



US005976474A

United States Patent [19] Barnstead

[11] Patent Number: **5,976,474**

[45] Date of Patent: **Nov. 2, 1999**

[54] **STERILIZER WITH STERILE DISCHARGE**

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4,637,916 1/1987 Hennebert et al. 422/295

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[21] Appl. No.: **09/104,805**

[22] Filed: **Jun. 25, 1998**

[57] **ABSTRACT**

[51] **Int. Cl.⁶** **A61L 2/04**

[52] **U.S. Cl.** **422/298; 422/292; 422/295;**
422/307

[58] **Field of Search** 422/26, 28, 33,
422/292, 295, 298, 307

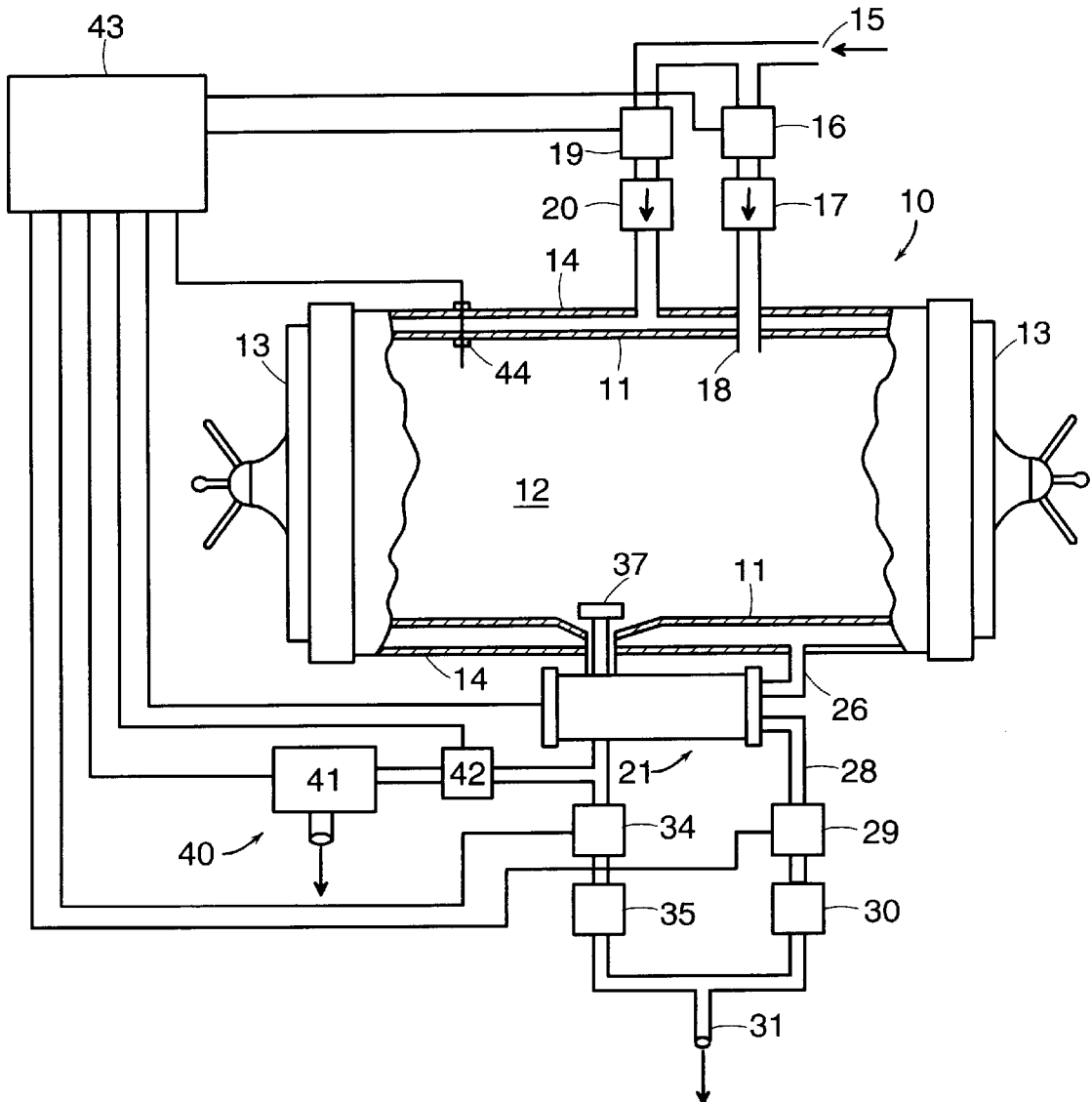
A sterilizing machines for decontaminating articles of dangerous biological material features an arrangement whereby all of the gas discharged from the sterilizer chamber during a sterilization cycle passes through a removable filter situated within the sterilization chamber.

[56] **References Cited**

U.S. PATENT DOCUMENTS

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6 Claims, 2 Drawing Sheets



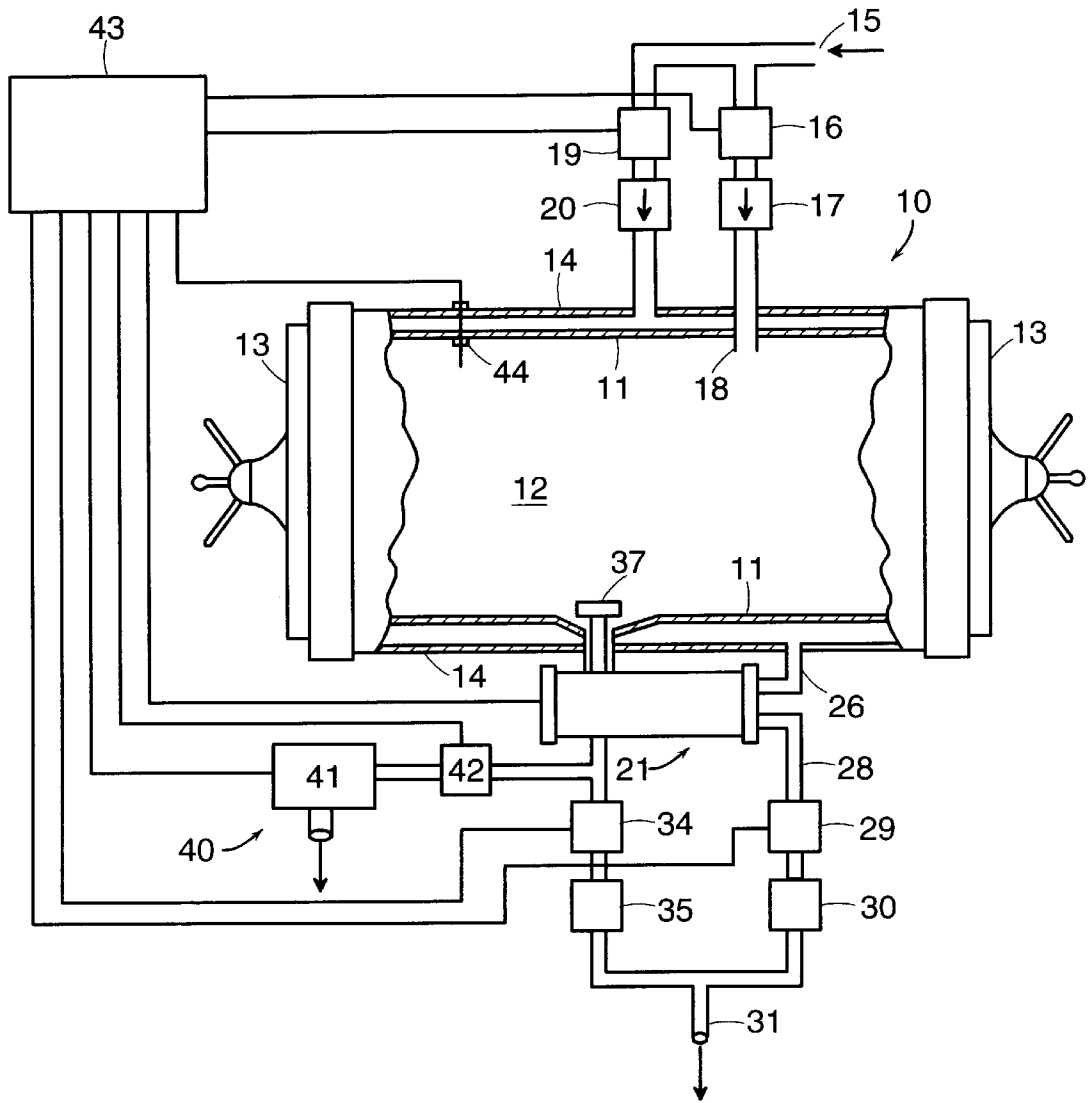


FIG. 1

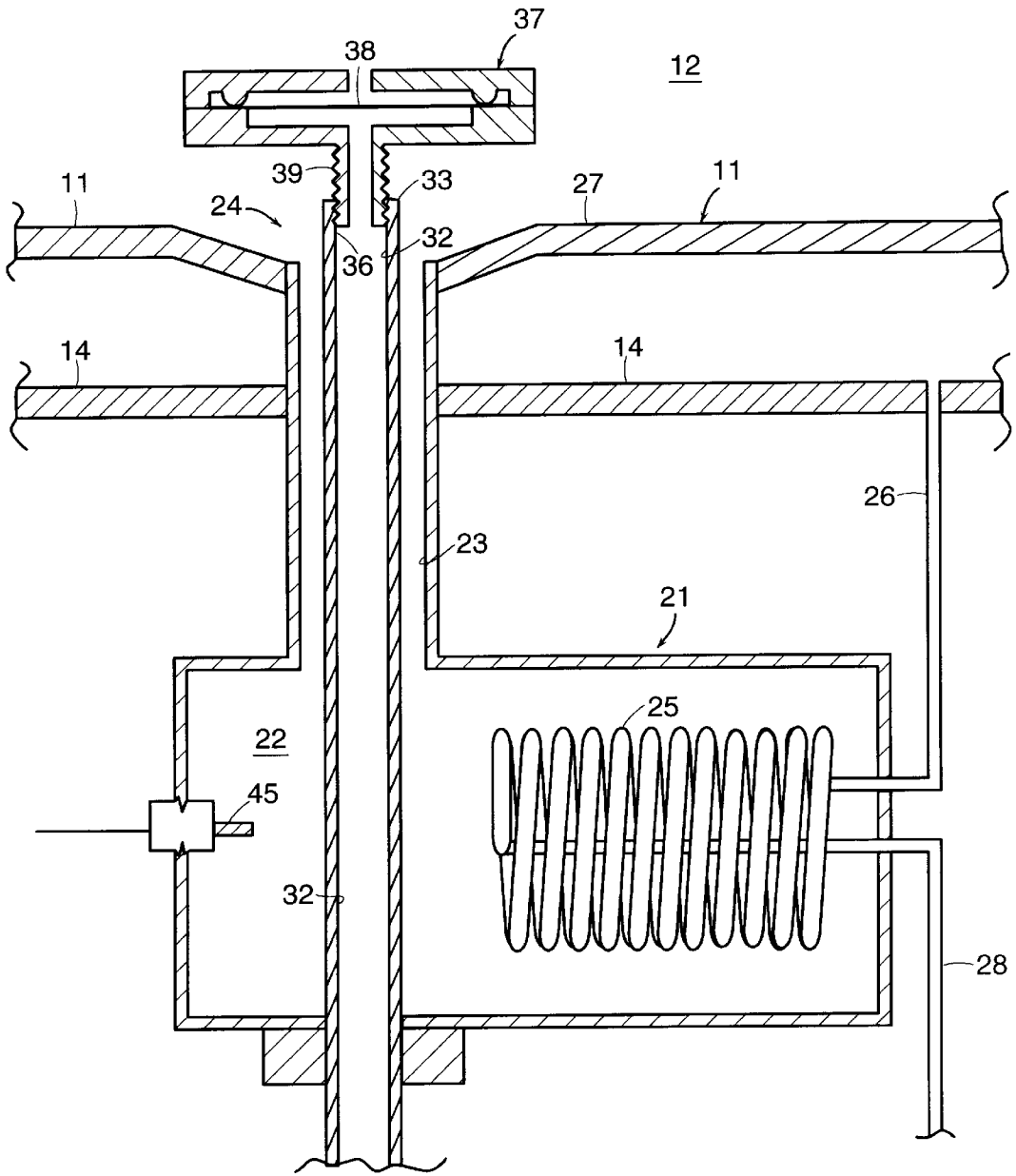


FIG. 2

STERILIZER WITH STERILE DISCHARGE**BRIEF SUMMARY OF THE INVENTION**

This invention relates to sterilizing machines for decontaminating articles of dangerous biological material. It features an arrangement whereby all of the gas discharged from the sterilizer chamber passes through a filter situated within the sterilization chamber.

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 shows a sterilizer according to the invention.

FIG. 2 shows a detail of the sterilizer of FIG. 1.

DETAILED DESCRIPTION

Referring to the Figures, sterilizer **10** according to the invention has interior wall **11** which with closed doors **13** enclose interior space **12** within which articles to be sterilized are placed. Jacket wall **14** surrounds interior wall **11** and defines a space around interior wall **11** through which steam can circulate.

Steam source **15** is connected through control valve **16** and check valve **17** to steam inlet port **18** which admits steam into interior space **12**. Steam source **15** is also connected through control valve **19** and check valve **20** to the space between interior wall **11** and jacket wall **14**.

Condensate collector **21** includes chamber **22** positioned below wall **14**. Conduit **23** connects condensate well **24** in the bottom **27** of interior space **12** to chamber **22**. Heater **25** inside chamber **22** is connected through conduit **26** to the space between interior wall **11** and jacket wall **14** and through conduit **28** control valve **29** and steam trap **30** to open drain **31**. In particular, the only fluid passage connecting to the interior of chamber **22** is conduit **23**.

Vent passage **32** has an inner end **33** positioned within interior wall **11**. Vent passage **32** passes down the lumen of conduit **23**, through condensate collector **21**, control valve **34** and trap **35** to outer end **31**, which is open to the ambient and drain. Inner end **33** terminates in threaded coupling **36**.

Filter holder **37** holds filter **38** and has threaded coupling **39** which mates with coupling **36** and permits the filter holder to be removed from the end of the vent passage.

Evacuation system **40** including vacuum pump **41** and control valve **42** is connected to draw from vent passage **32** from a point downstream from filter holder coupling **36**.

Controller **43** includes processors, information storage, operator interface, and input and output facilities to receive instructions from an operator and control the operation of the sterilizer according to a defined program. Controller receives data from temperature sensor **44** positioned within interior space **12** and from temperature sensor **45**, positioned within condensate collector chamber **22**, and emits signals controlling vacuum pump **41** and valves **16**, **19**, **42**, **34**, and **29**.

Filter **38** is made of materials suffering no significant damage at sterilization conditions and has a pore size to retain particles of the size of pathogenic microorganisms. In particular, a suitable filter is offered for sale by the Balston division of Watman, Inc. as item number CS-SA.

The operation of the sterilizer is as follows. A filter holder with a clean filter is installed by coupling it to the inner end of the of the vent passage. Articles to be sterilized are placed within the interior space, and the doors of the sterilizer are closed. Valves **16** and **34** are closed. Valve **42** is opened and the vacuum pump is started. The action of the vacuum pump

pulls the gases out of the interior space. After the evacuation has been completed, valve **42** is closed and steam is admitted to the interior space through valve **16** and to the jacket through valve **19**, and valves **34** and **29** are opened. The steam entering the interior space will displace any residual air remaining in the interior space. In general, the air will be concentrated in the bottom of the interior space and so be discharged through the filter and valve **34** to the ambient. Some of the steam admitted to the interior space will condense on contacting the initially cool articles within and walls of the interior space. This condensate will gather at the bottom of the interior space and drain into the condensate collector. The steam admitted to the jacket will maintain the temperature of the interior space and steam from the jacket passing through the condensate collector will evaporate the condensate drained into the condensate collector back into the interior space. After the desired interval of sterilization is completed the steam supplies are shut off and a door opened to remove the now sterile articles. The filter holder with filter element can be removed for replacement. The removed filter holder and filter have been sterilized because they were within the interior space during the sterilization cycle and can be discarded as uncontaminated waste.

It may be particularly noted, that all of the gases passing out of the interior space pass out through the filter which retains any microorganisms, preventing them from exiting with the gases. The filter, being positioned within the interior space, is sterilized along with the articles. Particles both biological and otherwise are deposited in the filter as a result of the passage of gas through it so that it becomes clogged with use. The filter holder with the filter is therefore advantageously decoupled from the vent passage and discarded after a sterilization cycle. The filter holder and filter have however been themselves sterilized at this point and require no special handling.

I claim:

1. A sterilizer for killing living organisms in goods comprising

a wall enclosing an interior space and having one or more doors which when open give access to said interior space, and when closed complete the enclosure of said interior space,

a steam inlet port connected into said wall for admitting steam into said interior space, said steam inlet port being connected through a control valve to a source of steam,

a vent passage having a first end opening into said interior space and a second end opening to the ambient, said first end of said vent passage terminating in a filter holder coupling,

a filter holder holding a filter having a pore size to retain particles of the size of biological microorganisms, said filter holder having a mating coupling mating with said filter holder coupling, and being removably attached through said mating coupling and said filter holder coupling to said first end of said vent passage so that fluid can enter said vent passage from said interior space only through said filter holder and said filter held therein,

all passages through said wall communicating with said interior space being constructed and arranged so that when said doors are closed material can exit from said interior space to the ambient only through said filter holder.

2. A sterilizer as claimed in claim 1, including a condensate collector with a chamber and a heater for evaporating

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material within said chamber, said chamber being connected to receive condensate draining from the bottom of said interior space and discharge evaporate from the evaporation thereof back into said interior space.

3. A sterilizer as claimed in claim 1, including an evacuation system for evacuating gas from said interior space, said evacuation system being connected to draw gas from said vent passage at a point downstream from said filter holder coupling.

4. A sterilizer as claimed in claim 1, wherein said filter holder is positioned near the bottom of said interior space.

5. A sterilizer as claimed in claim 1, including a collector positioned to collect condensate from said interior space and a heater positioned to re-evaporate such condensate into said interior space.

6. A sterilizer for killing living organisms in goods comprising a wall enclosing an interior space and having one or more doors which when open give access to said interior

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space, and when closed complete the enclosure of said interior space,

a steam inlet port connected into said wall for admitting steam into said interior space, said steam inlet port being connected through a control valve to a source of steam,

a vent passage having a first end opening into said interior space and a second end opening to the ambient,

a condensate collector for re-evaporating condensate, said condensate collector including a chamber and a heater, said chamber being positioned below said interior space,

said condensate collector being connected to receive liquid condensate draining from said interior space and to discharge revaporized condensate into said interior space, wherein said vent passage passes through said chamber without having fluid connection thereto.

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