

[72] Inventor **Frederick H. Howorth**
Withnall, Chorley, England
 [21] Appl. No. **819,582**
 [22] Filed **Apr. 28, 1969**
 [45] Patented **Aug. 31, 1971**
 [73] Assignee **James Howorth & Company Limited**
Bolton, England
 [32] Priority **May 2, 1968**
 [33] **Great Britain**
 [31] **20,764/68**

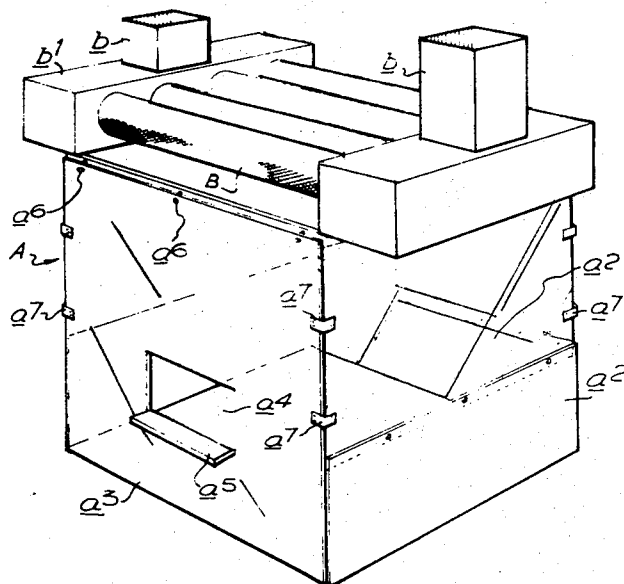
[56] References Cited		References Cited	
		UNITED STATES PATENTS	
3,265,059	8/1966	Matthews.....	128/1
3,363,532	1/1968	Horneff.....	93/33
3,380,369	4/1968	Allander.....	93/36
3,492,987	2/1970	Parker.....	128/1
3,501,213	3/1970	Trexler.....	128/1
3,505,989	4/1970	Truhan.....	98/36 X
3,511,162	5/1970	Truhan.....	98/36

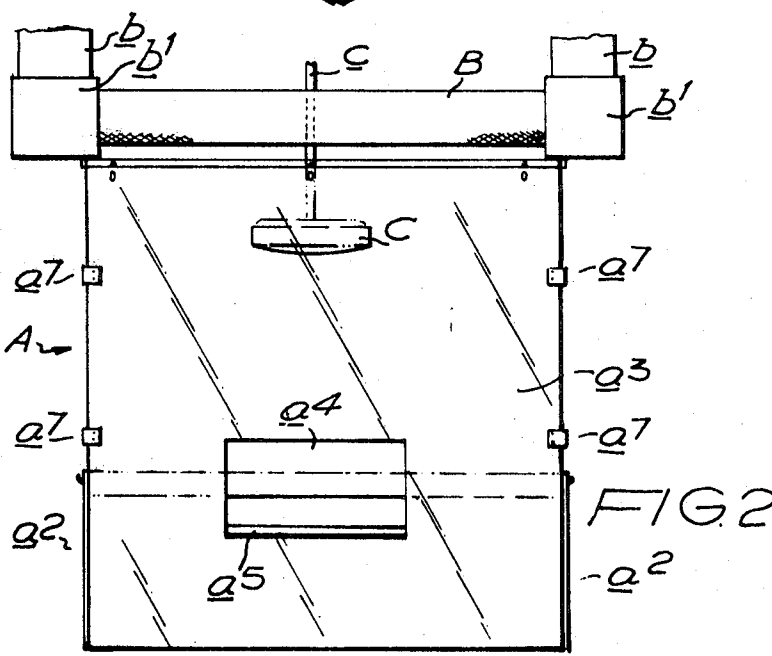
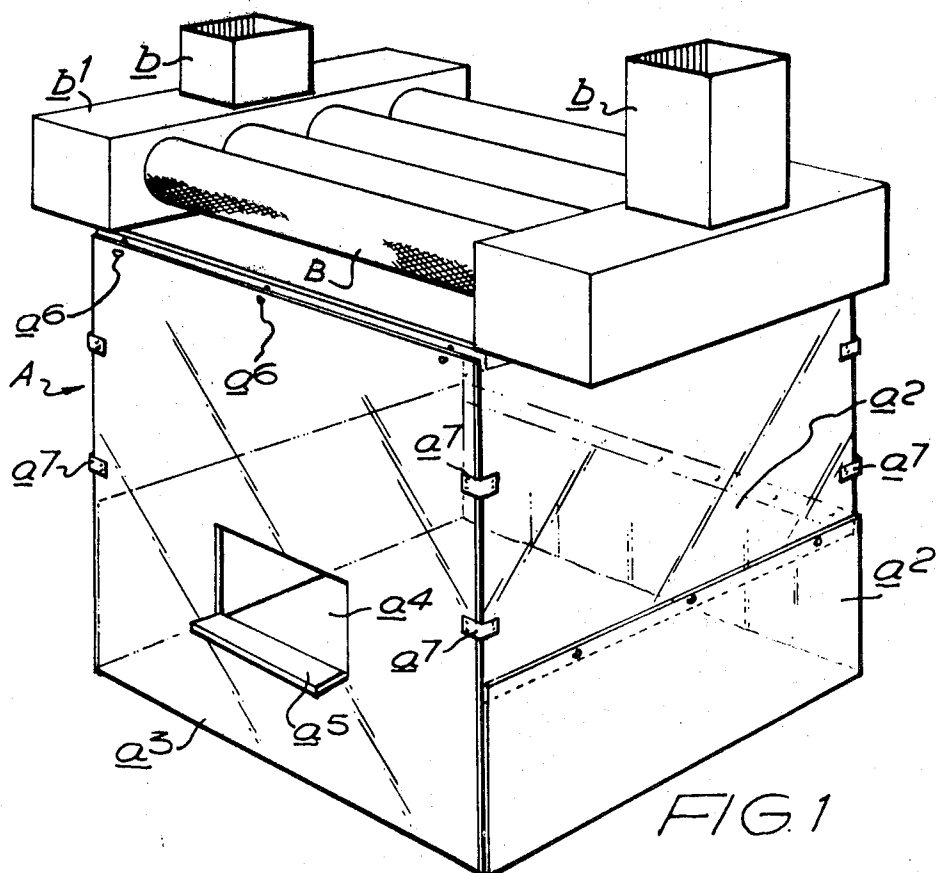
Primary Examiner—Dalton L. Truluck
 Attorney—Norris & Bateman

[54] **SURGICAL OPERATING THEATRE WITH
 STERILE AIR ADMITTING MEANS**
 3 Claims, 3 Drawing Figs.

[52] U.S. Cl..... 128/1 R,
 98/33 R, 98/40 D
 [51] Int. Cl..... A61b 19/00
 [50] Field of Search..... 128/1, 1 B,
 191; 98/32, 33, 36, 40 C, 40 D

ABSTRACT: A method an apparatus for carrying out surgical operations in which the operation is carried out in a transparent chamber or cubicle of a size to house the operating team and patient and through which a vertically downward fan actuated flow of sterile air passes and is changed some 300 times per hour and in which the air is introduced through tubes of porous textile material the pores in which contract when the fan is stopped to prevent contaminated air from reentering the tubes through the fabric.





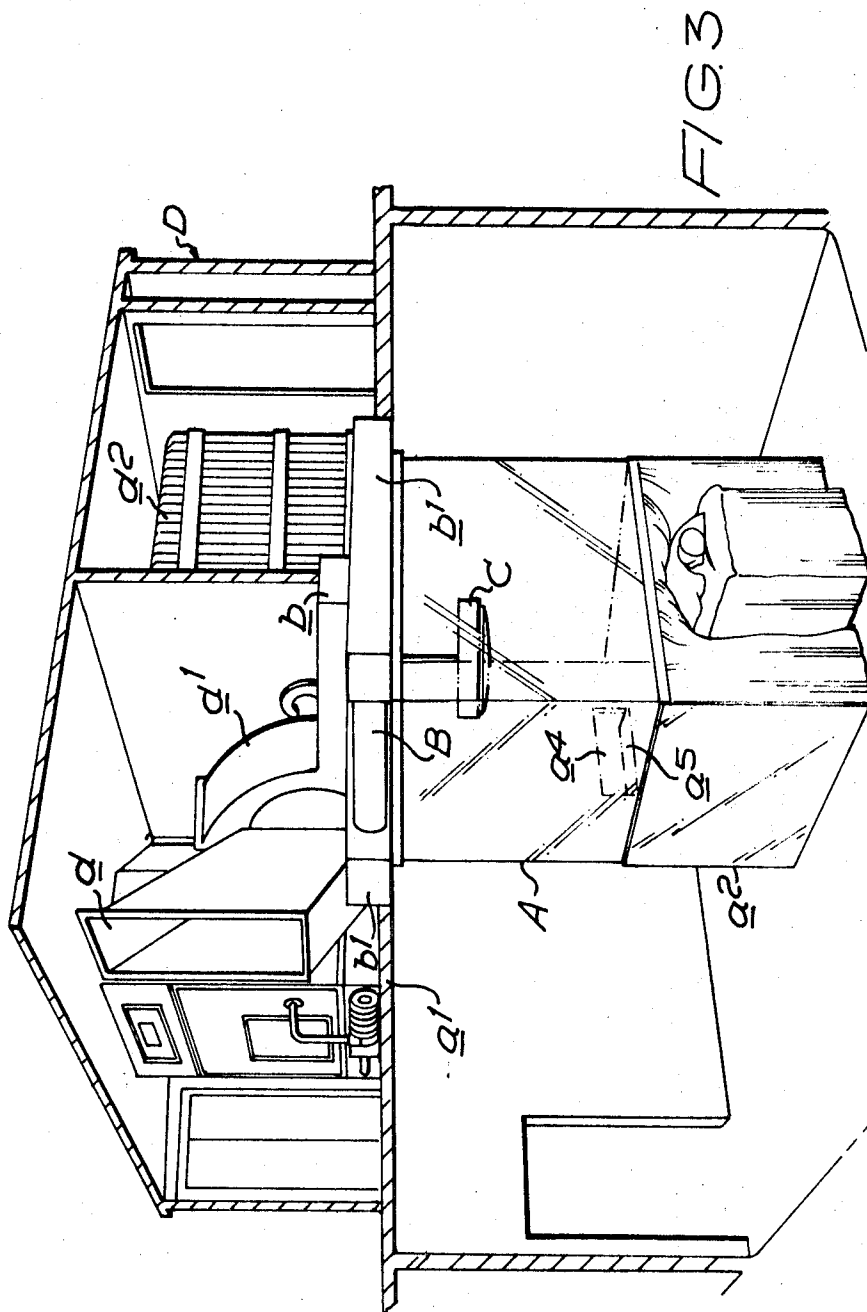
INVENTOR
FREDERICK H. HOWORTH

BY *Norris & Bateman*
NORRIS & BATEMAN

PATENTED AUG 31 1971

3,602,212

SHEET 2 OF 2



INVENTOR
FREDERICK H. HOWORTH

BY *Norris & Bateman*
NORRIS & BATEMAN

SURGICAL OPERATING THEATRE WITH STERILE AIR ADMITTING MEANS

This invention relates to improvements in operating theaters.

Investigations have shown that despite precautions taken for the sterility of operating theaters upwards of 4 percent of the patients incur bacterial or virus infection during the operation and the object of the present invention is to reduce the possibility of such infection.

The invention comprises a method for carrying out operations in which an operating team and the patient are enclosed in a transparent chamber through which sterile air is passed and changed substantially 300 times per hour and in which means are provided for exhausting air exhaled by the operating team to prevent it from contaminating the air in the compartment.

The invention will be described with reference to the accompanying drawings:

FIG. 1 is a perspective view of the chamber partly in section;

FIG. 2 is an elevation from the back of the chamber;

FIG. 3 is a perspective diagrammatic view of the chamber and air supply apparatus.

An operating theater is reduced in area by an enclosure A having transparent walls to provide a compartment of a size to accommodate a portion or all of the operating table and the team carrying out the operation, sterile air being passed downwards through the compartment in a lamina or piston flow to change the air in the compartment substantially 300 times per hour and to provide the team with an air extraction system from their robes to remove air exhaled by the team and so prevent it from contaminating the air in the compartment.

The operating theater is reduced in area to for example 7x7 square feet by plate glass walls or panels *a* or walls or panels of a plastics material extending from the floor to the ceiling *a*¹ or from the ceiling *a*¹ part way down to the floor. It has been found that a compartment of this size is sufficient to accommodate an operating team and sufficient of the operating table for carrying out the operation. The portion of the table and the team are introduced into the compartment through one side the lower part of which is closed by a curtain or a sheet or draped material *a*² to prevent the ingress of air.

The upper half or portion of the front (or side) wall *a* preferably extend from the ceiling *a*¹ part way towards the floor and terminates at a height to allow an operating table with a patient thereon to be wheeled into the compartment.

The lower half or portion of the front (and side) wall is closed by the draped material *a*² hooked or otherwise secured along the lower edge of the wall or panel *a* to allow air to escape through and under the material closed by perspex or fiber glass panels, preferably more than one panel for each sidewall. These lower panels may be either hooked or hinged to the upper panels so that access to the interior of the enclosure can easily be made.

The rear wall *a*³ of the compartment is also in two sections, the upper section being formed with an aperture or hatch *a*⁴ therein with a ledge *a*⁵ to provide a table for the reception of trays of instruments and the like for use of the team. The lower portion of the rear wall is closed by panels similar to those used in the sidewalls.

Air is supplied to the compartment over substantially the whole area of the ceiling opening leading into it by an air-conditioning plant comprising a multivane centrifugal fan absorbing 1.2 Horsepower when running at 520 revolutions per minute, the outlet velocity of the air at this speed being 1,380 feet per minute and the fan being fitted with an acoustic screen at the discharge end to minimize noise. The fan when run at 692 revolutions per minute absorbs 2.1 Horsepower and may be used at this speed for initially "flushing out" prior to using the theater for an operation.

An emergency standby motor may also be provided The fan and motor unit is mounted on resilient antivibration mountings to give quiet operation, including a 15 micron pre-

filter with ready access for filter changing. The filter handles a maximum 4,000 cubic feet of air per minute.

A double pocket type air filter is provided to handle 4,000 cubic feet of air per minute at a filtering speed of 4.28 feet per minute and providing bacteria free air to the theater, also H. V. ultra violet lamps to eliminate virus.

A steam heater battery for conditioning the incoming air, and an air cooler using spray water as the media is provided, the whole unit being manufactured from stainless steel to avoid corrosion. The unit is also equipped with electronic transmatic controls for heating and cooling, together with monitoring devices for temperature readings at various positions in the theater compartment. An electronic transistorized anemometer is provided to transmit and record the air velocities in the compartment A.

A high speed vacuum pump may be connected to pipe lines to the masks of the surgeons and other members of the team to extract exhaled breath and bacterial contaminants emanating from the team.

The air is preferably supplied from two ducts *b* supplying headers *b*¹ arranged below the ceiling and connected by a plurality of tubes B of a porous textile material. The air entering the tubes B escapes therethrough and passes vertically downwards through the compartment, a cover (not shown) enclosing the headers *b*¹ and pipes B from which air escaping upwards is deflected downwards.

The front rear and sidewalls of the operating theater chamber preferably extend downwardly from the edges of an opening in ceiling *a*¹ as shown in FIG. 3. Above that opening a normally closed compartment D extends over the opening. Air is taken into the compartment to pass through the bacteria removal filter at *d* and is forced by fan *d*¹ through ducts *b*. When the fan is in operation pressurized air escapes through the pressure expanded porous walls of textile tubes B and enters the operating theater downwardly to escape at the lower edges of drapes *a*². Thus sterile air is unidirectionally forced through the operating theater chamber to continually change the air therein during an operation. The textile tubes B inherently expand to open their pores wider when subjected to air under pressure, and the tubes contract to reduce pore size when the fan is stopped. Thus reduces entry of nonsterile air reversely through the tubes.

In order to remove the panels or walls *a* they are provided with holes *a*⁶ to engage hooks depending from the ceiling or the panels or walls *a* may be provided with members to engage a rail on the ceiling. Further clips *a*⁷ are provided for securing the edges of adjacent panels or walls.

A lamp C for illuminating the patient is suspended on a chain or cord *c* passing between two of the tubes B.

A set of controllable dampers give an infinitely variable volume of air. These dampers are electrically remote controlled by a rheostatic controller, operated on instructions from the surgeon inside the compartment.

The walls *a*, *a*³ may be detached from the ceiling *a*¹ and removed when their use in the main operating theater is not required without disturbing the air supply installation.

It has been found that operations carried out in a compartment as above described reduces the possibility of bacterial or virus infection during the operation has been reduced over some 500 operations to 0.6 percent and the colonies of bacteria per cubic foot of air to 0.02 percent the limit of accuracy of the checking apparatus.

What we claim is:

1. An operating theater that comprises a chamber having ceiling means, sidewalls depending therefrom and a floor, said ceiling means having defined therein an opening for the admission of sterile air into the chamber, means mounting an air conditioning plant at said opening comprising porous textile tube means extending over said opening, said tube means being connected to a fan adapted to supply sterile air under pressure into said tube means, wherein said porous tube means under pressure is expanded permitting air to pass through the pores downward into the chamber, said tube

3

means preventing backflow of air when the fan is stopped due to contraction of the pores, and said chamber having means permitting exhaust of pressurized air at the lower end of at least one of said sidewalls so that air from said tube means is unidirectionally, continuously passed downwardly through said chamber when the fan is in operation.

2. The operating theater defined in claim 1, wherein said

4

walls are mainly transparent.

3. The operating theater defined in claim 1, wherein the lower portion of at least one sidewall is a flexible sheet depending from a more rigid upper wall portion and having its free lower edge near the floor.

10

15

20

25

30

35

40

45

50

55

60

65

70

75