cushion. This device is intended for use within existing incubators, and therefore is not a portable alternative to the incubator itself.

US 3,818,896 (Medical Concepts Inc) discloses an inflatable housing to enclose a volume of atmosphere for use as an incubator or oxygen tent. This inflatable housing is intended to replace the rigid framework or housing of incubators to allow for ease of storage within a hospital environment.

Preferred embodiments of the present invention aim to provide a cost-effective basic means of incubating an infant that may be convenient and easy to store and transport. Various embodiments of the present invention also aim to provide a modular arrangement whereby a basic incubator may be supplemented with additional functionality according to the needs and requirements of an infant, an environment or a particular situation.

Various embodiments provide a collapsible incubator for an infant according to claim 1. Further embodiments are defined in the dependent claims.

According to one technique, there is provided a collapsible incubator for an infant, the collapsible incubator comprising:

- a flexible housing for containing the infant, the flexible housing being configurable between an expanded condition and a collapsed condition;
- a door within the flexible housing for infant access;
- a first end portion secured to a first end of the flexible housing;
- a second end portion secured to a second end of the flexible housing, said second end portion being configured to be substantially opposite said first end portion; and,
- at least one fastening means configured to releasably secure the first end portion to the second end portion when in the collapsed condition,

whereby the first end portion and the second end portion are configured, in use, to support the flexible housing in the expanded condition, and to substantially contain the flexible housing therebetween in the collapsed condition.

Preferably, the flexible housing incorporates at least one inflatable portion.

Preferably, the inflatable portion comprises a double-walled construction with an air space therebetween, said air space being fluidly connected to at least one air inlet.

Alternatively, the first end module and/or the second end module may incorporate a handle.

The flexible housing may comprise at least one transparent portion.

The door may be transparent.

The door may incorporate a sealing means.

Preferably, the fastening means comprises a zip.

Alternatively, the fastening means may comprise any one or more of the following: a mechanical clip, a hook and loop fastener, a strap, a plurality of poppers, a plurality of poppers, an elasticated band or strap

The flexible housing may incorporate at least one porthole.

The collapsible incubator may incorporate at least one light-emitting means configured to emit light inside the flexible housing.

Preferably, the flexible housing incorporates means to support the at least one light-emitting means.

The at least one light emitting means may comprise an ultraviolet light source.

The light emitting means may comprise a phototherapy unit.

Alternatively, the light emitting means may comprise an array of light emitting diodes mounted to a flexible strip.

The collapsible incubator may incorporate a water fill port.

The flexible housing may be provided with at least one telescopic rod, configured to support the flexible housing in an expanded condition, the telescopic rod being supported between the first end portion and the second end portion.

The flexible housing may incorporate an oxygen valve.

The flexible housing may comprise a polymer sheet.

Preferably, in use and in an expanded condition, the first end portion and the second end portion are substantially vertical.

Alternatively, in use and in an expanded condition, the first end portion and the second end portion are substantially horizontal.

For a better understanding of the invention and to show how embodiments of the same may be carried into effect, reference will now be made, by way of example, to the accompanying diagrammatic drawings, in which:

Figure 1 shows one embodiment of collapsible incubator in side view, in an expanded and collapsed condition;

Figure 2A shows the collapsible incubator of Figure 1 in expanded and collapsed condition, showing one embodiment of first end module prior to mounting to a first end portion;

Figure 2B shows the collapsible incubator of Figure 2A in an expanded and collapsed condition, showing the first end module mounted to the first end portion.

Figure 3 shows the collapsible incubator of Figure 2B in an expanded and collapsed condition, showing a second end module mounted to a second end portion;

Figure 4 shows the collapsible incubator of Figure 1 in an expanded condition, showing one embodiment of light emitting means supported within the flexible housing;

Figure 5 shows the collapsible incubator of Figure 1 in an expanded and collapsed condition, showing one embodiment of handles within the first end portion and the second end portion;

Figures 6A and 6B show the collapsible incubator in an expanded and collapsed condition, with a combination of first and second end modules, showing different possible configurations of handles within the first and second end portions and/or first and second end modules;

Figure 7 shows the collapsible incubator of Figure 1, showing one embodiment of air distribution means incorporating a plurality of holes;

Figure 8 shows the collapsible incubator of Figure 1, showing one embodiment of fastening means comprising a zip.

Figure 9 shows the collapsible incubator of Figure 1, showing one embodiment of flexible housing support means;

Figure 10 shows a further embodiment of collapsible incubator, shown in an expanded and collapsed condition, the first end portion and second end portion being configured, in use, to be substantially horizontal, and also showing a carrying case;

Figure 11 shows a detailed plan view of the collapsible incubator of Figure 6B shown in an expanded condition;

Figure 12 shows the collapsible incubator of Figure 11 in end view;

Figure 13 shows the collapsible incubator of Figure 11 in front view; and,

Figure 14 shows the collapsible incubator of Figure 11 in isometric view when in a collapsed condition.

In the figures like references denote like or corresponding parts.

The flexible housing 2 incorporates at least one transparent portion that allows the user to view the infant 4 contained within the flexible housing 2 from outside the flexible housing 2. The door 3 may be transparent. Or the flexible housing 2 may incorporate at least one viewing window. The flexible housing 2 may be transparent in entirety. This allows the user to make visual observations of the infant 4 such as checking skin colour, breathing, and movement, the location of any sensors, feeding tubes or medicinal tubes.

The flexible housing 2 incorporates a pair of end portions 5 and 6, or a first end portion 5 and a second end portion 6. These end portions 5 and 6 are located substantially opposite each other, such that when they are spread apart, they help to open up the flexible housing 2, and provide the flexible housing 2 with some strength and structure when in an expanded form. The first end portion 5 and the second end portion 6 may be substantially the same size, and may comprise planar portions, of rigid polymer, or otherwise, and be configured to be at opposite ends of the flexible housing 2. The first end portion 5 and the second end portion 6 are configured such that in a collapsed condition they may contain the flexible housing 2 when in a collapsed form. These end portions 5 and 6 may comprise shallow shells into which the collapsed flexible housing 2 may be folded or compressed.

The end portions 5 and 6 may not be substantially opposite each other in all embodiments, but are configured such that be bringing the first end portion 5 into contact with the second end portion 6 the flexible housing 2 is collapsed therebetween.

The first end portion 5 and/or the second end portion 6 may incorporate one or more access points 8. These access points 8 may also be formed within the flexible housing 2. The access points within the end portions 5 and 6 and the access points within the flexible housing 2 may correspond with each other to allow entry through either the first end portion 5 or the second end portion 6, and through the flexible housing 2, to the interior of the flexible housing 2.

Where the flexible housing 2 comprises a double wall arrangement 9, the access port 8 would be suitable sealed by welding or otherwise, so as not to allow air from the air space 10 to escape through this access port 8. These access ports 8 allow for the entry of cables,

sensors, wires, heated air, cooled air, moisture and other components and elements that support the incubation process of the infant 4 being incubated within the flexible housing 2.

The first end portion 5 is provided with a fastening means 7 and the second end portion 6 is providing with a corresponding fastening means 7 that allow the first end portion 5 to be releasably secured to the second end portion 6 when in a collapsed or stored condition. This is to allow the collapsible incubator 1 to be easily transported in a collapsed condition. It also means that the flexible housing 2 which is likely to have been sterilised prior to use, is kept free from the ingress of dirt and other detritus before the collapsible incubator 1 is expanded for use. Figure 1 shows the collapsed condition, beneath the expanded condition, where the flexible housing 2 cannot be seen as it is substantially contained within or between the first end portion 5 and the second end portion 6.

Figures 2A and 2B show the collapsible incubator 1 of Figure 1 with one embodiment of a first end module 12 releasably mounted by a mounting means 13 to the first end portion 5. This first end module 12 may comprise any number of functions that are required by the collapsible incubator 1 when incubating an infant 4. This first end module 12 may be operatively connected to the access port 8 to allow for the functions of the first end module 12 to be conveyed to the infant 4 through the access port 8.

The mounting means 13 for mounting the first end module 12 to the first end portion 5 may comprise any suitable mechanical mounting means such as clips or clamps, or may alternatively comprise other suitable mounting means 13 such as hook and loop fasteners. The first end module 12 may be added to the collapsible incubator 1 as and when required and specific for a certain use. This modular arrangement of end modules allows for different combinations of end modules to be added to the basic collapsible incubator 1, according to requirements or to meet various budget constraints.

The air inlet 11 is shown here with a pump 14, to provide air either manually or electrically to the air space 10 between walls 9. The pump 14 and air inlet 11 in a collapsed condition would fold within the boundaries of the first end portion 5 and the second end portion 6 to be substantially contained therebetween.

may have been heated or cooled, or may have been supplemented in some way to help support the life of the infant 4.

Figure 8 shows one embodiment of fastening means 7 shown as a zip or zipper 22. This zip 22 incorporates one portion of teeth on the first end portion 5 and the corresponding portion of teeth on the second end portion 6, and a zip 22 to zip the first end portion 5 to the second end portion 6, containing the flexible body 2 in a collapsed condition therebetween. Alternative fastening means may comprise hook and loop fasteners, poppers, mechanical clips, straps or other fastening means 7 suitable for securing together the first end portion 5 to the second end portion 6 and to containing the flexible housing 2 in between.

As shown in Figure 9, the flexible housing 2 may be provided with additional means of support 23 that in this embodiment comprise telescopic rods 23. These rods stretch between the first end portion 5 and the second end portion 6 and help to keep the flexible housing 2 in an open and expanded condition. These rods 23 are telescopic so that they too may collapse to be contained within the collapsible incubator 1 when in a collapsed condition. The flexible door 3 may be joined to the flexible body 2 by a hinge 25, or may form a removable piece. It may incorporate sealing means about the periphery 24 to prevent the ingress of dirt, detritus and suchlike and to help maintain a sterile incubated environment with the flexible housing 2. The door 3 may be closed by a zip, not shown.

Figure 10 shows a further embodiment of collapsible incubator 1 where the first end portion 5 and the second end portion 6 are shown in a vertical configuration, where one is substantially above the other. This arrangement of collapsible incubator 1 therefore expands and collapses in along a vertical plane. The collapsible incubator 1 may be contained within a carrying case 26 for transporting from place to place, and the carrying case 26 may form part of the first or second end modules 12 or 16.

Figure 11 shows the collapsible incubator 1 in some detail and in plan view. The first end module 12 is provided with at least one heating means 30 that may comprise heated wires, ceramic heaters, or other form of heat to warm the surrounding air. The heating means 30 or first end module 12 may be provided with a fan to drive the heated air 15 through an access port 8 within the first end portion 5 and the flexible body 2 and into the interior of the flexible

housing 2, or may be direct to the infant 4 through a tube and mask. Also shown in this figure is an access port 8 for a feeding tube 35 for supplying liquid food substances to an infant 4 through a tube or line, either intravenously or otherwise.

Figure 14 shows the collapsible housing 2 contained within the first end module 12 and the second end module 16, with the first end portion 5 secured by zipper 22 to the second end portion 6. In its collapsed form the collapsible incubator l is through to be convenient to transport, ship, stack and carry.

The collapsible incubator 1 may be provided as a disposable unit, for single use with one infant 4, and be made of suitable materials to allow for ease of recycling, disposal or incineration.

Alternatively, the collapsible incubator 1 may be provided as a reusable unit that may be reused with the same or another infant 4. In this instance the collapsible incubator 1 must be easy to clean and sterilise, and be configured to go through a sterilisation process. In particular the flexible housing 2 should be easy to sterilise, and any creases or joins should be minimised to prevent build-up of dirt or bacteria.

CLAIMS:

1. A collapsible incubator for an infant, the collapsible incubator comprising:

a flexible housing for containing the infant, the flexible housing being configurable between an expanded condition and a collapsed condition;

a door within the flexible housing for infant access;

a first end portion secured to a first end of the flexible housing;

a second end portion secured to a second end of the flexible housing, said second end portion being configured to be substantially opposite said first end portion; and,

at least one fastening means configured to releasably secure the first end portion to the second end portion when in the collapsed condition, whereby the first end portion and the second end portion are configured, in use, to support the flexible housing in the expanded condition, and to substantially contain the flexible housing therebetween in the collapsed condition, wherein the flexible housing incorporates at least one inflatable portion.

2. A collapsible incubator according to claim 1, wherein the inflatable portion comprises a double-walled construction with an air space therebetween, said air space being fluidly connected to at least one air inlet.

3. A collapsible incubator according to claim 2, wherein the inflatable portion comprises at least one inflatable rib configured to support the flexible housing in an expanded condition.

4. A collapsible incubator according to claim 2, wherein the inflatable portion is substantially throughout the flexible housing.

5. A collapsible incubator according to claims 2 to 4, wherein the at least one air inlet incorporates an air flow control means.

6. A collapsible incubator according to claim 5, wherein the air flow control means comprises one of: a valve; a manual air pump; an electric pump; and a gas canister.

7. A collapsible incubator according to any one of the preceding claims, wherein the flexible housing incorporates at least one access port for gaining access to the inside of the flexible housing.

8. A collapsible incubator according to any one of the preceding claims, wherein the first end portion incorporates a mounting means for releasably securing a first end module to the first end portion and/or wherein the second end portion incorporates a second mounting means for releasably securing a second end module to the second end portion.

9. A collapsible incubator according to claim 8, wherein the mounting means and/or second mounting means comprises at least one mechanical fastener.

10. A collapsible incubator according to claim 8, wherein the first end module comprises a heating means.

11. A collapsible incubator according to claim 10, wherein the heating means is fluidly connected to the inside of the flexible housing through the at least one access port within the first end portion.

12. A collapsible incubator according to claim 11, wherein the flexible housing incorporates an air distribution means comprising at least one channel and a plurality of holes within said at least one channel.

13. A collapsible incubator according to claim 8, wherein the second end module comprises a cooling means and/or a humidification means.

14. A collapsible incubator according to claims 8 to 9, wherein the collapsible incubator comprises at least one power means.

15. A collapsible incubator according to claim 14, wherein the first end module and/or second end module comprise a control means operatively connected to the power means for controlling the heating means and/or the cooling means and/or the humidification means.

16. A collapsible incubator according to claim 15, wherein the collapsible incubator comprises at least one sensing means operatively connected to the power

means, the at least one sensing means comprising any one or more of the following: heart rate monitor, pulse monitor, infant thermometer, environmental thermometer, thermocouple, motion, blood oxygen level monitor, environmental oxygen level monitor, infant weight, brain activity, a thermostat, moisture level monitor, air quality monitor.

17. A collapsible incubator according to claim 16, wherein the at least one sensor is operatively connected to at least one alert means.

18. A collapsible incubator according to any one of the preceding claims, wherein the flexible housing comprises at least one transparent portion.

19. A collapsible incubator according to any one of the preceding claims, wherein the collapsible incubator incorporates at least one light-emitting means configured to emit light inside the flexible housing.

20. A collapsible incubator according to claim 19, wherein the at least one light emitting means comprises an ultraviolet light source; a phototherapy unit; or an array of light emitting diodes mounted to a flexible strip.