COMMONWEALTH of AUSTRALIA

PATENTS ACT 1952

APPLICATION FOR A STANDARD PATENT

We

THE BOC GROUP, INC.
of 85 Chestnut Ridge Road,
Montvale, New Jersey 07645,
United States of America

hereby apply for the grant of a Standard Patent for an invention entitled:

"HANDHOLE FOR INFANT INCUBATOR"

which is described in the accompanying specification.

Details of basic application(s):

<table>
<thead>
<tr>
<th>Number</th>
<th>Convention Country</th>
<th>Date</th>
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<tbody>
<tr>
<td>050,835</td>
<td>United States of America</td>
<td>13th May, 1987</td>
</tr>
</tbody>
</table>

The address for service is care of DAVIES & COLLISON, Patent Attorneys, of 1 Little Collins Street, Melbourne, in the State of Victoria, Commonwealth of Australia.

Dated this 15th day of April, 1988

To: THE COMMISSIONER OF PATENTS

(a member of the firm of DAVIES & COLLISON for and on behalf of the Applicant).

Davies & Collison, Melbourne and Canberra.
COMMONWEALTH OF AUSTRALIA
PATENTS ACT 1952
DECLARATION IN SUPPORT OF CONVENTION OR NON-CONVENTION APPLICATION FOR A PATENT

In support of the Application made for a patent for an invention entitled: **HANDHOLE FOR INFANT INCUBATOR**

1. Larry R. Cassett
   of The BOC Group, Inc.
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   Montvale, New Jersey 07645
   United States of America

2. Robert J. Koch
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   Ellicott City, Maryland 21043
   United States of America

The Applicant is the Assignee of the Said Actual Inventor by virtue of an Assignment dated May 13, 1987 in respect of the invention.

The basic application as defined by Section 141 of the Act was made in United States of America on the May 13, 1987 by Robert J. Koch, 4048 Choctaw Drive, Ellicott City, Maryland 21043, U.S.A.

The basic application referred to in paragraph 3 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Declared at Murray Hill
New Providence this 7th day of March, 1988
New Jersey 07974 U.S.A.

Larry R. Cassett
Patent, Trademark and Licensing Activities

DAVIES & COLLISON, MELBOURNE and CANBERRA
1. A handhole for attachment to an infant incubator hood comprising a one piece, injection moulded plastic frame having an opening and having securing means for attachment to the incubator hood, said frame having latch means depending outwardly thereof, a single piece injected moulded plastic door hingedly attached to said frame member and pivotable between an open and closed position with respect to said opening, said door being securable by said latch means to retain said door in its closed position, and means to impart a predetermined bending to said door when in said closed position to substantially create all of bias required to cause said door to spring toward its open position when said latch means is unsecured.
COMPLETE SPECIFICATION FOR THE INVENTION ENTITLED:

"HANDHOLE FOR INFANT INCUBATOR"

The following statement is a full description of this invention, including the best method of performing it known to us:

-1-
Background of the Invention

This invention relates to infant incubators and, more particularly, to handholes for gaining access to an infant positioned within the incubator.

Handholes are conventionally used with incubators and are basically small doors that are normally closed and are opened by hospital personnel so that the personnel can insert their hands into the incubator to attend to the needs of the infant. Since the incubator provides a very closely controlled environment, both as to temperature and humidity, the handholes are used instead of opening an incubator hood, thus minimizing the disruption to that controlled environment by the admission of ambient air.

One preferred characteristic of handholes is the feature of elbow-operation, that is, for convenience, the doors of handholes are generally spring loaded such that they spring open when the latch is released. The feature is particularly advantageous since personnel utilizing incubators generally prefer to merely touch the door latch with an elbow to open that door. An example of a typical handhole door operable by an elbow is described in Grosholz et al, United States Patent 3,335,713.
At the present time, the handholes are manufactured in numerous parts including individual coil springs and are assembled and installed on an incubator with considerable labor including extensive alignment to assure the proper orientation of the door with its frame and orientation of the latch as well as in positioning the handhole in proper position on the incubator hood. The handholes are thus relatively expensive to manufacture and install, both from the cost of individual parts and also the labor cost of assembly and installation.

Summary of the Invention

The handhole of the present invention thus provides a unique construction in which only two major components are utilized, both of which are injection molded of a clear plastic composition. One component, a frame, is readily attached to the incubator by hand installed screws and thus is easily assembled and removed without special tools or the like. The frame includes a latch depending outwardly as part of its one-piece construction and includes a special flange for mounting a wristlet frame. The door likewise is a one-piece injection molded component and is hingedly connected to the frame to assume open and closed positions. In the closed position, the free end of the door is held in position by the latch.

A spring bias or effect is created by slightly bending the door when in its closed position such that when the latch is released, the inherent flexibility of the material used to construct the door causes the door to flex outwardly and thus spring to its open position by itself. Thus, the door can be opened by means of a user's elbow. Preferably, the door is installed on the incubator hood at an angle with
respect to the horizontal elevating the center of gravity
above the hinged connection so that the weight of the door
itself aids in continuing to open the door beyond the
initial effect of the flexible door.

The handhole is thus elbow operated and yet is comprised
of but two major injectable molded component.s and therefore
is inexpensive to manufacture, install and remove for
servicing and cleaning. In addition, because the door and
frame are prealigned, the handhole can be installed without
adjustment of springs or any other need to align the doors
with its mating frame or latch mechanism. In effect, proper
orientation is assured by manufacturing each component for
preassembly of the proper dimensions. All alignment and
spring action are accomplished in the molding of the two
components and only final assembly to the incubator is
needed.

The foregoing and other advantages and features of the
present invention will become readily apparent from the
following description.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention is diagrammatically illustrated by way of
example in the drawings appended hereto, in which:

FIG. 1 is an isometric view of an incubator having
installed therein, handholes constructed in accordance with
the present invention; and

FIG. 2A is a side view of a handhole constructed in
accordance with this invention, and

FIG. 2B is a further side view of the handhole of FIG.
2A shown with its door in the partly open position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Turning first to FIG. 1, there is shown an isometric
view of an incubator 10 containing handholes 12 constructed in accordance with the present invention. In particular, incubator 10 comprises a base 14 and a hood 16 on top of the base 14 so as to enclose therein an infant compartment 18 where the infant is confined in a specially controlled environment.

That environment generally includes a heated atmosphere as well as controlled humidification. In general, hoods for such incubators are hinged, such as by piano type hinge 20 so that personnel can open the hood for complete access to the infant or for placing the infant in the incubator or removing the infant therefrom. Typical hinges are commonly also provided at the rear of the entire hood for complete opening of hood for access to the inside compartment.

As to the handhole 12 itself, it is comprised of only two basic components, a frame 22 that is secured to the hood 16 of incubator 10 and which itself has an opening, and a door 24 that is hingedly attached to the frame 22 by a hinge 26 and which pivots about the hinge 26 to both open and closed positions. Also, as shown in FIG. 1, the frame 22 includes a latch 28 that is molded integral thereto and, as will be explained, holds the door 24 in its closed position.

As shown, therefore, the handhole 12 is readily accessible to be opened by hospital or other attending personnel and which personnel can insert their hands through the handholes 12 for access to the infant, yet by minimizing the opening size, only a minimum of disruption to the internal controlled environment occurs.

The handhole 12 is, as discussed, comprised of but the two major components, that is, the frame 22 and the door 24. Each compartment is of a single piece manufactured by injection molding and preferably are of a transparent plastic such as polycarbonate which may be readily injection
molded with adequate tolerances for this application. The other needed component relates to the hinge 26 and comprises a pin 30 that hingedly joins together the frame 22 and door 24.

Turning now to FIG. 2A, there is shown a side view of a handhole 12 with the door 24 in the closed position. Taking first the frame 22, the frame 22 as noted is a unitary piece of injection molded plastic and comprises a flange 32 that overlies the opening in the incubator hood when the handhole 12 is affixed to an incubator. The flange 32 includes a plurality of bosses 34 that are inserted in similarly shaped holes in the hood of the incubator and which are utilized in securing handhole 12 to an incubator. The use of bosses 34 which interfit with hand tightenable screws assure correct orientation in the installation of the handhole 12 to incubator hood 16.

The latch 23 depends outwardly from frame 22 and includes an elbow actuator 36 extending laterally outwardly forming an L shaped latch 28. By depressing the elbow actuator 36, the L shaped latch 28 flexes and moves edge 38 away from door 24 thereby releasing the door 24 as will be explained.

The door 24, as may be seen in FIG. 2A, is also a unitary piece construction of injection molded plastic. The door 24 is joined at its one end by hinge 26 to frame 22 secured thereto by pin 30, thus the door 24 is pivotable about hinge 26 to its various positions. As noted in FIG. 2A, the door 24 is held in its closed position by the overlapping relationship with latch 28 depending from flange 32.

FIG. 2A also shows the bending of door 24 in its closed position. The bending creates a spring bias toward the open position based upon the amount of such bending and the
inherent flexible characteristics of the plastic material used to injection mold door 24. In order to insure that the amount of flexing is predetermined, thus the amount of bias is known, a bump 40 is injection molded into the door 24 and which bump 40 presses against flange 32 of the frame 22 when door 24 is in the closed position. By properly locating and sizing the amount of protrusion of bump 40, it is possible to predetermine the amount of bending, or bias of the door 24. That amount of protrusion is, of course, dependent upon its configuration, position and the inherent flexibility of the material used to construct door 24, and the exact dimension can readily be determined by experimentation of different locations of bump 40 and door materials. Alternatively, not shown, the protrusion or bump could be injection molded on the flange 32 of frame 22.

In FIG. 2B, there is shown a side view of the handhole 12 in which the door 24 has been released by latch 28 and has sprung open as a result of the slight bend imposed upon the door 24 in its closed position. In FIG. 2B, there can also be seen, a wristlet flange 42, also injection molded as part of the unitary piece frame 22 and which is used to attach a conventional wristlet frame that provides additionally protection to the infant's environment by forming a seal about the arms of attending personnel as they reach in to the incubator.

Returning to FIG. 1, it should be additionally noted that the bending action of door 24 is further argumented by positioning the doors 24 on incubator 10 at an angle with respect to the horizontal, thus, a center line between the center of hinge 26 and latch 28 is at an angle of approximately 5-25 degrees of the horizontal such that, the center of gravity of the door is above its pivot point. The door 24 will, after opening a slight amount by its bending
bias, thereafter be aided by the force of gravity in the open direction so that the door 24 swings open to the extent necessary for personnel to gain access to the infant.

While the invention has been disclosed and described with reference to a single embodiment, it will become apparent that variations and modifications may be made therein, and it is therefore intended in the following claims to cover each such variation and modification as falls within the true spirit and scope of the invention.
CLAIMS
THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A handhole for attachment to an infant incubator hood comprising a one piece, injection moulded plastic frame having an opening and having securing means for attachment to the incubator hood, said frame having latch means depending outwardly thereof, a single piece injected moulded plastic door hingedly attached to said frame member and pivotable between an open and closed position with respect to said opening, said door being securable by said latch means to retain said door in its closed position, and means to impart a predetermined bending to said door when in said closed position to substantially create all of bias required to cause said door to spring toward its open position when said latch means is unsecured.

2. A handhole as defined in claim 1 wherein said means to impart bending comprises a projection of predetermined size and location moulded into said handhole.

3. A handhole as defined in claim 2 wherein said projection is injection moulded on said door.
4. A handhole as defined in claim 2 wherein said injection molded plastic frame and door are both of polycarbonate.

5. A handhole as defined in claim 5 wherein said injection molded frame further includes a wristlet flange.

6. A method of manufacturing a handhole for use with an infant incubator comprising the steps of:

a. injection molding as a single piece, a frame having an opening and adapted to be secured to the incubator and having a latch;

b. injection molding as a single piece, a door adapted to fit over the opening of the frame,

c. pivotably securing one end of the injection molded door to the injection molded frame thereby allowing the other end of the door to pivot between open and closed positions with respect to the opening in the frame,

d. imparting or slight bending to said door when in its closed position and held by the latch to create a predetermined bias toward the open position.

7. A method as set forth in claim 7 wherein said step of imparting a slight bending to said door comprises injection molding a projection in a predetermined location and predetermined size on said door or said flange to cause the door to bend in its closed position.
8. A method as set forth in claim 8 wherein said step of injection molding said door further includes injection molding said projection in a predetermined position on said door.

9. A method as set forth in claim 8 wherein said step of injection molding said flange further includes injection molding as part of said flange, a wristlet flange for attaching a wristlet frame thereto.

10. A handhole for attachment to an infant incubator substantially as hereinbefore described with reference to the drawings.

11. A method of manufacturing a handhole substantially as hereinbefore described with reference to the drawings.

12. The steps or features disclosed herein or any combination thereof.

DATED this 15th day of April, 1988

THE BOC GROUP, INC.
By its Patent Attorneys
DAVIES & COLLISON
including the best method of performing it known to