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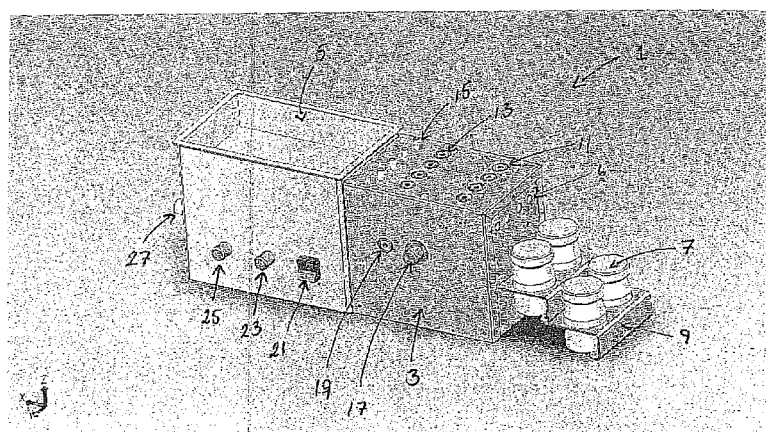
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(54) Title: CLEANING APPARATUS

Fig. 1



(57) Abstract: This invention describes a cleaning apparatus for perfusion of medical device s comprising at least one cleaning circuit, where said at least one cleaning circuit comprises a cleaning channel; a fluid reservoir comprising a cleaning liquid in fluid communication with said cleaning channel, where said fluid reservoir comprises a limited amount of cleaning liquid; at least one control means for progressively measuring a measured value with regard to said cleaning liquid and comparing said measured value with a predetermined value; a coupling means for coupling of a first end of a medical device to the cleaning circuit; an alarming means for notification when said measured value diverts from said predetermined value and a pump, said pump pumps said cleaning liquid from said fluid reservoir, through said cleaning channel, and through said endoscope.

Cleaning apparatus

Field of the Invention

- 5 The present invention relates to a cleaning apparatus for the cleaning of medical devices which contain a channel or lumen inside the medical device such as endoscopes.

Background of the Invention

Endoscopes and similar medical devices having channels or lumens formed there through are being used on an ever increasing basis in the performance of medical pro-
10 cedures. After use the endoscopes or similar medical devices have to be cleaned on the outside as well as in the inside channels or lumens in order to be used additional times. Thus, the medical devices are to be cleaned and disinfected as well as sterilised in order for subsequent medical procedures to be performed.

- 15 Before the process of sterilisation it is important that the channels and lumens of the medical devices are cleaned sufficiently. Hence, any remains of tissues or fluids in contact with the surfaces of the channels or lumens are to be removed before sterilisation. If they are not efficiently removed they can be burned into the surfaces of the channels or lumens during the process of sterilisation and sufficient sterility of the medical de-
20 vice cannot be obtained. Thus, the medical device cannot be used anymore or it is to be cleaned by a specific and expensive procedure.

EP1338237 describes an apparatus for testing that the channels of an endoscope are sufficiently cleaned. The liquid is transferred through the channels of the endoscope
25 with a given pressure and after a certain time a sensor measures the amount of liquid, which has been flushed through the endoscope channels. If the amount of liquid is not sufficient after the given time period, blockage of the endoscope channel occurs.

EP1757313 describes an apparatus for decontaminating endoscopes and other medical
30 devices which include channels or lumens formed there through. The decontamination apparatus comprises a switch or sensor for measuring of pressure or flow rate. The

switch or sensor is in fluid communication with at least one of the flush lines, where each flush line is connected with separate channels of the endoscope. Each flush line is isolated with relation to the others and hereby allows separate channels to be identified and isolated. The liquid for cleaning is re-circulated for reuse but cleaned through a filter before entering into the reservoir. If one of the sensors detects to high a pressure or to low a flow rate in one of the fluid lines the associated pumps cycles off since this is associated with blockage in the channels or lumens of the endoscopes.

EP1433412 describes a method which detects a proper flow through one or more channels in an endoscope during a cleaning procedure. Fluid flows from a supply vessel through a channel for a given time period the amount of fluid is calculated based upon a volume change in the supply vessel and the flow rate calculated based upon the amount of fluid and the time period. If the flow rate varies by more than a predetermined amount from a predetermined value, an indication of improper flow is given. The rinsing is continued until the blockage of the channels has been removed.

WO 98/58682 describes a decontamination apparatus for medical devices. Each channel of a medical device is connected to a channel flush line and a channel pump for flushing the channels of the device. Pressure sensor is in communication with each flush line to sense a blockage in the channels of the medical device.

Each of the above patent documents describes processes of checking blockages of the lumens or channels of the medical device. However, a sufficiently effective rinsing process is not described whereby minor remains/deposits are removed.

25

Object of the Invention

It is the object of the following invention to provide an apparatus and a method which in a simple manner checks and rinses the channels and lumens of medical devices in an efficient and automatic manner.

Description of the Invention

The object of the invention can be fulfilled with a cleaning apparatus for perfusion of medical devices comprising at least one cleaning circuit, where said at least one cleaning circuit comprises

- 5 - a cleaning channel;
- a fluid reservoir comprising a cleaning liquid in fluid communication with said cleaning channel, where said fluid reservoir comprises a limited amount of cleaning liquid;
- at least one control means for progressively measuring a measured
- 10 value with regard to said cleaning liquid and comparing said measured value with a predetermined value;
- a coupling means for coupling of a first end of an medical device to the cleaning circuit;
- an alarming means for notification when said measured value
- 15 diverts from said predetermined value;
- a pump, said pump pumps said cleaning liquid from said fluid reservoir, through said cleaning channel, and through said endoscope.

In an advantageous embodiment, said pump is a peristaltic pump, preferably a tube pump.

20

The cleaning apparatus as described with regard to this invention can be used for any medical device containing channels or lumens which are to be purified after contact with human tissues or fluids. A correct rinsing of the channels or lumens is essential in order to prevent microbial growth and to obtain correct sterilisation. All of this in order

25 to increase the safety of the patients and decrease the risk of cross-contaminations and infections.

The cleaning apparatus can contain several cleaning circuits where each cleaning circuit is connected with a single channel or lumen of the medical device. The cleaning circuits

30 comprise a cleaning channel which is in fluid communication with a fluid reservoir and the coupling means.

Advantageously, the fluid reservoirs comprise a limited amount of cleaning liquid. It is known that in order to obtain a sufficient rinsing of the channels or lumens a given amount of liquid is demanded. Adding a limited amount of liquid within each fluid reservoir enables the user to control that the given amount indeed has been rinsed
5 through the channels of the medical device. Thus, the liquid in the fluid reservoir is to be used before the cleaning process stop. Hereby, a validated cleaning process can be obtained and the lumens and/or channels are properly rinsed. The limited amount of liquid can be for example 60 mL to 200 mL depending on the size of the medical device and the given standards for sufficient rinsing. It is important that even though the
10 channel of the medical device is not blocked by larger tissue and/or blood samples the channel is still properly rinsed in order to clean the channels from minor tissue and/or blood samples along the surface. Hereby, the medical device is not destroyed during sterilizing.

15 Furthermore, this is not only advantageous due to the fact that it is known that the channel has been rinsed with a given amount but also because there is no need to rinse the channels with more than the amount necessary to provide efficient cleaning of the channels. Especially, if the cleaning liquid is an expensive disinfectant, an advantage can be obtained only to rinse with the given amount of liquid.

20 Furthermore, control means is connected to the cleaning channel. The control means comprises a sensor in order to be able to measure a parameter of the liquid. This parameter is continuously measured. Hereby is to be understood that the measurement can take place either constantly or at given time intervals. The measured values are
25 compared with a predetermined value known for this particular channel. The predetermined value depends upon the type of medical device as well as the size, i.e. the diameter or the volume of the lumen or channel. The predetermined value can either predefined manually prior to the start of the cleaning process or it can be a predefined value defined when manufacturing the cleaning apparatus.

30 The medical device is coupled to the cleaning apparatus by arranging the first end of the channels of the medical device to separate cleaning circuits. The coupling means is preferably a fitting connector, more preferably with a locking mechanism such as a

Luer Lock[®] connection. It is of course to be understood by a person skilled in the art that other types of connection can be used as well as long as the connection secures that the liquid is delivered into the lumen or channels of the medical device in a nearly leakage free manner.

5

The cleaning circuit further comprises an alarming means for notification cleaning problems as observed by the difference between the predetermined value and the measured value of the parameter. This means that if the predetermined value is different from the measured value in a manner which indicates a blockage of the channel, an alarm sets off. This alarm can be either a light signalling device and/or a sound. It is implicitly to be understood that the alarming means can be any signal which make the user attentive to the fact that the cleaning process is faulty.

Furthermore, a pump is connected with each cleaning circuit where the pump pumps the cleaning liquid from a fluid reservoir, through the cleaning channel and through the channels or lumens of the medical device. The pump can beneficially be a peristaltic pump which is able to circulate both liquid and air.

Furthermore, a peristaltic pump is attractive in order to avoid contamination and to maintain the sterility of the cleaning fluid. In an alternative embodiment, the pump can be a tube pump, whereby the amount of cleaning liquid pumped through the cleaning channel and the channel of the medical device can be regulated and controlled.

Advantageously, each channel of the medical devices is connected with each cleaning circuit and each cleaning circuit comprises all of the above mentioned means. In this manner blockage in specific channels can be detected.

In one embodiment the cleaning circuits can differ with regard to the flow of the cleaning circuits in order for the cleaning circuits to fit to multiple different medical devices where the size of the channels is different. Alternatively, a number of cleaning circuits can be divided into two or more groups, where the flow differs between the groups.

In an advantageous embodiment, said cleaning apparatus further comprises an electrical circuit, which controls said at least one pump, where said electrical circuit comprises means for transmission lag.

5 Advantageously, the pump is controlled by an electrical circuit which comprises a means for a transmission lag. The measured parameter is continuously measured and if blockage occurs in the channel the pump will stop and will maintained stopped as long as the blockage is present. However, if the blockage is removed due to the cleaning fluid, the measured parameters change and resemble the predetermined values. This is
10 signalled to the electrical circuit and the pump starts after a small time period. Thus, the rinsing of the channels or lumens will continue automatically if the blockage is removed. Inducing a transmission lack enables the blockage to be removed from the surface where it is attached before the pump starts again.

15 Furthermore, the transmission lag avoids that the apparatus continuously starts and stops when a fault is notified i.e. the pump automatically is stopped at the first time.

As an alternative, a blockage stops the pump, and the pump starts automatically after a short period of time. If the blockage is not yet removed the pumps with stop once
20 again and start after a short period of time. In this manner the blockage of the channel is affected by periodic flows of cleaning fluid, which induces pressure onto the blockage and help in removal of the blockage.

To induce a transmission lag a time relay is induced in the electrical circuit, the time
25 relay can be either a mechanical time relay such as a thermal relay, a pneumatic relay, or an electromechanical relay or it can be an electronic time relay such as a RC-coupling or an impulse counter.

In a further advantageous embodiment, said at least one control means comprises a
30 pressure sensor.

Advantageously, the control means comprises a pressure sensor. In this manner the pressure of the cleaning fluid inside the cleaning channel is measured and this value is

compared with a predetermined value. Hereby, an increased pressure with relation to the predetermined value of the pressure indicates that a blockage is present in the channel of the medical device. The increased pressure may push the blockage whereby it is loosened and can be rinsed from the channel. It is of course to be understood that the blockage of the channel can be fully or partly but that an increased pressure will be built inside the cleaning channel no matter what kind of blockage.

In addition, the control means can comprise a flow sensor which can measure the flow of the cleaning fluid through the cleaning channel. A blockage in the channel will decrease the flow rate to a level lower than a predetermined value. If the flow is decreased alarming means are started and the pump stopped. Thus, a flow sensor could function similarly with a pressure sensor.

In a further advantageous embodiment, said cleaning apparatus comprises four, six or eight channels.

The cleaning apparatus can comprise a multiple of cleaning circuits such as 4, 6 or 8 cleaning circuits. Multiple medical devices comprise more channels or lumens and it is beneficial to be able to rinse more than one channel at a time in order to save time in the rinsing process. Since three or four channels are often observed in medical devices, a number of four, six or eight cleaning circuits enable complete cleaning of one or two medical devices at the same time.

In a further advantageous embodiment, said cleaning apparatus comprises at least one tank; said tank comprises an ultrasound device in connection with said at least one waste reservoir. In a further advantageous embodiment, said tank further comprises temperature regulating means.

In connection with the cleaning circuit a tank could be connected. The tank comprises a liquid into which the medical devices could be lowered either at the same time as the channels of the medical device is connected with the cleaning circuits or before or after. In this manner the medical devices are cleaned on the outside as well as in the channels inside the medical device.

If the cleaning takes place at the same time as the cleaning of the channels, the cleaning fluid passing through the channels enters the second reservoir and can be mixed with liquid which may already be present in the reservoir. As an alternative the liquid which has passed through the medical device fills the reservoir and rinses the medical devices
5 on the outside. Hereby, the cleaning liquid is used twice and the necessary amount of cleaning liquid is thus lowered.

The tank can further comprise ultrasonic means in order to treat the liquid of the tank with ultrasound. The ultrasound causes small bubbles on the surfaces of the medical
10 devices and hereby cleans the surface of the devices in a sterilising manner. Furthermore, the cleaning liquid, which has passed through the medical device is further sterilised. Any micro-organisms are killed during the process, and there is no risk in removing the liquid from the tank. It is hereby effected that not only the medical device is sterilised but also the cleaning liquid.

15 The tank can further comprise means for regulating the temperature of the cleaning liquid present inside the tank such as a heater. By increasing the temperature of the cleaning liquid during the ultrasonic process the efficiency of the process is increased.

20 This invention further describes a method for perfusion of medical device s using a cleaning apparatus comprising the steps of:

- connecting a channel of a medical device to a means of connection of a cleaning circuit;
- starting a cleaning process;
- 25 - pumping a cleaning liquid from a fluid reservoir through a cleaning channel, and through a channel inside an medical device, where said amount of cleaning liquid is limited;
- progressively measurement of a measured value by at least one control means;
- 30 - comparing said measured value with a predetermined value;

- disconnecting said pump if said measured value is increased as compared to said predetermined value and starting said alarming means;
- starting said pump if said measured value equals or is decreased as compared to said predetermined value and disconnecting said alarming means.

Furthermore, a method for perfusion of medical devices is described where said pump is started after a transmission lag.

- 10 The cleaning apparatus of the invention function in the following way. A medical device is attached to the coupling means in order for each lumen or channel of the medical device to be attached to a separate coupling means. The coupling means can be either a minor device or an elongated tube for coupling, in case the medical device is to be arranged in the tank at the same time as the channels are connected to the cleaning circuit.

- Hereafter the pump pumps cleaning liquid from a fluid reservoir through the cleaning channel before it enters the medical device and rinses the surfaces of the channels. During this process the pressure or the flow is measured progressively by at least one pressure or flow sensor. Progressively means that the measurement can be performed continuously, meaning all the time, or the measurement can be performed point-wise separated by intervals. The measured value of the sensor is compared to a predetermined value in order to determine if there is a considerable difference between the values. If the pressure is significantly increased as compared to the predetermined value or if the flow is significantly decreased as compared to the predetermined value, the alarming means will start and the pump will stop.

- When the blockage inside the cleaning channel is removed, the measured value will equal the predetermined value, the alarming means is stopped and the pump started after a short time period. When the blockage inside the cleaning channel is still present the measured value will still differ from the predetermined value and the alarming means will continue either until the blockage is removed or for a given time period. Hereafter, the alarming means will still be on but the pump will not start and the person

handling the cleaning apparatus is aware of that the channel of the medical device is to be cleaned manually.

If the blockage of a medical device channel is removed due to the flow of liquid, the cleaning apparatus continues pumping cleaning fluid through the apparatus until the cleaning liquid of the fluid reservoir is used. In this manner it is obtained that a specified amount of cleaning liquid is passed through the channel. Advantageously, air or gas can be passed through the channels hereafter. Further advantageously, the time for the cleaning process can be pre-set in order to ensure that cleaning liquid and preferably gas are passed through the channels.

Description of the Drawing

- Fig. 1 illustrates one embodiment of a cleaning apparatus comprising four cleaning circuits and a tank,
- Fig. 2 illustrates a diagram for an electrical circuit,
- Fig. 3 illustrates a second embodiment of a cleaning apparatus comprising eight cleaning circuits and a tank,
- Fig. 4 illustrates a third embodiment of a cleaning apparatus comprising six cleaning circuits and a tank.

Detailed Description of the Invention

Fig. 1 illustrates one embodiment of a cleaning apparatus 1 comprising four cleaning circuits integrated in a box 3 and a tank 5. The cleaning apparatus 1 comprises four separate fluid reservoirs 7, one per cleaning circuit. The fluid reservoirs 7 are inserted into a rack 9 attached to the box 3. Tubes lowered into the fluid of the fluid reservoirs 7 are connected with the box 3 through the openings 6 on the side of the box 3. Fluid is hereby pumped from the fluid reservoir 7 through the tubes and finally through the channels of the medical devices. For the purpose of simplification the tubes are not illustrated in this figure.

The box 3 further comprises four start buttons 11 to be pushed separately in order to start the cleaning procedure of the separate cleaning circuits. Next to the start buttons

11 four alarms 13 are shown, one for each separate cleaning circuit. The alarm 13 is illuminated when blockage of the cleaning channel occurs to which the alarm belong to.

Four pipe stubs 15 are arranged next to the alarms 13. The pipe stubs 15 functions as
5 coupling means for each channel to be cleaned and each pipe stub 15 belongs to a separate cleaning circuit.

The time for the cleaning process is set by adjusting the button 17 on the side of the box 3. Next to the button 17 is arranged an indicator 19 that emits light during the
10 cleaning process.

The power of the cleaning apparatus 1 is turned on by pushing the main switch 21 arranged on the tank 5. Furthermore, the tank 5 comprises a regulator 23 for regulating the temperature of the liquid inside the tank 5 and an adjuster 25 for adjusting the time
15 of the ultrasound. In addition, the tank 5 comprises a drain cock 27 to be able easily to empty the content of the tank 5.

Before the cleaning process, cleaning liquid is poured into the fluid reservoirs 7 in a given amount for example 60 mL of either distilled water or a disinfecting liquid. Here-
20 after the cleaning channel is coupled with the fluid reservoirs 7 and the medical device to be cleaned is coupled to the cleaning apparatus 1 by coupling the separate channels to be cleaned with the pipe stubs 15. The medical device is then arranged into the tank 5.

25 To start the cleaning process, the cleaning apparatus 1 is turned on at the main switch 21, the cleaning time is set at the time button 17 and the start buttons 11 of the relevant cleaning circuits are turn on e.g. by pushing i.e. if three channels to be cleaned is connected with three pipe stubs 15 the start buttons 11 controlling the cleaning procedure related with these cleaning circuits are pushed and similarly if one, two or four channels
30 are to be used. The light of the indicator 19 and the start button 11 is now lit.

Cleaning liquid is now pumped from the fluid reservoir 7 through the cleaning channel, through the pipe stubs 15, through the channels of the endoscope and into the tank 5.

If the channel of the medical device is blocked the pressure of the cleaning channel is increased above a predetermined pressure limit the pump stops and the alarm 13 belonging to the relevant cleaning circuit is lit. The pressure limit can preferably be 600 mbar, which is what normally is obtained by hand-rinsing of the channels using a syringe. However, the pressure limit can as well be other values set with regard to the particular medical device, the size of the channel, the use and the material of the medical device since each of these are influencing the pressure at which the channel is properly rinsed. The pressure is continuously measured and if the blockage is removed by the pressure of the liquid the light of the alarm is turned off and the pump starts after a short transmission lag. The cleaning process is then continued until the time set on the time button 17 is up. This time is preferably longer than the time necessary to empty the fluid reservoirs 7 since it is most advantageously to blow air through the channels after the fluid reservoirs have been emptied.

If the blockage is not removed the cleaning process continues until the time set on the time button 17 is up and the indicator 19 is turned off. The alarm 13 still emits light after the indicator 19 is turned off in order to warn about an incomplete cleaning procedure.

During the cleaning process, the medical device is arranged in the tank 5 immersed in cleaning liquid. The cleaning liquid is heated to a temperature set on the regulator 23 and the effect of the ultrasound is set via the time-adjuster 25. Hereby, the medical device is cleaned on the outside and the cleaning liquid is purified as well. At the end of the cleaning process the cleaning liquid is emptied from the tank 5.

Fig. 2 illustrates the electrical circuit controlling the pump of a cleaning circuit. The cleaning circuit is started at the start button 11, whereby a light is lit 12, and the pump 29 is started. This process is controlled by a pressure sensor 37 and a RC-relay 31, 33, 35 comprising a relay 31, a resistance 33 and a condenser 35. The electrical circuit further comprises a fuse 39, a further resistance 34, condensers for smoothing 36, and diodes 41. In addition, the electrical circuit is connected with alarms 43, 45 here illustrated as a buzzer alarm 43 and a red light to be lit 45.

Switching on the start button 11 the green light 12 of the button is lit and the pump 29 is started. When the pressure in the cleaning channel is below a critical limit the pressure sensor 37 is in a closed position. However when the pressure in the cleaning channel is increased due to a blockage the pressure sensor 37 turns to an open position as illustrated in fig. 2. Thus, the pump 29 is stopped and the alarming means i.e. the buzzer alarm 43 and the red light 45 is turned on. It is implicitly to be understood that the lights can be other colours than here indicated e.g. yellow, purple etc. or that the red light can be green or reverse.

Fig. 3 illustrates another embodiment of the cleaning apparatus 47. In this embodiment, the cleaning apparatus 47 comprises a support 49 with wheels 51 and a handle 53. Advantageously, brakes 52 are arranged on one or more wheels 51. In this embodiment, brakes 52 are present on the two front wheels.

The cleaning apparatus 47 can thus easily be moved without lifting and can be used in multiple places. Advantageously, a remote control 50 can be used for adjusting the height of the cleaning apparatus 47.

The cleaning apparatus 47 further comprises a console 55 and a table 57. The tank 5 is attached to the table 57 but the main part of the tank 5 is arranged beneath the table 57. On the tank 5, a switch 56, an adjuster 25 and a regulator 23 is observed. At the table 57, a tray 59 is arranged for manual work with ultrasonic handpieces.

At and in the console 55 the means of the cleaning circuits are arranged. In this embodiment, two times four cleaning circuits are available as observed by the eight components of each of the start buttons 11, alarms 13, and pipe stumps 15. The cleaning circuits are divided into two groups 58, 60 of four by the compressor switch 61. The group 58 to the right of the compressor switch 61 comprises cleaning circuits for a low flow, while the group 60 to the left of the compressor switch 61 comprises cleaning circuits for a high flow. In order to control the running time of each of the groups two timers are arranged next to the two groups 58, 60 i.e. a low flow timer 65 and a high flow timer 67.

On the backside of the console 55 a rack 63 is arranged for the placement of eight fluid reservoirs, one for each cleaning circuit.

Advantageously, the cleaning apparatus 47 further comprises a compressor, which is
5 turned on by the compressor switch 61 and connected with a blow pistol. Hereby, manual cleaning of channels inside medical devices can be performed if the blockage is not removed by the cleaning circuits of the cleaning apparatus 47 or additional air can be blown through the channels to remove additional liquid from the interior of the channels.

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Figure 4 illustrates a third embodiment of a cleaning apparatus 69 developed for rigid endoscopes comprising up to eight cleaning circuits. The cleaning apparatus 69 therefore comprises a larger tank 5. The cleaning apparatus 69 comprises a box 3 and a tank
5. The cleaning apparatus 69 comprises six separate fluid reservoirs 7, one per cleaning
15 circuit. The fluid reservoirs 7 are inserted into a rack 9 attached to the box 3. Tubes 8 lowered into the fluid of the fluid reservoirs 7 are connected with the box 3 through the openings 6 on the side of the box 3.

The box 3 further comprises six start buttons 11 to be pushed separately in order to
20 start the cleaning procedure of the separate cleaning circuits. Next to the start buttons 11 six alarms 13 are shown, one for each separate cleaning circuit. The alarm 13 is illuminated when blockage of the cleaning channel occurs to which the alarm belong to.

Six pipe stubs 15 are arranged next to the alarms 13. The pipe stubs 15 functions as
25 coupling means for each channel to be cleaned and each pipe stub 15 belongs to a separate cleaning circuit.

Advantageously, in another embodiment the six pipe stubs 15 can be arranged into two groups comprising three pipe stubs each, where the pipe stubs of one of the groups can
30 be marked in order to differentiate the pipe stubs from one another. The flow of the two groups can be different for example a major and a minor flow, where the major flow is determined for medical devices comprising large channels.

The time for the cleaning process is set by adjusting the button 17 on the side of the box 3. Next to the button 17 is arranged an indicator 19 that emits light during the cleaning process.

- 5 The power of the cleaning apparatus 69 is turned on by pushing the main switch 21 arranged on the tank 5. Furthermore, the tank 5 comprises a regulator 23 for regulating the temperature of the liquid inside the tank 5 and an adjuster 25 for adjusting the effect of the ultrasound.

CLAIMS

1. A cleaning apparatus for perfusion of medical devices comprising at least one cleaning circuit, where said at least one cleaning circuit comprises

- a cleaning channel;
- 5 - a fluid reservoir comprising a cleaning liquid in fluid communication with said cleaning channel, where said fluid reservoir comprises a limited amount of cleaning liquid;
- at least one control means for progressively measuring a measured value with regard to said cleaning liquid and comparing said measured value with a predetermined value;
- 10 - a coupling means for coupling of a first end of an medical device to the cleaning circuit;
- an alarming means for notification when said measured value diverges from said predetermined value;
- 15 - a pump, said pump pumps said cleaning liquid from said fluid reservoir, through said cleaning channel, and through said endoscope.

2. The cleaning apparatus for perfusion of medical devices according to claim 1 characterised in that said pump is a peristaltic pump, preferably a tube pump.

3. The cleaning apparatus for perfusion of medical devices according to any of the preceding claims characterised in that said cleaning apparatus further comprises an electrical circuit, which controls said at least one pump, where said electrical circuit comprises means for transmission lag.

4. The cleaning apparatus for perfusion of medical devices according to any of the preceding claims characterised in that said at least one control means comprises a pressure sensor.

5. The cleaning apparatus for perfusion of medical devices according to any of the preceding claims characterised in that said cleaning apparatus comprises four, six or eight channels.

6. The cleaning apparatus for perfusion of medical devices according to any of the preceding claims characterised in that said cleaning apparatus comprises at least one tank; said tank comprises an ultrasound device.

5

7. The cleaning apparatus for perfusion of medical devices according to claim 6 characterised in that said tank further comprises temperature regulating means.

8. A method for perfusion of medical devices using a cleaning apparatus according to any of the claims 1-7 comprising the steps of:

10

- connecting a channel of a medical device to a means of connection of a cleaning circuit;
- starting a cleaning process;
- pumping a cleaning liquid from a fluid reservoir through a cleaning channel, and through a channel inside an medical device, where said amount of cleaning liquid is limited;
- progressively measurement of a measured value by at least one control means;
- comparing said measured value with a predetermined value;
- disconnecting said pump if said measured value is increased as compared to said predetermined value and starting said alarming means;
- starting said pump if said measured value equals or is decreased as compared to said predetermined value and disconnecting said alarming means.

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9. The method for perfusion of medical devices according to claim 8 characterised in that said pump is started after a transmission lag.

30

Fig. 1

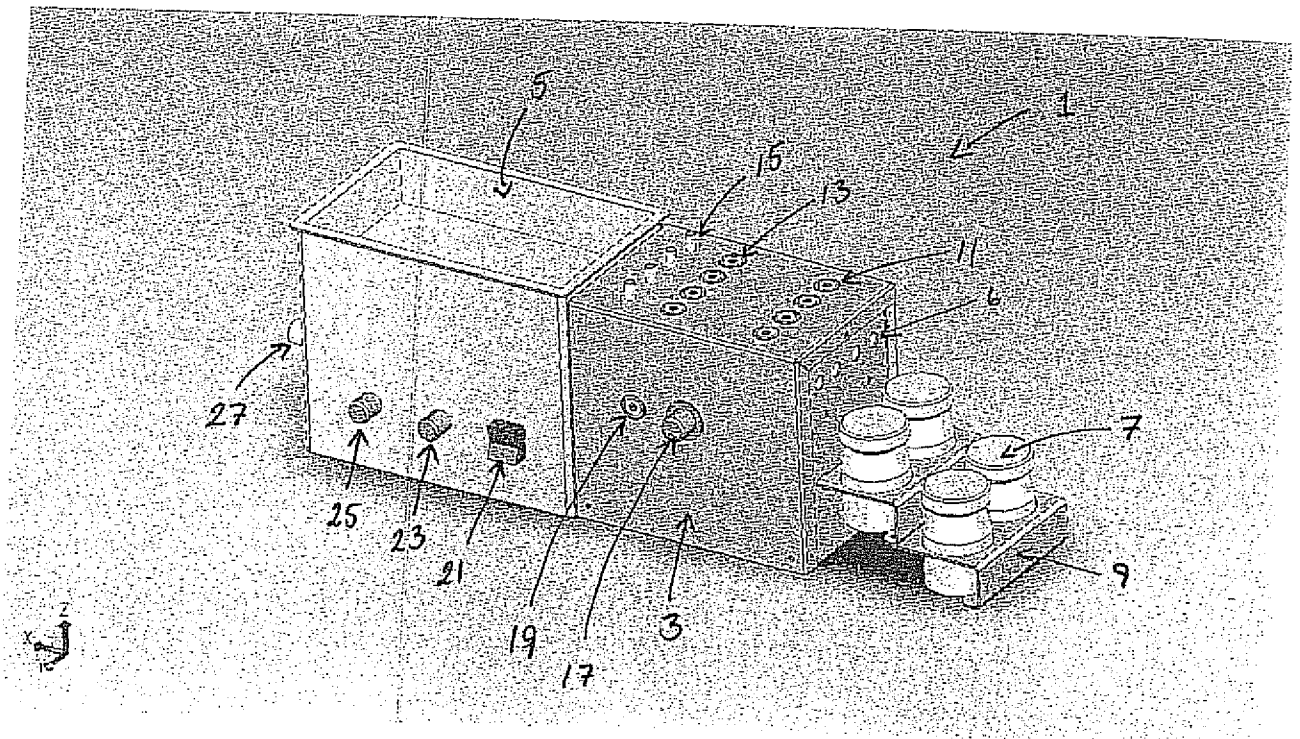


Fig. 2

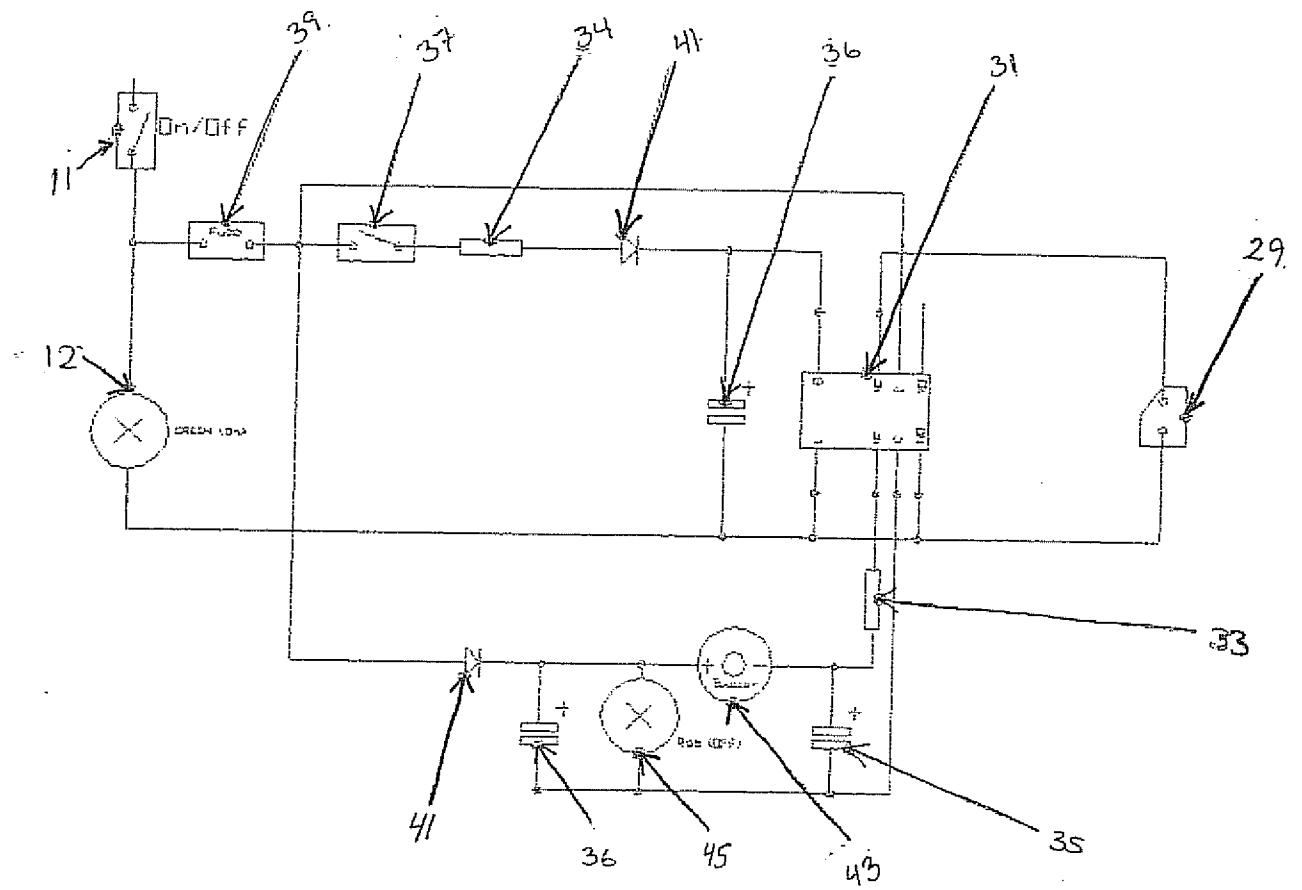


Fig. 3

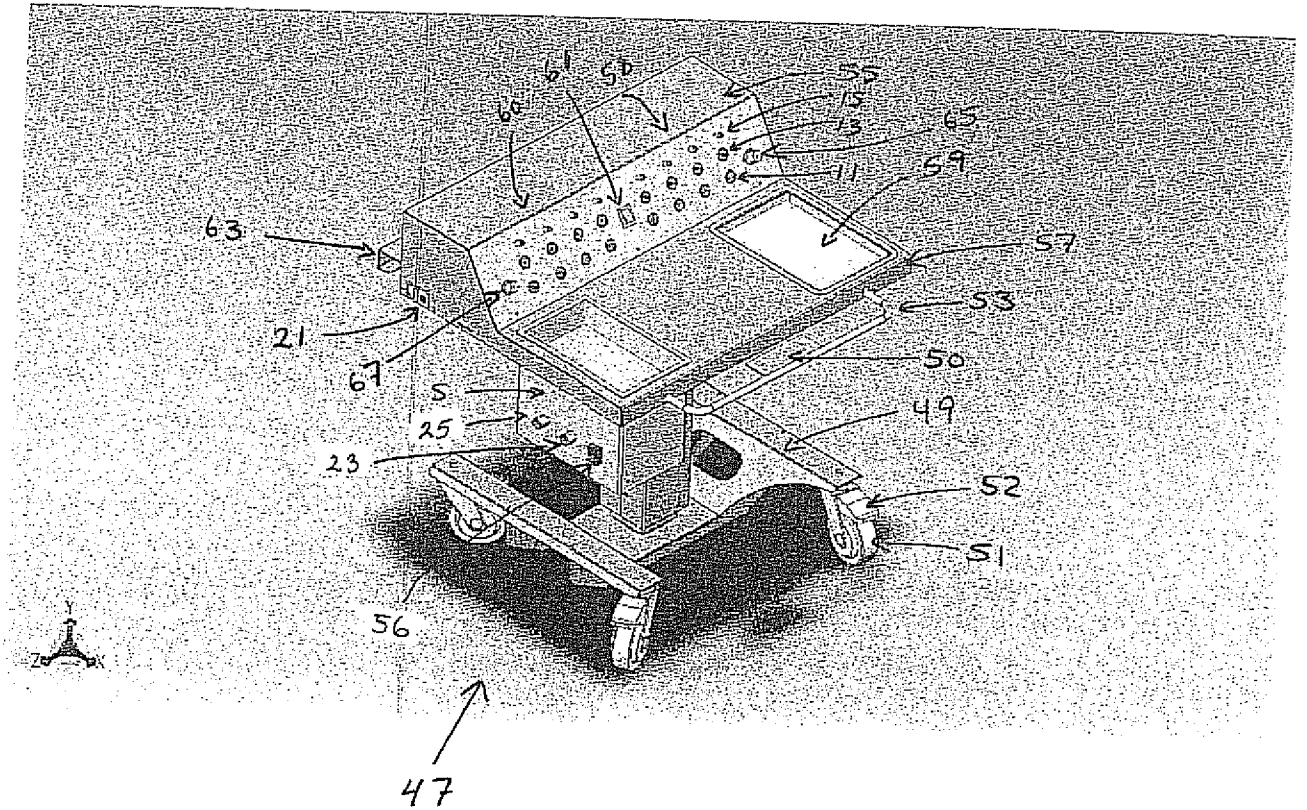
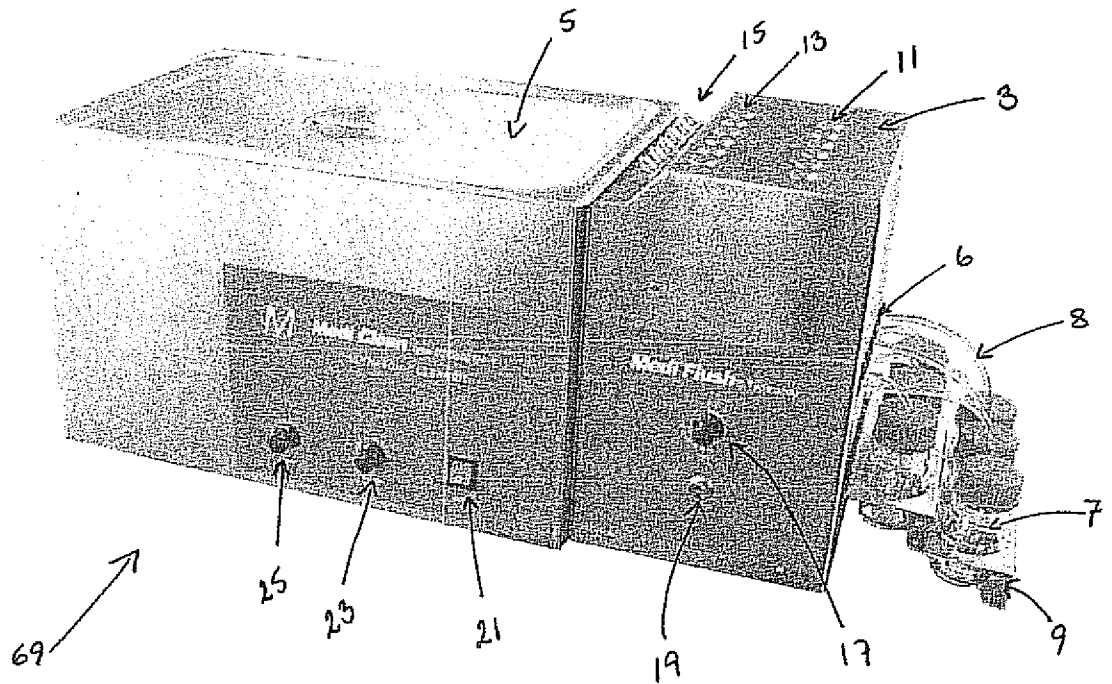


Fig. 4



INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK2010/050133

A. CLASSIFICATION OF SUBJECT MATTER

B08B 9/032 (2006.01), A51L 2/18 (2006.01), A61L 2/28 (2006.01)

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC: A61B, A61L, B08B, G02B, H01H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPODOC, WPI, Full text databases

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0709056 A1 (FUJINON MEDICAL HOLLAND B.V.) 1996.05.01 See the whole document.	1-2
A	WO 9858682 A2 (STERIS CORPORATION) 1998.12.30	-
A	EP 14333412 A1 (ETHICON INC.) 2004.06.30	-
A	EP 1757313 A1 (ETHICON INC.) 2007.02.28	-
A	EP 1338237 A2 (BHT HYGIENETECHNIK GMBH) 2003.08.27	-



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/DK2010/050133

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