of the relatively cold water at the top of the bath, but in addition assists in keeping clean the bottom portion of the cabinet. Thus some of the foreign materials, such as dirt from the ice, glue from the labels on the bottles and other waste mateials, may be conducted out of the box through the overflow pipe without wasting any of the cold clean water at the top of the bath.

In this conenction it may be pointed out that my improved cooling apparatus is more sanitary than the conventional type of unit now in use, because the articles to be cooled, such for example as the bottles 23 and 24 of Fig. 2, are supported on a clean screen-like partition and are surrounded by clean cold water, the natural accumulation of waste materials and dirt which occurs in conventional units being, in my improved apparatus, substantially confined to the bottom portion of the bath with which portion the articles being cooled do not come in contact. Furthermore, the constant dilution of the water bath by melting of the ice produces a semiself-cleaning action in so far as the screen-like partition is concerned.

Although the article-supporting partition formed by the trays 16 and 17 in Figs. 1 and 2 may be located at any desired height with respect to the bottom of the cabinet and with respect to the floor, I have found it most convenient to locate this partition at substantially the same height as the bottom of the cabinet in heretofore known units, this height having been ascertained through long experience to be the most convenient height for the user. It will be apparent that with the horizontal partition located at this height a large ice-receiving compartment may be disposed therebelow without taking up any space other than that which is normally waste space in conventional units. This large compartment will hold several times as much ice as the average conventional cooling unit, and therefore it is not necessary to re-ice my improved unit so frequently.

As heretofore mentioned, any suitable means may be provided for depositing the desired quantity of ice in the lower portion of the water bath beneath the horizontal partition, and in Fig. 3 I have shown an embodiment of my invention in which a mechanical refrigerating system is utilized to produce the ice by freezing predetermined amounts of the water contained in the lower portion of the bath. Although any suitable type of mechanical refrigerating system may be employed, I have shown somewhat diagrammatically in Fig. 3 a refrigerating system comprising a compressor 36 adapted to be driven by an electric motor 37, which is connected through suitable conductors 38 and an automatically controlled switch 39 to a suitable source of energy represented by the conductors 40. In addition to the compressor 36, the refrigerating system includes a suitable condenser 41, a control valve 42, and an evaporator or freezing unit 43, the compressor, condenser, freezing unit, and control valve being connected in series in the usual manner. As shown, the freezing coil or unit 43 is located within the insulated bottom and side walls of the cabinet and is preferably soldered or welded to the inner metal lining thereof so as to provide an efficient thermal contact between the walls and the coil 43.

The automatic control switch 39, which is effective to stop and start the compressor motor 37 at predetermined intervals, may be of the type well known in the art and includes a thermal bulb 44 which is connected to the control switch 39, through a capillary tube 45, the thermal bulb 44 being positioned in the cabinet 10 adjacent the bottom wall thereof. The cabinet 10, the horizontal partition comprising the trays 16 and 17, and the overflow conduit 29 are identical with the corresponding parts previously described in connection with Figs. 1 and 2, and similar reference numerals are accordingly utilized in Fig. 3. In order to maintain a proper supply of ice beneath the horizontal partition in the embodiment shown in Fig. 3, the control switch 39 is preferably adjusted so as to start and stop the compressor motor 37 periodically, in accordance with the temperature conditions adjacent the thermal bulb 44. Thus, when the temperature of the water bath adjacent the bulb 44 rises to a predetermined value, the switch 39 operates to start the compressor motor and operate the refrigerating mechanism so as gradually to build up a layer of ice on the bottom wall of the cabinet and on the lower portions of the side walls contacted by the freezing coil 43. As soon as this ice reaches a predetermined thickness, determined by the position of the bulb 44 with respect to the walls, the switch 39 operates to shut off the compressor motor, and during the off-cycle of the refrigerating apparatus the ice may melt off of the walls and float up against the horizontal partition, as indicated in Fig. 3.

It is of course not necessary that the freezing coils 43 be located as shown, and if desired a suitable freezing coil may be positioned in the lower portion of the water bath directly in contact therewith. Furthermore, it is not necessary that the above-described refrigerating cycle be utilized. Thus, for example, the refrigerating mechanism may, if desired, be so adjusted as to maintain at all times a layer of ice of predetermined thickness on the freezing coils or on the walls of the lower portion of the cabinet.

It will of course be understood that when mechanical refrigeration is employed, as in the embodiment shown in Fig. 3, freezing and melting of the ice does not materially affect the depth of the water bath, and ordinarily a new supply of ice is not periodically inserted, as described in connection with Figs. 1 and 2. Accordingly, in the embodiment of my invention shown in Fig. 3, the only purpose of the overflow pipe **29** is to automatically determine the height of the bath whenever the cabinet is emptied for cleaning purposes and is subsequently filled with clean water. In different localities different depths of the bath will be found most useful, and after the proper depth has been determined and the proper number of corks or plugs **30** positioned in the apertures in the conduit **2**, it is only necessary, after a cleaning operation, to fill the cabinet to a point such that water flows through the lowermost one of the unblocked apertures in the overflow pipe.

It will now be apparent that I have provided an improved cooling method and apparatus for packages or articles adapted to be cooled by complete or partial immersion in a bath of cooling medium, and a particular advantage of my improved apparatus is found in the fact that standard beverage bottles may be cooled to temperatures below 40° F. by maintaining the water bath at a depth extending only about 1'' above the horizontal partition on which the bottles are supported. This particular feature has considerable commercial value, since the bottles may thus be cooled without any danger that the labels normally carried by the bottle will be washed off, as so frequently occurs with the conventional type of cooling equipment now on the market.

I have found that when beverage-containing bottles are placed upright in the position occupied by the bottles **24** in Figs. 2 and 3, a large number of bottles may be placed in the cabinet **10** and cooled to a satisfactory serving temperature within a comparatively short time. Since it is not necessary to utilize any of the available space for crushed ice, the capacity of my improved cooling unit is increased over that of a conventional unit of corresponding size. In rush hours when it becomes necessary to cool more quickly a new supply of warm articles or packages, it is advisable to place these warm articles in a position corresponding to the position occupied by the bottles **23** in Figs. 2 and 3 so that they will be almost completely submerged in the very cold water which forms the upper portion of the water bath.

While I have shown particular embodiments of my invention, it will be understood, of course, that I do not wish to be limited thereto since many modifications may be made, and I, therefore, contemplate by the appended claims to cover any such modifications as fall within the true spirit and scope of my invention.

Having thus described my invention, what I claim and desire to secure by Letters Patent is:

1. A cooling apparatus comprising a housing adapted to contain a water bath of substantial depth with a quantity of ice therein, substantially horizontal partition means supported below the surface of said bath for confining said ice to the portion of said bath below said partition means and for supporting the articles at least partially immersed in the portion of said bath above said partition means, and overflow means for withdrawing relatively warm water from the lowermost portions of said bath to maintain the depth of said bath substantially constant, said overflow means comprising a conduit having an inlet adjacent the bottom of said bath and an outlet below the desired level of said bath, said conduit including a return bend portion connecting said inlet and outlet, with the lower wall of said bend at the desired level of said bath, and an air vent in the upper wall of said bend for preventing siphonic flow in said conduit.

2. A cooling apparatus comprising a housing adapted to contain a bath of water, substantially horizontal partition means extending substantially in a single plane in said housing and disposed below the level of the surface of the water bath, said partition means being effective to support articles at least partially immersed in said bath and to retain a quantity of ice below the surface of said bath against the tendency of the ice to float therein, means for removably supporting a portion only of said partition means to provide for insertion of a quantity of ice into the portion of said bath below said partition means, means in heat exchanging relation with said water bath below said partition means for further cooling a portion of said water, and means for controlling said last-mentioned means to maintain a desired quantity of ice in the lower portion of said bath.

3. A cooling apparatus comprising a housing adapted to contain a bath of water, overflow means for maintaining said water bath at a substantially constant water level and adapted to withdraw water from the lowermost portions of said bath, substantially horizontal partition means extending substantially in a single plane in said housing and disposed below the level of the surface of the water bath maintained by said overflow means, said partition means being effective to support articles at least partially immersed in said bath and to retain a quantity of ice below the surface of said bath against the tendency of the ice to float therein, means for removably supporting a portion only of said partition means to provide for insertion of a quantity of ice into the portion of said bath below said partition means, means in heat exchanging relation with said water bath below said partition means for further cooling a portion of said water, and means for controlling said last-mentioned means to maintain a desired quantity of ice in the lower portion of said bath.

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