

Environmental Control Apparatus

This invention relates to environmental control apparatus and, more particularly but not exclusively, to individual environmental units.

People frequently become stressed by the environment in which they live. When they become stressed they attempt to alleviate the symptoms causing the stress. If they are too hot they move somewhere cooler, if they are too cold they move somewhere warmer and if they are dirty they clean themselves. Normally the solutions to these environmental stresses are housed inside buildings taking the form of air-conditioning, fireplaces and bathrooms.

However there are certain circumstances such as massed gatherings, sporting events and medical situations where buildings housing these utilities are either inadequate or non-existent, but where electrical power is available.

According to one aspect of this invention there is provided environmental control apparatus comprising a receptacle formed to receive a single human or other animal body and environmental control means to control the environment surrounding said body.

The receptacle may be provided with a seat to enable a human to be seated in said receptacle. The receptacle may, alternatively, be so formed to receive a human body lying down or may be so formed to receive said body standing up.

The environmental control means may comprise means capable of heating and/or cooling the inside of the receptacle. The environmental control means may be a heat pump adapted selectively to heat or cool the inside of the receptacle, as desired. In another embodiment, the control means may comprise a heater to heat the inside of the receptacle. In a further embodiment the environmental control means may be in the form of refrigeration means to cool the inside of the receptacle.

The environmental control means may alternatively comprise air supply means to supply air to the receptacle via air supply conduits having outlets directed inwardly of the apparatus, the conduits being so directed that they can blow air onto or around said human or animal body.

The environmental control means may, in another embodiment, be in the form of liquid supply means connected to liquid supply conduits to spray the human or animal body with a liquid, for example water to clean

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said body. The liquid supply means preferably comprises a pump for pumping the liquid through the conduits. The liquid supply means may further include a vessel to hold liquid for the pumping means to pump. Alternatively, the pumping means may conveniently be connected to the mains supply of water.

In a preferred embodiment, the environmental control means is interchangeable with other environmental control means. The receptacle may define an aperture into which a selected one of the environmental control means can be fitted.

The receptacle may comprise a base and a shell mounted thereon. A seat may be arranged on said base. In one embodiment, the seat comprises a seating portion which may be movable into and out of the shell. The shell may include at least one closure member adapted to be closed when the apparatus is occupied.

The apparatus is preferably mobile and may be provided with wheels or castors to enable the apparatus to be moved from one place to another.

The outlets of the liquid supply conduits may be arranged to spray substantially the whole of the body with said liquid. The outlets may be defined in the

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shell of the receptacle. In the embodiments where the receptacle is provided with a seat the conduits are so arranged that said outlets are provided in the seat.

Valve means may be provided in the conduits, which valve means may be selectively operable to determine the outlets through which said liquid is sprayed.

In another embodiment, the receptacle may be elongate in configuration to receive a human body in a lying position. The apparatus may further include rails extending from a region outside the receptacle to a region inside said receptacle. Carrying means may be provided on said rails, and said carrying means may be movable therealong from a position outside said receptacle to a position inside said receptacle. The carrying means may comprise a stretcher capable of carrying a body in a lying position. The receptacle may be provided with a movable cover. In the case of apparatus adapted to receive a body in a sitting position, the cover may be hingedly attached to said shell. In the case of apparatus adapted to receive a body in a lying position, the cover may be slidably mounted on the shell.

The stretcher may comprise an elongate flexible material arranged around a plurality of rollers to

provide a support for the body. The rollers may be operated so as to move the material around said rollers. Thus, the body thereon can be turned to ensure that any liquid sprayed into the receptacle substantially covers the body.

According to another aspect of this invention there is provided a body enclosing structure comprising first and second opposed flexible members defining a space therebetween, and a fluid material held between said flexible members, said fluid material having a heat capacity sufficient to heat or cool the body to be enclosed. The heat capacity of the fluid material may be higher than the heat capacity of the body to be enclosed. Thus, in the case of a body requiring to be cooled the enclosing structure can be cooled prior to enclosing said body whereby heat is transferred from said body to the structure to cool said body and, in the case of a body requiring to be heated, the structure can be heated prior to enclosing said body whereby heat is transferred from said structure to said body to heat said body.

Preferably, the body enclosing structure is capable of tightly enclosing a human or animal body and may be in the form of a blanket or article of clothing.

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According to another aspect of the present invention there is provided a portable shell fitted with an openable or removable section, the whole being of sufficient size to contain a person, a seat and interchangeable mechanisms for producing the desired environmental effects.

The preferred embodiment of this invention can be used to alleviate the problems of excessive or reduced body temperature and lack of bodily cleanliness.

Specific embodiments of the invention will now be described by way of example with reference to the accompanying drawings, in which:-

Figs. 1a-1c show respectively environmental control apparatus in plan, sectional side and front views omitting the environmental control means;

Figs. 2a-2c show similar views to Figs. 1a-1c but housing a thermal control mechanism;

Figs. 3a-3c show views similar to Figs. 1a-1c but housing a cleansing mechanism;

Fig. 4 shows the movement of a seat in the environmental apparatus;

Fig. 5 shows the environmental apparatus fitted with an antechamber;

Fig. 6 shows a modification of the environmental apparatus;

Fig. 7 shows a patient being loaded into the environmental apparatus shown in Fig. 6;

Fig. 8 shows a patient in the environmental apparatus shown in Fig. 6 with a transparent top in an open position;

Fig. 9 shows a patient in the environmental apparatus shown in Fig. 6 with the transparent top in a closed position;

Fig. 10 shows a patient receiving medical treatment while in the environmental apparatus shown in Fig. 6;

Fig. 11 shows a further modification of an environmental apparatus that has been fitted for the proper handling of the recently deceased;

Fig. 12 shows the operation of the apparatus shown in Fig. 11;

Fig. 13 shows further operation of the apparatus shown in Fig. 11;

Fig. 14 shows a gel or liquid filled blanket and a gel or liquid filled sleeve;

Fig. 15 shows a refrigeration unit for use with the blanket shown in Fig. 14; and

Fig. 16 shows the blanket shown in Fig. 14 wrapped around the refrigeration unit and a suggested location in the back of an emergency vehicle.

Referring to Figs. 1 to 5, there is shown

environmental control apparatus 10 comprising a receptacle 10a having a shell 11, mounted on a base 11a. The shell 11 is fitted with a movable, or removable, front cover 12. In the rear of the shell 11 is defined an aperture 13 for reasons which will be explained below. The shell 11 can be mounted on wheels or castors 14 for ease of manoeuvrability. In a situation where many units are required the shell 11 can be mounted on a suitable support for movement by a load carrying apparatus or vehicle.

Referring to Fig. 2. An environmental control unit 15, for example a refrigeration unit or a heating unit, can be housed in the shell 11 by manoeuvring the unit 15 and the seat 16 into the shell 11 until the unit 15 attains its correct position in the aperture 13. It will be appreciated that the environmental control unit could be any other suitable means for controlling the environment in the receptacle. It will also be appreciated that where the environmental control unit is a refrigeration unit, the refrigeration unit can be reconfigured to act as a heat pump.

The seat 16 is fitted with controls 17 and the shell 11 can be surmounted by a dome 18 formed of either a flexible or rigid material to protect the head of the user from the outside environment. If the user is

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severely physically incapacitated the controls 17 can be incorporated in, or attached to, the headrest 19 such that the apparatus 10 can be controlled by head movement. If the user is completely incapacitated the controls 17 can be positioned such that they can only be operated from outside of the apparatus 10 by a third party.

In the case where the unit 15 is a refrigeration unit, in the cooling mode, the refrigeration unit 15 can be connected up in one of two ways dependant on the available supply of electrical power.

If electrical power is limited, the coolant output from the refrigeration unit 15 can be fed through cooling pipes in the seat 16. In this instance the seat 16 would be of generally hollow form and can have a liquid or gel filled solid outer shell. A low powered refrigeration unit could thus chill or freeze the air, liquid or gel contained within the seat 16 over a relatively long period of time in readiness for its use over a shorter period of time.

If electrical power is not limited the cooling output from the refrigeration unit 15 can be operated in the manner of a normal air-conditioning unit. In this instance the seat 16 is formed of a structurally

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supported open weave material that permits the free circulation of cooled air around the apparatus 10, seat 16 and the user.

In order to heat the inside of the receptacle 11a, the refrigeration unit 15 can be re-configured to operate as a heat pump or the refrigeration unit 15 can be removed and replaced by a suitable heat generator and pump mechanism or circulatory air heater. Heating of the receptacle 11a would then be undertaken in one of two modes, again dependant on the availability of electrical power, and operating in a similar manner in both cases as previously described for the operations in the cooling mode. This means that the inside of the shell 11 would be heated rather than cooled.

In situations where a number of apparatus 10 are required together, their shells 11 can be fitted with individual seats 16, controls 17, domes 18 and headrests 19 but the individual refrigeration or heating units 15 can be replaced by one central unit of a larger capacity outputting heat or cold to the individual apparatus 10 via connective ducting of a manifold form.

The seat 16 may also have attachment means for a single use disposable hygienic liner which can be fitted prior to use and then removed and disposed of subsequent

to use. The form of this liner would not impair the functions and benefits obtained by the user from the environmental unit during use but would provide the user with a clean bodily contact area from the seat 16 to the headrest 19.

The seat 16 comprises a seat back 22, a seat base 26 having rear legs 23 and arms 29 extending from the seat back 22.

Referring to Fig. 3 and Fig. 4, the environmental control means could be in the form of a cleansing unit 20 fitted into the shell 11 at the aperture 13. The cleansing unit 20 comprises a pump unit 20a and the tank 21. The seat back 22 can be attached onto the pump unit 20 by mechanical means. The mechanical means that attach the seat back 22 to the pump unit 20a may also act as fluid conduits and permit the flow of liquid from the tank 21 to the seat back 22 via the pump 20a. Alternatively the fluid conduits permitting liquid flow may be separately attached features from the mechanical means of attachment of the seat back 22 to the pump unit 20a.

The seat back 22 incorporates nozzles 25 through which the liquid can be pumped. The seat base 26 is attached to the pump unit 20 via at least two flexible

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pipes 27 which are in turn attached to the rear legs 23 of the seat base 26.

The seat base 26 (see Fig. 4) is designed to move easily both into and out of the shell 11 such that a physically disabled user can transfer more easily onto the seat base 26 when it is out of the shell 11.

The rear legs 23 of the seat base 26 are hollow and are perforated with openings to allow egress of the liquid pumped by the pump unit 20 from the tank 21. The surface of the seat base 26 is provided with nozzles 28, again allowing liquid egress.

Openings 24 can also be provided in the receptacle 11a to permit the egress of liquid pumped by the pump unit 20.

The arms 29 attached to the seat back 22 are also fluid conduits connected to the pump unit 20 and perforated with nozzles 30.

The positioning of the control options is the same as that described previously for the environmental unit operating in cooling mode and will again be dependent on the physical incapacity of the user.

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The nozzles 25, 28 and 30 need not be of similar design to each other dependant on their effectiveness of operation in use under the varying load conditions they will experience during use and therefore different pressure requirements necessary to achieve satisfactory liquid egress.

The nozzles 25, 28 and 30 are designed such that only those nozzles in direct contact with the user permit the egress of liquid.

The seat base 26 can be moved backwards and forwards within the shell 11 to accommodate users of varying height.

The nozzles 25, 28 and 30 are concentrated in those areas of the seat base 26, the seat back 22 and the arms 29 that are in contact with those parts of the user that are most prone to pressure sores.

The openings in the rear legs 23 of the seat base 26 aim the flow of liquid at the anal and genital regions of the user.

The openings 24 are provided in front pipes attached to the shell 11 aim the flow of liquid at the front and sides of the arms, legs and torso of the user.

The tank 21 contains liquid kept at a predetermined temperature by means of an immersion heater.

If all of the nozzles 25, 28 and 30 egressed pumped liquid simultaneously then the body of the user would be lifted off the seat base 26 and the seat back 22 by hydrodynamic pressure to the detriment of the safety and comfort of the user. The pump unit 20a therefore is fitted with both a pump and a valve, or valves. The openings and nozzles 25, 28 and 30 within the seat base 26, seat back 22 and arms 29 are divided up into two, or more, groups and each group of orifices is controlled by a separate valve, or valve setting within a single valve, either within, or connected to, the pump unit 20a. In operation the pump unit 20a functions continuously and then the valve, or valves, operate sequentially from either a timed or pressure sensing control device. This pulses the flow of liquid through each group of orifices sequentially.

The pulsing action of the liquid aids in the cleansing of the user and also massages the cutaneous and sub-cutaneous tissues thus minimising the formation of pressure sores on the user by stimulating the flow of blood in the aforementioned tissues. The sequential operation of the valve, or valves, also prevents the hydrodynamic pressure lifting the whole of the body of

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the user at any one time during use.

During the operational sequence the running speed of the pump unit 20a may be varied such that the pressure profile of each pulse suits the weight, skin condition and other factors affecting the user's safety and comfort.

The tank 21 is divided into at least two compartments. One compartment is pre-loaded with water to which a wetting agent, e.g. shampoo has either been added in solution or is added during use by a dosing system from a dispenser. Another compartment is also pre-loaded with water and such agents as may be considered to be therapeutic to the user, e.g. oils, salts and skin medications. Again these therapeutic agents may either be held in solution or added by means of a dosing system from a dispenser during use.

A representative cleaning cycle may consist of a series of pulses of wetting agent and water from the first compartment followed by a series of pulses of water and therapeutic agent from the other compartment. This could be repeated until a desired state of cleanliness for the user was attained.

If any of the agents to be added to the water are

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costly or are known to promote microbial growth in an environment such as that encountered in the tank 21 their addition by a dispenser mechanism would be more desirable. This could be achieved by the use of a subsidiary pump on the high pressure side of the main pump unit 20a.

The pump unit 20a can also be fitted with a warm air blower. When the cleansing cycle is complete the blower would operate sending warm air through the fluid conduits, orifices and separate independent openings as deemed necessary to dry both the user and the fluid conduits thus inhibiting microbial growth in the residual wetness found within the cleansing system as a whole subsequent to the cleansing cycle.

The tank 21 would also be fitted with a suitable catchment tray and means of drainage for the waste water and added agents and may also have access for internal cleaning or descaling as considered necessary.

The tank 21 can also be fitted with a suitable filtration unit such that the water and added agents that have been used in a cleansing cycle can be re-circulated via the filtration unit if required.

The seat base 26 and the seat back 22 may also be

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fitted with suitable attachment means for a single use hygienic liner of an open mesh form that would cover the seating components but still permit the cleansing actions to take place. This liner could be attached prior to use and then disposed of subsequent to use as described previously.

Referring to Fig. 5. In a situation where user dignity is a factor the environmental unit can be fitted with an antechamber 31 in which the user may disrobe and then dress in relative privacy.

If an individual is suffering from acute hyperthermia or hypothermia they may not be able to maintain a sitting position. Accordingly there is shown in Fig. 6 an horizontal modification 110 of the environmental unit.

The unit comprises a pair of horizontal rails 32 on which is positioned a stretcher 37. The stretcher can be slid in and out of a receptacle 110a through a movable flap 34 in a top cover 35 which can slide up and down over a fixed cover 36. Normally the top cover is transparent. To the end of the fixed cover 36 is affixed a cooling or heating unit 33.

In Fig. 7 there is shown a patient on a stretcher

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37 loaded onto the rails 32.

In Fig. 8 there is shown a patient on a stretcher 37 that has been slid into the unit. The top cover 35 is in an open position for initial treatment of the patient.

In Fig. 9 there is shown the patient in the unit with the top cover in a closed position. The patient can see out and the condition of the patient can be monitored visually from the outside.

In Fig. 10 there is shown the top cover slid into the open position and the patient receiving medical treatment. Normally, treatment for hypo or hyperthermia involves the use of water. This not only removes the dignity of the patient but it also makes medical processes such as defibrillation dangerous for the staff involved.

In a disaster the local facilities for handling the dead are frequently overloaded.

Accordingly there is shown in Fig. 11 a further modification of the horizontal environmental unit for the handling of corpses.

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The unit comprises a fixed cover 36 into which the stretcher 37 can be slid. The stretcher comprises a long roll of flexible material over two long rollers 38. The unit is fitted with a modified base 39 which is fitted with a drain 40.

Along the inside of the unit are fitted spray heads 41 and 42. In operation the body is placed on the stretcher as shown in Fig. 11. The rollers 38 then roll as shown in Fig. 12 until a sling or hammock is formed. Then water and/or wetting agent are sprayed through the spray heads 41 and the rollers are turned as shown in Fig. 13. Thus the body is rotated and thoroughly cleaned. If there is no room locally in a mortuary draw for the body the refrigeration unit 33 can be switched on to keep the body chilled until it is ready for burial.

When emergency services respond to a fire the condition of burned victims deteriorates rapidly before they reach hospital due to there being no proper method of rapidly cooling damaged areas of skin. Also people suffering from a high fever need some way of being rapidly cooled. Also hyperthermia victims need to be warmed rapidly. Accordingly there is shown in Figs. 14 to 16 a further modification of the environmental unit that consists of a liquid or gel filled blanket 43 that fulfils the same function as the seat 16 as shown in

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Fig. 2. The liquid or gel blanket 43 and the liquid or gel sleeves 44 are wrapped around the refrigeration or heating system 45 shown in Fig. 15. The refrigeration unit can be configured so that it will work either as a heat pump or as a refrigerator. When the emergency crew are told what sort of incident they are going to they can switch it into the appropriate mode.

Fig. 16 shows the blanket wrapped around the refrigeration unit 46 and located in an emergency vehicle.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

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Claims:-



1. Environmental control apparatus comprising a receptacle formed to receive a single human or other animal body and environmental control means to control the environment surrounding said body.
2. Apparatus according to claim 1, wherein the environmental control means comprises means capable of heating and/or cooling the inside of the receptacle.
3. Apparatus according to claim 2, wherein the environmental control means is in the form of a heat pump adapted selectively to heat or cool the inside of the receptacle, as desired.
4. Apparatus according to claim 2, wherein the environmental control means comprises a heater to heat the inside of the receptacle.
5. Apparatus according to claim 2, wherein the environmental control means is in the form of refrigeration means to cool the inside of the receptacle.
6. Apparatus according to claim 1, wherein the environmental control means is in the form of air supply

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means to supply air to the receptacle via air supply conduits having air outlets directed inwardly of the apparatus, the conduits being so directed that they can blow air onto or around said human or animal body.

7. Apparatus according to claim 1, wherein the environmental control means is in the form of liquid supply means connected to liquid supply conduits having liquid outlets to spray the human or animal body with a liquid, to clean said body.

8. Apparatus according to claim 7, wherein the outlets of the liquid supply conduits are arranged to spray substantially the whole of the body with said liquid.

9. Apparatus according to claim 8, wherein the outlets are defined in the shell of the receptacle.

10. Apparatus according to any of claims 7 to 9, wherein valve means are provided in the conduits, which valve means are selectively operable to vary the outlets through which said liquid is sprayed.

11. Apparatus according to claims 7 to 10, wherein the liquid supply means comprises pumping means for pumping the liquid through the conduits.

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12. Apparatus according to claim 11, wherein the liquid supply means further includes a vessel to hold liquid for the pumping means to pump.
13. Apparatus according to claim 11, wherein the pumping means is connected to the mains supply of water.
14. Apparatus according to any preceding claim, wherein the environmental control means is interchangeable with other environmental control means.
15. Apparatus according to claim 14, wherein the receptacle defines an aperture into which a selected one of the environmental control means can be fitted.
16. Apparatus according to any of claims 7 to 13, wherein the receptacle comprises a base having a shell mounted thereon.
17. Apparatus according to claim 16, wherein the shell includes at least one closure member adapted to be closed when the apparatus is occupied, the or each closure member being removably, hingedly or slidably attached to the shell.
18. Apparatus according to any preceding claim, comprises wheels or castors to enable the apparatus to



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be moved from one place to another.

19. Apparatus according to any preceding claim, wherein the receptacle is provided with a seat to enable a human to be seated in said receptacle.

20. Apparatus according to any of claims 1 to 18, wherein the receptacle is so formed to receive a human body lying down or is so formed to receive said body standing up.

21. Apparatus according to claim 20, wherein the apparatus includes a horizontal surface upon which said body can lie.

22. Apparatus according to claim 19, wherein the seat comprises a seating portion which is movable into and out of the receptacle.

23. Apparatus according to claim 19 when dependent upon any of claims 6 to 13, wherein the conduits are so arranged that at least some of said air or liquid outlets are provided in the seat.

24. Apparatus according to any of claims 20 or 21, wherein the receptacle is elongate in configuration to receive a human body in a lying position.

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25. Apparatus according to claim 24, further including rails extending from a region outside the receptacle to a region inside said receptacle, carrying means provided on said rails, said carrying means being movable therealong from a position outside said receptacle to a position inside said receptacle.

26. Apparatus according to claim 25, wherein the carrying means comprises a stretcher capable of carrying a body in a lying position.

27. Apparatus according to any of claims 24 to 26, wherein the receptacle is provided with a movable or removable cover.

28. Apparatus according to claim 27, wherein the cover is slidably or hingedly mounted on the shell.

29. Apparatus according to any of claims 24 to 26, wherein the stretcher comprises an elongate flexible material arranged around a plurality of rollers to provide a support for the body.

30. Apparatus according to claim 29, wherein the rollers can be operated so as to move the material around said rollers.

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31. A body enclosing structure comprising first and second opposed flexible members defining a space therebetween, and a fluid material held between said flexible members, said fluid material having a heat capacity higher than the water the heat capacity of the body to be enclosed.

32. A structure according to claim 31 which is capable of tightly enclosing a human or animal body.

33. A structure according to claim 31 or 32, which is in the form of a blanket or article of clothing.

34. Environmental control apparatus substantially as herein described with reference to and as shown in Figs. 1 to 13 of the accompanying drawings.

35. A body enclosing a structure substantially as herein described with reference to and as shown in Figs. 14 to 16.

36. Any novel subject matter or combination including novel subject matter disclosed, whether or not within the scope of or relating to the same invention as any of the preceding claims.

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