

April 29, 1952

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2,594,474

REFRIGERATED DISPLAY TANK

Filed April 28, 1950

2 SHEETS—SHEET 1

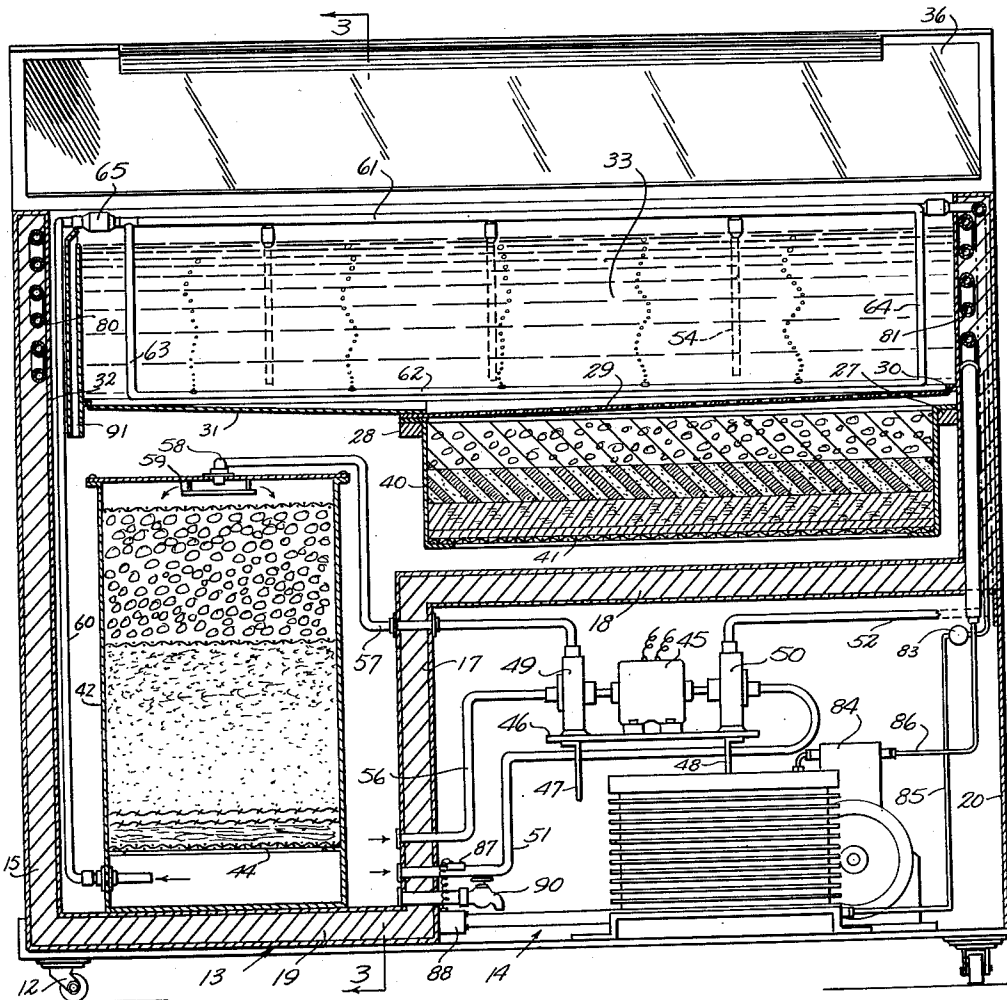


FIG. 2.

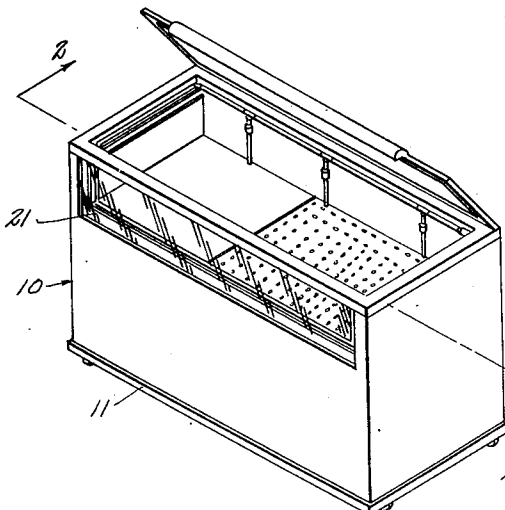


FIG. 1.

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2 SHEETS—SHEET 2

FIG. 3.

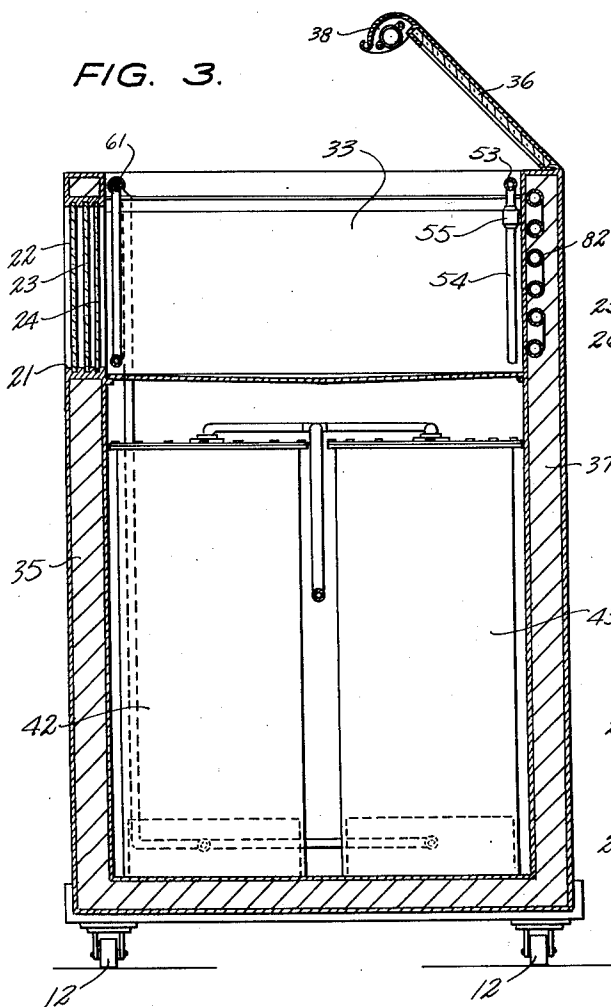


FIG. 4.

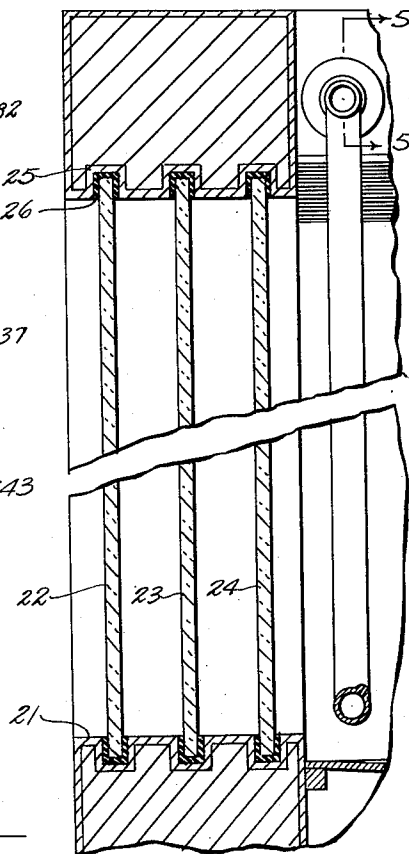


FIG. 5.

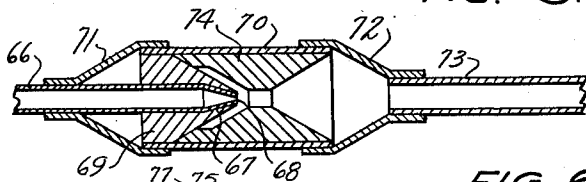
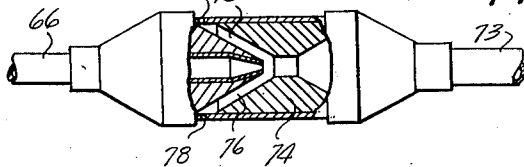


FIG. 6.



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REFRIGERATED DISPLAY TANK

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5 Claims. (Cl. 62—89.5)

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This invention relates to refrigerated display tanks and more particularly to an open top tank having a transparent portion for displaying live aquatic creatures and maintaining such creatures alive and in a clean and healthy condition.

It is among the objects of the invention to provide an improved refrigerated display tank for live aquatic creatures which tank contains a large volume of liquid, such as water or an aqueous solution, in proportion to the quantity of creatures displayed therein so that the same liquid can be used for an extended period of time and will not be subject to rapid temperature variations, which refrigerates the liquid, and maintains the same at a predetermined low temperature and constantly circulates the liquid through the display space in the tank, which constantly filters and cleans the water while circulating the same, using a coarse filter to remove the coarser dirt and debris and one or more fine filters to remove fine dirt and impurities, such as algae and bacteria, which provides two independent water circulating means only one of which is connected with the fine filter or filters so that circulation of water can be maintained even if such fine filters should become clogged, which provides heat insulation around the entire body of liquid except the top surface thereof to maintain the liquid at a substantially constant temperature and reduce the power requirements of the refrigerating equipment, which constantly adds air to the liquid during the circulation thereof, which includes a heat insulated transparent side panel or portion to increase the display effectiveness of the device and may also be provided with illuminating and reflective means for the same purpose, and which is simple and durable in construction, economical to manufacture and operate, easy to clean and neat and attractive in appearance.

Other objects and advantages will become apparent from a consideration of the following description and the appended claims in conjunction with the accompanying drawings wherein:

Figure 1 is a perspective view of a display tank illustrative of the invention;

Figure 2 is a cross sectional view on an enlarged scale on the line 2—2 of Figure 1;

Figure 3 is a transverse cross sectional view on the line 3—3 of Figure 2;

Figure 4 is a traverse cross sectional view on an enlarged scale of a fragmentary portion of the device particularly illustrating the construction of a transparent panel provided in the device;

Figure 5 is a longitudinal cross sectional view

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of a fragmentary portion of the device taken on the line 5—5 of Figure 4; and

Figure 6 is a cross sectional view of the device illustrated in Figure 5 but is taken on a plane substantially perpendicular to the section plane of Figure 5.

With continued reference to the drawings, the display tank or device comprises a body 10 of elongated, rectangular shape having around its bottom edge a base frame 11 and supported at its four bottom corners on cast wheels 12.

The body 10 includes a tank, generally indicated at 13, and a rectangular chamber, generally indicated at 14, provided in a portion of the tank 13.

The tank 13 has heat insulative walls which are joined together at their adjoining edges to provide a unitary structure and each of which includes an outer covering of suitable material, such as sheet metal, an inner covering, also of a suitable material, such as sheet metal, spaced from and substantially parallel to the outer covering and a body of heat insulating material, such as fibre glass, packed in the space between the outer and inner coverings. The inner covering is formed of a suitable material, such as stainless steel, to provide a corrosion resisting surface and avoid the introduction of deleterious materials, such as copper salts, into the liquid contained in the tank.

One end wall 15 of the tank constitutes the entire corresponding end wall of the body 10 and is of square or rectangular shape. The other end wall 16 of the tank constitutes only a portion of the corresponding end wall of the body and while it extends for the entire width of the body, extends from the top of the body downwardly to a location intermediate the height of the body and substantially at the mid-height location of the corresponding end of the body 10. At intermediate wall or partition 17 of the tank is disposed substantially perpendicular to the front and back walls and the bottom wall of the body 10 and is disposed intermediate the length of the body but preferably somewhat nearer the end wall 15 than the end wall 16. An upper bottom wall 18 of the tank extends from the lower end of the end wall 16 to the upper end of the intermediate wall 17 and between the front and back walls while the lower bottom wall 19 of the tank extends between the lower ends of the end wall 15 and the intermediate wall 17 and between the front and back walls of the tank. The front and back walls of the tank are of somewhat L-shaped formation and are joined along their edges to the corre-

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sponding edges of the end walls 15 and 16, the intermediate wall 17 and the tank bottom walls 18 and 19. This provides the rectangular chamber 14 below the upper bottom wall 18 of the tank and between the intermediate wall 17 and the end of the body 10 opposite the end wall 15. The chamber is enclosed in suitable walls, as indicated at 20, preferably formed of a suitable sheet material, such as stainless steel.

The top or upper end of the tank is open and the front wall of the tank has an elongated rectangular opening 21 therein which extends substantially from the end wall 15 to the end wall 16 but extends from the upper edge of the front wall downwardly a distance which is only a fractional part of the entire height of the tank, a width of the opening 21 of approximately one fifth of the entire height of the tank having been found to provide excellent results in practice.

The opening 21 is closed by three rectangular pieces 22, 23 and 24 of transparent sheet material, such as glass, which pieces of sheet material are marginally sealed to the walls of the opening 21.

The sheet material surrounding the opening 21 is provided with groove formations 25 of rectangular cross sectional shape each of which entirely surrounds the opening. The several groove formations are spaced apart through the thickness of the front wall of the tank and receive the edges of the plates or pieces 22, 23 and 24 so that these pieces are secured in the opening in spaced apart, substantially parallel relationship to each other. Suitable sealing material 26 is disposed within the groove formations 25 around the edges of the glass plates and the spaces between the outer plates 22 and 24 and the intermediate plate 23 may be partially evacuated to reduce heat transfer through the plate assembly, to avoid sweating or frosting of the plates and maintain the transparent panel in a clear condition.

A support 27 extends transversely of the interior of the tank against the inner surface of the end wall 16 and adjacent the lower edge of the opening 21 and a corresponding support 28 extends transversely of the interior of the tank at the lower edge of the opening 21 and substantially in vertical alignment with the intermediate partition 17.

A perforated plate 29 is supported at one end on a ledge 30 formed on the inner surface of the end wall 16 substantially in horizontal alignment with the lower edge of the opening 21 and is supported at its opposite end on the transverse support 28. A second plate 31, preferably of imperforate construction, is supported at one end on the transverse support 28 and at its opposite end on a ledge 32 formed on the inner surface of the end wall 15 also substantially in horizontal alignment with the lower edge of the opening 21.

The two plates 29 and 31 define thereabove a display space 33 in the upper portion of the tank and the aquatic creatures to be displayed and kept alive in the tank are kept in the space 33 above the plates 29 and 31 where they are clearly visible through the transparent panel in the front wall 35 of the tank and also through the open top end of the tank.

A mirror 36 may be secured along one edge to the top edge of the rear wall 37 of the tank to incline upwardly and forwardly over the upper end of the tank and provide reflective means for enhancing the display characteristics of the device. Illuminating means such as the shaded lamp 38 may extend along the upper edge of the mirror 36 and be supported by this upper edge

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of the mirror above the open upper end of the tank to illuminate the display space 33.

A flat rectangular filter 40 is dependently supported on the supports 27 and 28 below the perforated plate 29 and above the upper bottom wall 18 of the tank. This filter preferably comprises a rectangular box or housing formed of a suitable material, such as stainless steel sheet and having a foraminous bottom wall 41 and several layers of sponge of different degrees of coarseness disposed within the housing and on the bottom 41, the sponge layers increasing in fineness of the material from the top to the bottom of the filter.

This coarse filter will strain most of the larger particles of dirt and debris from the water in the tank and delay clogging of the fine filters to be later described. The filter 40 is readily accessible for cleaning by simply removing the plate 29 from the tank.

Two closed containers 42 and 43 are disposed in side by side relationship in the deeper part of the tank between the end wall 15 and the intermediate wall 17 and are supported at their bottom ends on the inner surface of the lower bottom wall 19 of the tank. Each of these containers contains a fine filter which may comprise layers of material increasing in fineness from the upper to the lower ends of the containers.

For example, each of the fine filters may contain an upper layer of gravel disposed between an upper and a lower horizontal partition of foraminous material, such as wire mesh, a layer of sand below the gravel layer increasing in fineness in a direction downwardly from the gravel layer, two or more layers of fabric at the bottom of the sand layer and a layer of felt between the fabric layers and a horizontal partition 44 of foraminous material supported above the bottom of the container.

The fine filters contained in the containers 42 and 43 will remove fine particles of dirt, algae and even bacteria from the water in the tank.

An electric motor 45 is disposed in the chamber 14 and mounted on a base 46 supported by brackets 47 and 48 which project outwardly from the rear cover of the chamber. Two rotary fluid pumps 49 and 50 are supported on the base 46 and drivenly connected to respectively opposite ends of the motor shaft. The intake of the pump 50 is connected through the conduit 51 with the interior of the tank adjacent the lower bottom wall 19 and the outlet of this pump is connected by a conduit 52 with a manifold pipe 53 which extends along the interior of the rear wall 37 of the tank at the upper edge of the latter. Discharge pipes 54 extend downwardly from the manifold pipe 53 at spaced apart intervals along the latter substantially to the plates 29 and 31 to direct liquid from the pump 50 against the upper surfaces of these plates. An air mixing device 55 is interposed in the conduit 54 and adjacent the connection of the conduit 54 with the manifold pipe 53 for mixing air with the water discharged through the discharge pipes 54. This air mixing device is particularly illustrated in Figures 5 and 6 and will be later described.

A conduit 56 connects the intake of pump 49 to the interior of the tank near the lower bottom wall 19 and a conduit 57 connects the outlet of pump 49 to a transverse conduit 58 the respectively opposite ends of which are received in the top walls of the containers 42 and 43. A baffle plate 59 is secured in each con-

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tainer overlying the corresponding end of the conduit 58 to absorb the kinetic energy of the liquid flowing from the conduit 53 into the containers and prevent the liquid from channeling or tunneling through the filtering material in the containers.

A conduit 60 is connected to the spaces in the lower ends of the two containers 42 and 43 and is connected at its upper end to a pipe 61 which extends along the inner side of the front wall 35 of the tank at the upper edge of the latter. A discharge pipe 62 extends along the inner side of the front wall of the tank at the lower side of the opening 21 and is connected at its opposite ends to the pipe 61 by the vertically disposed conduits 63 and 64. The pipe 62 is provided with orifices or nozzles at spaced apart locations therealong for discharging liquid into the space 33 adjacent the upper sides of the plates 29 and 31.

An air mixing device 65 is connected into the pipe 61 between the conduit 63 and the adjacent conduit 64 and is also of the construction particularly illustrated in Figures 5 and 6.

Each of the air mixing devices comprises a thin walled tubular conduit 66 having a conically tapered end portion 67 provided with a restricted orifice 68. A conical body 69 is mounted on the tube 66 and extends from the orifice 68 in the end of the tube along the tube past the conically tapered portion of the latter and a cylindrical sleeve 70 receives the conical body 69 at one end of the sleeve and extends beyond the end of the tube. A conical boot 71 receives in its larger end the end of the sleeve 70 secured to the body 69 and receives the tube 66 in its smaller end at a location spaced from the body 69, this boot providing a reinforcement for the connection between the sleeve 70, the body 69 and the tube 66.

A second conical boot 72 receives in its larger end the end of sleeve 70 remote from the boot 71 and receives in its smaller end the end of a tubular conduit 73. A Venturi body 74 is disposed in the sleeve 70 between the body 69 and the boot 72 and has a doubly tapered bore therethrough. As is well known, when a stream of fluid is forced through a venturi the pressure of the stream at the throat of the venturi is reduced to such an extent as to create a suction at the Venturi throat. This principle is utilized in the present device by providing passages 75 and 76 which extend from the Venturi throat between the Venturi body and the conical body 69 to ports 77 and 78 respectively provided through the sleeve or housing 70.

With the above described construction, when the liquid is forced through a device as illustrated in Figures 5 and 6, the reduced pressure at the throat of the Venturi body will draw air through the ports and air passages into the stream of liquid and the air will be mixed with the liquid and the mixture discharged from the venturi. The device illustrated in Figures 5 and 6 and described above may be either the device 55 or 65, the tubular conduit 66 may be either the conduit 54 or 58 and the conduit 73 may be the portion of the conduit 54 between the device 55 and the manifold pipe 53 or may be the conduit between the upper end of the conduit 60 and the device 65.

Refrigerating coils, as indicated at 80 and 81, are mounted in the end walls 15 and 16 of the tank at the opposite ends of the display space 33 and a refrigerating coil 82 is mounted in the

back wall 37 at the rear of the refrigerating space. These coils 80, 81 and 82 are preferably soldered or otherwise suitably secured to the inner covering of the tank walls and are interconnected and connected at one end to an expansion valve 83.

A refrigerating mechanism 84, including the usual compressor, condenser and accumulator, is mounted in the chamber 14 and the accumulator is connected through a conduit 85 to the expansion valve 83. The opposite end of the interconnected refrigerating coil assembly is connected through a conduit 86 to the intake side of the compressor so that refrigerant will be supplied to the refrigerating coils. A temperature responsive switch or relay 87 is mounted on the conduit 51 where it is responsive to the temperature of the liquid leaving the bottom of the tank and is connected to a power controlling switch 88 which controls the operation of the compressor of the refrigerating apparatus. The operation of the temperature responsive relay 87 is effective to maintain the liquid in the tank at a predetermined temperature.

A drain fitting 90 extends through the intermediate wall 17 of the tank near the bottom wall 19 into the chamber 14 so that the contents of the tank can be drained when necessary.

An overflow conduit or duct 91 extends vertically along the inner side of the end wall 15 from a position somewhat below the plate 31 to a position slightly below the upper edge of the end wall 15. This conduit provides an overflow conduit for the display space 33 of the tank and also serves to drain away any material which may float on the surface of the liquid in the tank.

If fresh water creatures are to be kept alive and displayed in the tank it is necessary to fill the tank with only fresh water but, if salt water creatures are to be displayed the tank will be filled with ocean water or with a solution of water and various soluble salts resembling ocean water but preferably containing certain buffer and neutralizing agents which will keep the solution in a healthful and usable condition over a long period of time.

If it should be desired to keep seafood creatures, such as crabs and lobsters, alive in the display space of the tank under a spray of water instead of submerged in water, this can be accomplished by reducing or limiting the quantity of water in the tank until the surface of the water is a short distance below the perforated plate 29. The discharge pipes 54 and 62 will then direct a spray of mixed water and air into the display space and the water will quickly drain away through the perforated plate.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is, therefore, to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are, therefore, intended to be embraced therein.

What is claimed is:

1. A display device for aquatic creatures comprising a liquid tank having heat insulative walls and an open upper end, said walls being shaped to provide in the lower portion of the device a chamber having a length less than the length of the tank, a first filter mounted in said tank

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above said chamber, a perforated plate disposed in said tank below the upper end thereof and covering said filter, a closed container disposed in said tank adjacent the inner end of said chamber, a second filter in said container, two motor driven liquid pumps mounted in said chamber, conduit means connecting the inlet of one of said pumps to the interior of said tank near the bottom thereof and the outlet of said pump to the interior of said tank above said plate, conduit means connecting the inlet of the other of said pumps to the interior of said tank near the bottom thereof and the outlet of said other pump to the interior of said container and connecting the interior of said container to the interior of said tank above said plate, air introducing means connected into each of said conduit means, a refrigerating coil in the wall of said tank, and refrigerating apparatus mounted in said chamber and connected to said coil.

2. A display device comprising a rectangular body including a tank and a chamber arranged in end to end relationship in the body with a deep portion of the tank adjacent the inner end of the chamber and a shallow portion of said tank overlying said chamber, a perforated plate supported in said tank above the bottom of the shallow portion of the latter, a second plate supported in said tank at the level of said perforated plate and overlying the bottom of the deep portion of the tank, refrigerating coils partly surrounding the portion of said tank above said plates, refrigerating apparatus in said chamber connected to said refrigerating coils, a pump in said chamber, conduit means connecting the inlet of said pump to the interior of said tank adjacent the bottom of the deep portion of said tank and conduit means connected to the outlet of said pump and terminating in the space within said tank above said plate.

3. A display device comprising a rectangular body including a tank and a chamber arranged in end to end relationship in the body with a deep portion of the tank adjacent the inner end of the chamber and a shallow portion of said tank overlying said chamber, a perforated plate supported in said tank above the bottom of the shallow portion of the latter, a second plate supported in said tank at the level of said perforated plate and overlying the bottom of the deep

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portion of the tank, refrigerating coils partly surrounding the portion of said tank above said plates, refrigerating apparatus in said chamber connected to said refrigerating coils, a pump in said chamber, conduit means connecting the inlet of said pump to the interior of said tank adjacent the bottom of the deep portion of said tank and conduit means connected to the outlet of said pump and terminating in the space within said tank above said plate, said tank having an open top and heat insulative walls on the sides and the bottoms of its two portions.

4. A display device comprising a body including a tank and a chamber arranged in end to end relationship in the body with a deep portion of the tank adjacent the inner end of the chamber and a shallow portion of the tank overlying the chamber, means providing a display space in the upper portion of said tank, a filter in the deep portion of said tank, a first pump in said chamber operative to force liquid from the deep portion of said tank into said display space, and a second pump in said chamber operative to force liquid from the deep portion of said tank through said filter and into said display space.

5. A display device comprising a body including a tank and a chamber arranged in end to end relationship in the body with a deep portion of the tank adjacent the inner end of the chamber and a shallow portion of the tank overlying the chamber, means providing a display space in the upper portion of said tank, a filter in said tank, a first pump in said chamber operative to force liquid from the deep portion of said tank into said display case, a second pump in said chamber operative to force liquid from the deep portion of said tank through said filter and into said display space, and an air injection device connected with each of said pumps.

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