May 12, 1953 R. LIVSEY 2,638,087

INFANT INCUBATOR

Filed Oct. 18, 1949 3 Sheets-Sheet 1

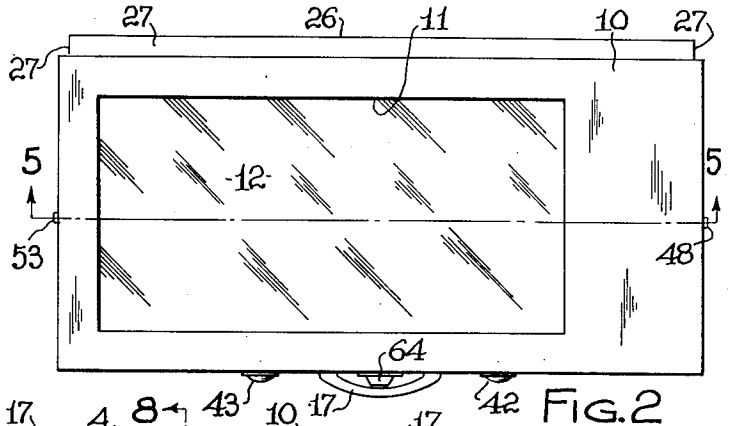


FIG. 2

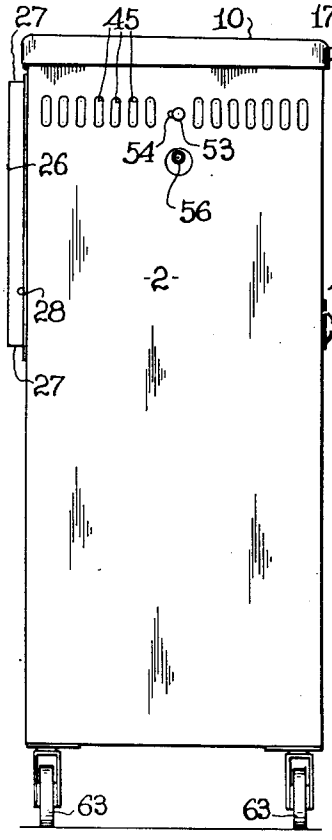


FIG. 3

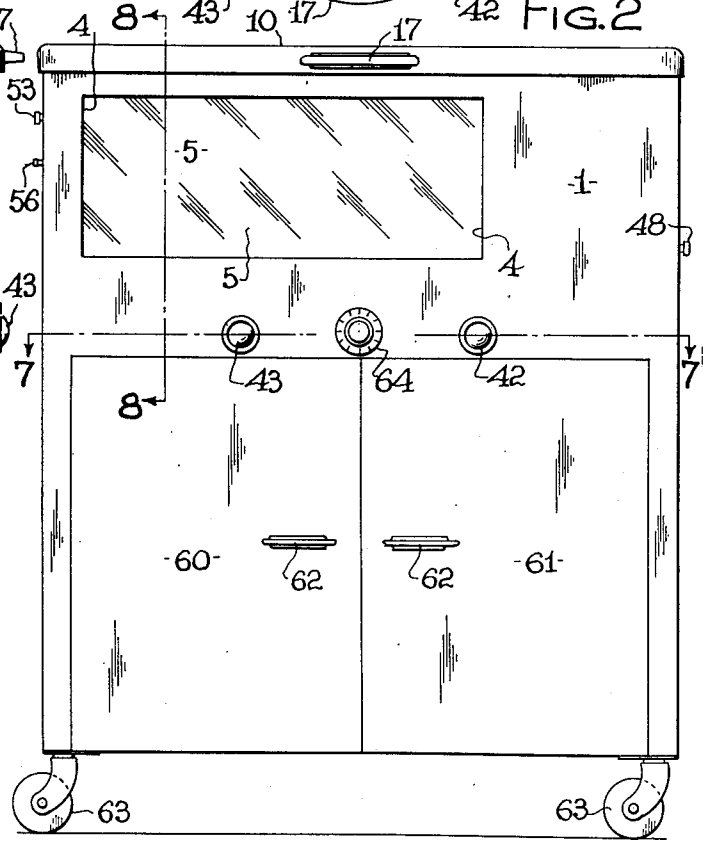


FIG. 1

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INFANT INCUBATOR

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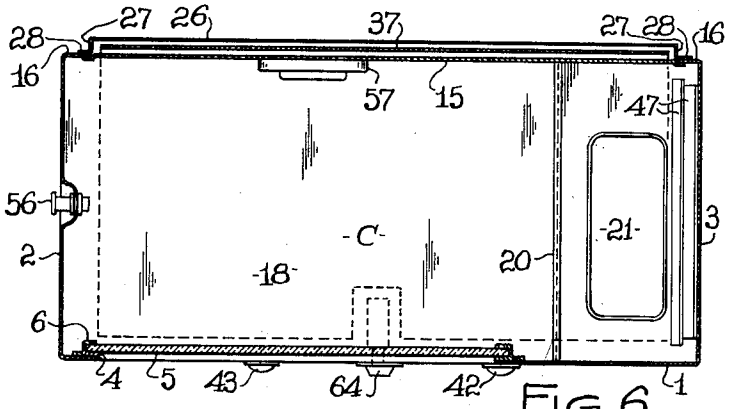


FIG. 6

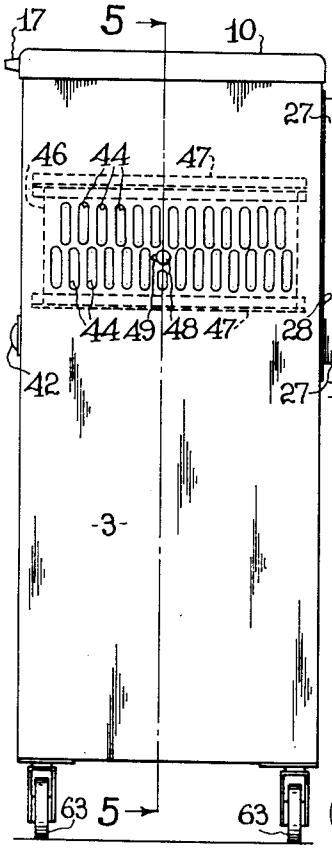


FIG. 4

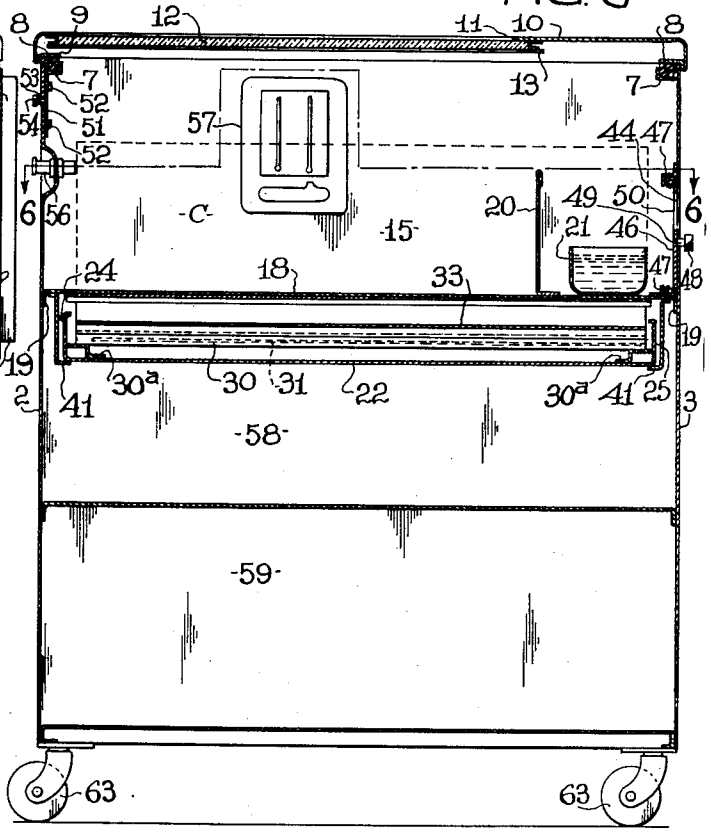


FIG. 5

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INFANT INCUBATOR

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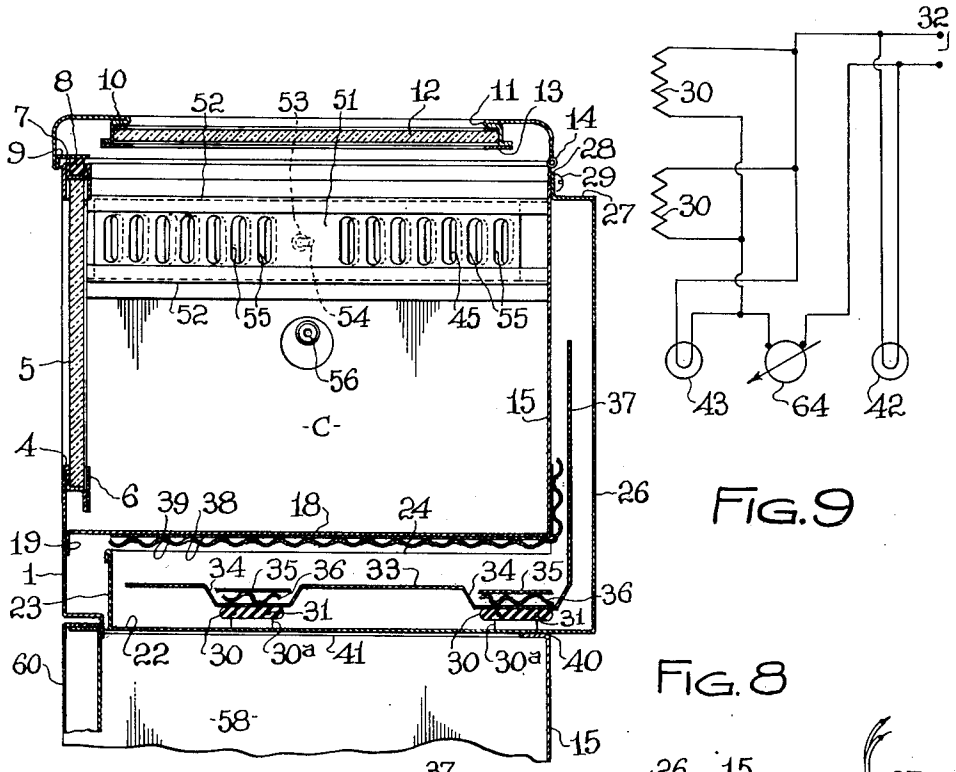


FIG. 9

FIG. 8

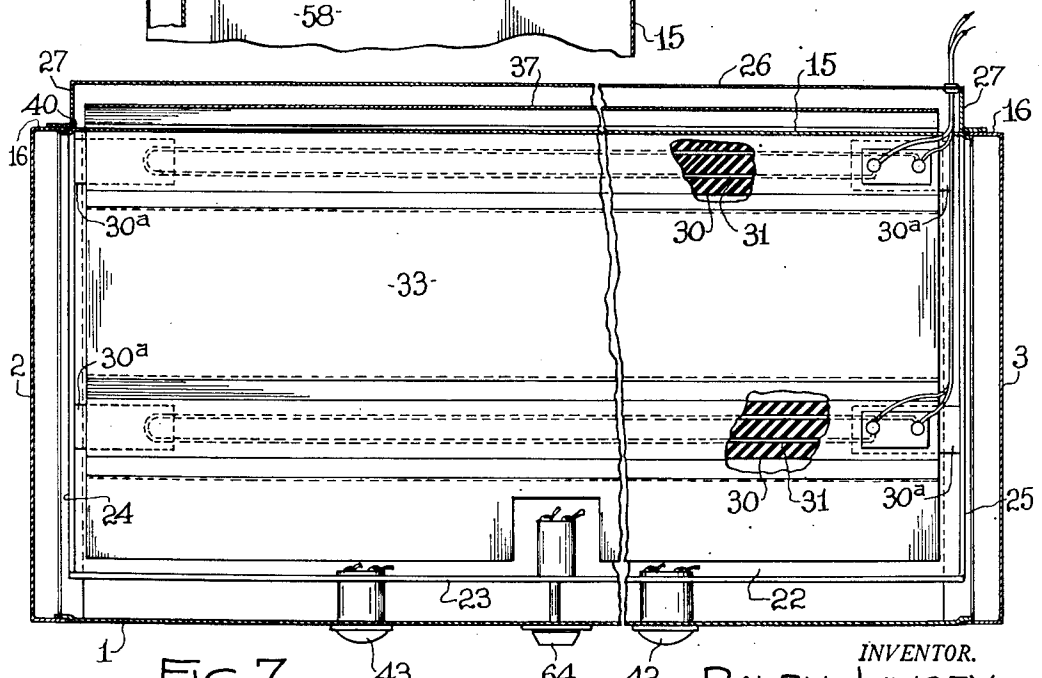


FIG. 7

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2,638,087

# UNITED STATES PATENT OFFICE

2,638,087

## INFANT INCUBATOR

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Application October 18, 1949, Serial No. 122,088

2 Claims. (Cl. 128—1)

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This invention relates, as indicated, to an infant incubator.

A primary object of the invention is to provide an incubator of the character described, having novel means for uniformly heating the infant-receiving compartment of the incubator.

Another object of the invention is to provide an incubator of the character described, having novel and improved means for ventilating the infant-receiving compartment of the incubator.

A further object of the invention is to provide an infant incubator in the form of a portable cabinet having self-contained means for warming garments and blankets used for the infant.

A still further object of the invention is to provide a novel construction of heating unit, which is easily removable and replaceable.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this specification, and in which like numerals are employed to designate like parts throughout the same,

Fig. 1 is a front plan view of the incubator;

Fig. 2 is a top plan view of the incubator;

Fig. 3 is a side elevational view of the incubator, as viewed from the left side of Fig. 1;

Fig. 4 is a side elevational view of the incubator, as viewed from the right side of Fig. 1;

Fig. 5 is a vertical cross-sectional view, taken on the line 5—5 of Fig. 4;

Fig. 6 is a horizontal cross-sectional view, taken on the line 6—6 of Fig. 5;

Fig. 7 is a horizontal cross-sectional view, on an enlarged scale, taken on the line 7—7 of Fig. 1;

Fig. 8 is a fragmentary vertical cross-sectional view, taken on the line 8—8 of Fig. 1, and

Fig. 9 is a wiring diagram, showing the electrical features of the incubator.

Referring more particularly to the drawings, the incubator will be seen to comprise a front wall 1 and side walls 2 and 3, these being formed from a single sheet of metal, which has been blanked to provide a rectangular opening 4 in the front wall 1. This rectangular opening is closed by a clear glass plate 5, preferably made of safety glass, which is secured rearwardly of the front wall 1, as by a rectangular frame 6.

Secured within a channel 7, formed at the upper edge of the walls 1, 2 and 3, is an asbestos seal or gasket 8, upon which the flange 9 of a lid or cover 10 rests, when the lid is closed. The lid or cover 10 is also provided with a rectangular opening 11, which is closed by a clear safety

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glass plate 12, secured to the cover as by a frame 13.

The lid or cover 10, is pivotally secured, as by a hinge 14 (Fig. 8) to the upper edge of a plate 15. The plate 15 extends from the side wall 2 to the side wall 3, and is retained against displacement rearwardly, as by means of vertical inturned flanges 16 at the rear edges of the walls 2 and 3. The plate 15 extends vertically downward, in parallel spaced relationship to the wall 1, to form the rear wall of the incubator. A handle 17 is secured to the front of the cover 10 to facilitate raising and lowering of the cover.

The plate 15 also forms the rear wall of the compartment C of the incubator, in which the infant is placed, the bottom of this compartment being provided by a plate 18, which also extends from the wall 2 to the wall 3 and from the plate 15 to the front wall 1, being provided with downturned flanges 19, which are welded to the walls 1, 2 and 3.

The lower portion of the compartment C of the incubator is provided with a separator plate 20, which partitions off a small portion of the compartment to form a chamber, in which a container 21 is disposed, this container being normally filled with water, in order to provide a continuously humidified atmosphere within the incubator, which is created by the evaporation of the water.

An important feature of the invention is the provision of a novel heating unit for supplying the desired incubation temperatures within the incubator. This unit comprises a rectangular base 22 having a front flange 23, side flanges 24 and 25, and a vertical rear wall 26, provided at its upper and side edges with flanges 27. The side flanges 27 are coplanar with the flanges 24 and 25. The flanges 27 serve to space the wall 26 away from the wall 15 sufficiently to provide a space for a purpose to be presently described. The flanges 27 are also provided at their inner edges with out-turned flanges 28 (Fig. 8), which are adapted to be secured to the wall 15, as by screws 29, for the purpose of removably securing the heating unit to the incubator.

The heating unit further includes a pair of spaced electric heating elements 30, mounted on Z-bars 30a, so as to be in spaced relation to the base 22. Each of these elements consists of wires 31 embedded in suitable insulating material, and connected to a common source of alternating current, as indicated at 32 in Fig. 9. Mounted above these heating elements is a heat radiating plate 33, having an extended radiating surface, as well

as recesses 34 for the reception of additional heat radiating elements 35 and 36, which are preferably in the form of built up layers of asbestos. The heat radiating plate 33 is provided at its rear edge with a vertical flange 37, which extends upwardly into the space between the walls 15 and 26, in parallel relation to the latter. Additional heat absorbing elements, in the form of sheets 38 and corrugated sheets 39, are secured to the lower surface of the plate 18 and rear surface of the wall 15, as best shown in Fig. 8. The sheets 38 and 39 are also preferably formed of asbestos.

The heat radiating elements 33, 34, 35 and 36 absorb heat from the elements 30 and radiate this heat to the heat absorbing elements 38 and 39, thereby heating the plate 18 and wall 15 sufficiently to provide a desired degree of heat within the incubator. This particular arrangement has been found highly efficient and effective to provide a uniform temperature within the entire incubator compartment C. This is in marked contrast to existing incubators of this type, in which the temperature between the lower and upper portions, and between one end and the other end of the incubator, has been found to vary as much as 10 degrees.

The heating unit, as thus described, is insertable through a rectangular opening 40 in the wall 15, and is slid into the position shown in Fig. 8, on tracks or guides 41, which depend from the plate 18, as best shown in Fig. 5. After being moved into the desired position, it is secured against displacement, as by means of the screws 29 (Fig. 8). The unit is thus compact and may be easily and quickly removed for replacement purposes, or in the event that any repairs or cleaning are required.

The heating method which is utilized, and which has been described is a form of radiant heating, which maintains a comfortable environment in a wholly enclosed unit by utilizing heat waves which radiate from the large surfaces of the bottom and back of the incubator, warming everything they touch. In this system, the heat waves prevent the loss of body heat. The air within the incubator is not hot (as in hot air systems), but objects in the incubator, such as the mattress and the infant, are warm. Moreover, the temperature can be varied according to the individual requirements. The heating units are made of a durable high quality material, and are sealed in the bottom and back of the incubator, entirely outside the infant compartment, thus eliminating any danger of the infant or attendant coming into contact with them. Danger of oxygen ignition is also eliminated.

As best shown in Figs. 1, 2, 3, 4, 6, 7 and 9, the temperature within the incubator may be controlled by means of an adjustable thermostat or thermoswitch 64. This constitutes the only control on the incubator, all of the regulators and heating apparatus working in conjunction with it. The temperature may be increased by turning the dial to the right, or decreased by turning it to the left. When the incubator is operating at the required setting, the thermoswitch will automatically keep it at the temperature desired. It is scientifically calibrated and tested for performance, and is so sensitive that it permits only one-half degree variance from the desired temperature. Reference numeral 42 shows a neon glo indicating lamp or bulb, which, when lighted, affords a visual indication that the current is on. Reference numeral 43 shows a neon glo indicating lamp or bulb, which, when lighted, affords a visual indication that the heating units are in operation.

Means have also been provided for ventilating the incubator. For this purpose, a series of openings or slots 44 are provided in the side wall 3 of the incubator, adjacent the right end of the compartment C, as viewed in Fig. 5, the air entering these openings and passing over the container 21, where it is humidified, and whence it passes through the compartment C and out through exhaust openings 45 (Figs. 3 and 8) in the wall 2, adjacent the upper edge of the latter. The volume of air passing through the openings 44 may be regulated by a damper 46 slidable in tracks or guides 47 (Figs. 4 and 5), as by means of a button 48, the stem of which extends through a slot 49 in the wall 3. The damper 46 is provided with slots or openings 50, which correspond in size and spacing with the openings 44, and may be moved into full registration with the latter (for maximum volume of air intake), or completely out of registration with the latter (to completely close the air intake). Similarly, the volume of air passing out of the openings 45 may be regulated by a damper 51 slidable in tracks or guides 52 (Figs. 5 and 8), as by means of a button 53, the stem of which extends through a slot 54. The damper 51 is provided with slots or openings 55, which correspond in size and spacing with the openings 45, and may be moved into full registration with the latter (for maximum volume of air exhaust), or completely out of registration with the latter (to completely close the air exhaust).

The dampers thus regulate the amount or volume of air entering or leaving the incubator, and can be locked in any desired position. The dampers may be completely closed, when it is desired to administer oxygen to the infant. The oxygen may be admitted into the incubator through a tube 56, which is connected to and passes through the wall 2 of the incubator. The inner end of the tube 56 is readily accessible for attachment of an oxygen mask when a concentration of oxygen is needed.

The incubator is also provided with a thermometer panel 57, which is mounted on the rear wall 15 and is designed to protect both dry and wet bulb thermometers from breakage.

The lower portion of the incubator is designed to provide an upper compartment 58 for clothing and blankets, these being maintained sufficiently heated by heat which radiates downwardly through the base 22 of the heating unit. It is also designed to provide a lower compartment 59, which forms a convenient storage compartment for medicine and other items. These compartments 58 and 59 are adapted to be closed by doors 60 and 61, which are hinged to the front wall 1 at their outer vertical edges, and are provided with handles 62. The doors 60 and 61 are inset, as shown in Fig. 8, so that their outer faces are flush with the wall 1 of the incubator.

The incubator is movably supported by casters 63, the front casters being provided with brakes (not shown) for locking the incubator against movement.

In cases where it is desired to obtain a greater concentration of heat under the humidifier compartment (to the right of the baffle 20 in Fig. 5), so as to increase the rate of evaporation from the humidifier pan 21, the portion of the

elements 33, 34, 35, 36 and 37 to the right of the baffle 20 may be omitted, in which case, the heat from the elements 30—31 will reach the humidifier compartment more directly than when dissipated through the aforesaid radiating elements. This modification is not illustrated, since the manner in which it is accomplished will be readily understood by those skilled in the art.

It is to be understood that the form of my invention, herewith shown and described, is to be taken as a preferred example of the same, and that various changes in the shape, size and arrangement of parts may be resorted to, without departing from the spirit of my invention, or the scope of the subjoined claims.

Having thus described my invention, I claim:

1. In an incubator of the character described, a cabinet having a compartment adapted to receive an infant, said compartment being defined by end walls, an imperforate non-combustible bottom, an imperforate non-combustible rear wall, and a closure lid, and means for radiating heat to said bottom and rear wall without danger of transmission of sparks into said compartment, said means comprising a unit disposed below said bottom and having electrical heating elements and a plate having an extended heat



radiating surface interposed between said elements and said bottom, said unit being out of contact with said bottom, whereby heat is radiated to said bottom through an air space, said cabinet being provided with spaced tracks, said unit being slidable on said tracks and being removable bodily from said cabinet, said unit being further provided with a vertical rear wall, in parallel spaced relation to said first-named rear wall, and said unit rear wall being provided with flanges adapted to be screwed to said first-named rear wall.

2. An incubator, as defined in claim 1, in which said heat radiating plate has a vertical flange at the rear thereof extending upwardly into the space between said first-named rear wall and said unit rear wall, said flange adapted to radiate heat to said compartment rear wall.

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