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NOTICE OF ENTITLEMENT

We, CARBA SOCIETE ANONYME of Waldeggstrasse 38, 3097 Liebefeld, Switzerland state the following in connection with Australian Application No. 48233/93

1. We are the nominated person.
2. The nominated person is entitled to grant of the patent by assignment from the actual inventors.
3. The nominated person is entitled to the priority claim by assignment from the applicant(s) of the basic application listed in the declaration under Article 8 of the PCT.
4. The basic application is the application first made in a Convention country in respect of the invention.

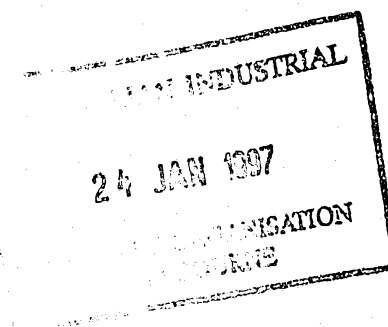
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- (57) Claim

1. Device for the treatment, particularly the decontamination, the disinfection and/or the deodorization, of liquid, gaseous, or solid materials such as waste, particularly that coming from the medical environment, the device comprising an enclosure for treatment of the materials to be treated, an ozone generator capable of feeding this enclosure with ozonized gas, an ozone destroyer capable of destroying the ozone of the ozonized gas contained in the treatment enclosure wherein the device further includes an accumulator of ozonized gas inserted between the ozone generator and the treatment enclosure, the accumulator being capable of establishing with the ozone generator, via suitable pipes, a closed circuit so as rapidly to increase and vary the ozone concentration in the gas intended to circulate in the decontamination enclosure.

12. Process for treatment, particularly for decontamination, of preferably solid materials such as waste, particularly coming from the medical environment, disposed in a treatment enclosure subjected to the action of an ozonized gas produced by an ozone generator and eliminated by an ozone destroyer, wherein an accumulator of ozonized gas capable of establishing a closed circuit with the ozone generator so as to enrich the ozonized gas with ozone is integrated between the treatment enclosure and the ozone generator.

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(54) Title: TREATMENT DEVICE PARTICULARLY FOR DECONTAMINATING MATERIALS, PREFERABLY SOLIDS SUCH AS WASTE MATERIALS (54) Titre: DISPOSITIF DE TRAITEMENT NOTAMMENT DE DECONTAMINATION DE MATERIAUX DE PREFERENCE SOLIDES TELS QUE DES DECHETS (57) Abstract The invention relates to a device for the decontamination of waste materials of the type comprising a decontamination housing (5), an ozone generator (1) capable of supplying said housing (5) with ozone-containing gas, an ozone destructor (16) capable of destroying the ozone of the ozone-containing gas held in the decontamination housing (5). The device of the invention also comprises an ozone gas accumulator (4) arranged between the ozone generator (1) and the decontamination housing (5), said accumulator (4) being capable of establishing with the ozone generator (1), through appropriate conduits (22, 23, 24), a closed circuit so as to increase and rapidly modify the ozone concentration in the gas intended to circulate in the decontamination housing (5). Application to the decontamination of medical waste materials. (57) Abrégé L'invention concerne un dispositif pour la decontamination de déchets du type comportant une enceinte de decontamination (5), un générateur d'ozone (1) susceptible d'alimenter cette enceinte (5) en gaz ozone, un destructeur d'ozone (16) susceptible de détruire l'ozone du gaz ozone contenu dans l'enceinte de decontamination (5). Le dispositif selon l'invention comprend en outre un accumulateur de gaz ozone (4) intercalé entre le générateur d'ozone (1) et l'enceinte de decontamination (5), cet accumulateur (4) étant susceptible d'établir avec le générateur d'ozone (1), par l'intermédiaire de tubulures (22, 23, 24) appropriées, un circuit fermé de manière à augmenter et faire varier rapidement la concentration en ozone dans le gaz destiné à circuler dans l'enceinte de decontamination (5). Application à la decontamination des déchets médicaux.			

TREATMENT DEVICE ESPECIALLY FOR DECONTAMINATION OF MATERIALS
PREFERABLY SOLIDS SUCH AS WASTE

The present invention relates to a device for treatment, particularly for decontamination of materials, preferably solids, such as waste coming, for example, from the medical environment, as well as a process for putting this device to use.

The practitioners, particularly liberal ones, of the medical and paramedical professions generate a number of types of refuse of diverse physical nature (plastic, textile, metal, glass, etc.), all liable to be contaminated by microbial or viral germs coming from their patients.

The quantity of this waste is constantly augmenting, on the one hand, with the development of consumption for health, and on the other hand with the use by those in the art of an unceasingly increasing quantity of objects for one-time use which thus have no need to be sterilized after their use and their contamination.

To remedy these drawbacks, a number of incineration devices have been perfected. However, they require the organization of a collection of the waste and the placing nearby of a device of this type.

Besides the processes and devices calling for heat, devices carrying out either chemical or physical solutions have been seen to be developed in the past few years. The devices based upon the action of chemical agents offer the interest of permitting lighter installations. Thus, an apparatus is known which, in a first stage, grinds the waste,

reducing it to a standard granulometry. Next, this granulate is immersed for a given time in a disinfectant solution, then, after draining off, it is compacted by means of a press, reducing the total waste volume but not eliminating the secondary chemical effluents. This device is, by reason of the necessary investments, more particularly intended for communities. Moreover, the problem still arises of eliminating the disinfectant solution. As for the devices carrying out physical solutions such as treatments by ionizing radiations, they are very cumbersome, costly, and require protection of persons and the environment.

Other devices, in accordance, for example with that described in patent DE-A-3,324,939, comprise a decontamination enclosure containing a cleaning liquid subjected at regular intervals to an ozone-enriched gas. These devices generally further include an ultrasonic generator. These mixed, chemical, gaseous and ultrasonic processes are expensive and do not always give complete satisfaction. A similar process is likewise described in patent EP-A-202,366.

Finally, the devices closest to that described below are those, for example, of patent WO-A-8,605,100, wherein a process and a device are described for the sterilization of medical material by means of ozone in the gaseous state. The device described is relatively complex, especially because the final result desired is sterilization. This device includes an enclosure within which the waste to be sterilized is disposed, an ozone generator connected to a source of oxygen, a vacuum pump, heating means, and means

for destruction of the ozone produced. The sterilization process is therefore accompanied by the placing under vacuum of the enclosure and possibly humidification of the latter. This process and this device, despite their advantages, viz., the absence of pollution, present two major drawbacks. First of all, the ozone is produced starting from pure oxygen which therefore entails a number of risks at the level of the installation, especially by reason of the fact that waste is treated that is liable to contain fat and is capable of leading to explosions at the time of being put in contact with the oxygen. Moreover, this device entails an operation of the ozone generator starting from a gaseous flux with a high rate of humidity and pollution, involving a reduction in output of the generator.

Patent FR-A-2,611,343 describes a sterilization device similar to that described previously, wherein the ozone is still produced starting from oxygen, and a direct coupling is again found between the sterilization enclosure and the ozonizer, the augmentation of the concentration of ozone being effected by heating of the ozonized oxygen at the entry of the sterilization enclosure.

Finally, there is known from patent FR-A-1,137,268 a basic installation of the type comprising an ionized-air generator integrated within the decontamination enclosure and, thanks to the flow of ozonized air generated, permitting pieces of work to be aseptized. However, this type of installation does not permit high or variable ozone

concentrations to be obtained.

The object of the present invention is therefore to remedy these drawbacks by proposing a device for treatment, particularly for decontamination, eliminating any risk of explosion owing to the absence of a source of oxygen and thus working, not starting from ozonized oxygen, but starting from ozonized air, and thanks to its simple but efficient configuration, permitting working at variable but high ozone concentrations thanks to rapid and efficient generation means without increasing the cost of the installation.

To this end, the invention relates to a device for the treatment, particularly the decontamination of preferably solid materials such as waste, especially that coming from the medical environment, of the type comprising an open or closed treatment enclosure ^{for} containing the medium to be treated, an ozone generator capable of feeding this enclosure with ozonized gas, an ozone destroyer, capable of destroying the gases contained in the ozonized gas after and/or during the treatment, characterized in that it further includes an accumulator of ozonized gas inserted between the ozone generator and the enclosure containing the medium to be treated, this accumulator being capable of establishing with the ozone generator, through suitable pipes, a closed circuit so as rapidly to obtain high and variable ozone concentrations in the gas intended to circulate in the enclosure containing the medium to be treated.

In the case of a decontamination, the ozone concentration in the ozonized gas circulating within the treatment



enclosure can, thanks to this configuration, be made to vary as a function of the degree of contamination of the waste to be decontaminated, of the duration of the decontamination cycle, and of the moment at which this ozonized air is injected in the course of the decontaminated cycle. Thus, the present invention can provide
5 a device, the operation of which is moduable, which ensures excellent decontamination with good control of the expenditures of energy.

In a preferred embodiment of this invention, the treatment enclosure includes a partition, such as a grating, at its lower part forming a double bottom and delimiting a lower space for recovery of the treatment gases.

10 Throughout the description and claims of this specification the word "comprise" and variations of that word, such as "comprises" and "comprising", are not intended to exclude other additives or components or integers or steps.

Further features and advantages of the invention will appear upon reading the following description of a preferred embodiment with reference to the
15 accompanying drawings, which description and drawings are given by way of example only. In these drawings:

Figure 1 shows a diagrammatic view of a device according to the invention,

Figure 2 shows a perspective view of an embodiment of means for introducing the waste into the decontamination enclosures, and

20 Figure 3 shows a schematic section view of the waste introducing means of Figure 2 along lines A-A combined with a grinding device.

According to the embodiment of the invention as shown in Figures 1 to 3, the decontamination device includes an ozone generator 1, an accumulator of ozonized gas 4, a fluid-tight enclosure for decontamination of the waste 5 through
25 action of the ozonized gas produced by the generator 1, and an ozone destroyer 15. These main constituents are interconnected by a set of pipes, valves, and pumps permitting the decontamination process to be carried out.

The ozone generator 1 consists of a tubular system of



the cylindrical condenser type including an inner electrode composed of a small-diameter wire 3 surrounded coaxially by an outer electrode 1bis. This wire cylinder system presents the advantage of being of reduced size. The wire constituting the inner electrode is kept at a high positive or negative voltage, the outer cylinder 1a for its part being grounded. The gas enters through the pipeline 24 and leaves through the pipe 23 and circulates axially between the two electrodes. This wire cylinder system constitutes the body of the ozonizer, the centering of the wire being ensured by two insulating ferrules pierced at their centers to permit the flow of the gas and the centering of the inner electrode. These insulating materials block the end of the outer electrode, allowing the gaseous flux through an opening connected to the air circulation pipes. These insulating ferrules are in turn inserted into two end parts, at least one of which is movable and/or equipped with a metal contact connected to the high voltage. Hence, an ozone generator which takes up little space is obtained, which can be dismantled easily to be replaced or cleaned. It will be noted that in the case shown in Figure 1, the gas which flows through the generator is air which has additionally been dried out by means of a desiccator 20. The fact of drying out the air permits the efficacy of the ozone generator 1 to be increased. Thus constituted, the generator 1 represents a closed cylindrical volume which can be traversed along its large axis by a flow of gas when a continuous electric field is applied between its axis and the

surface of its wall of revolution. Hence, the annular discharges generated cause the formation of ozone in the gaseous flux starting from the oxygen in the air which flows through it. So as to increase the output of the generator tube while avoiding its heating, a cooling device (not shown) may possibly be appended to it.

This ozone generator 1 is connected by means of a pipe 23 to the entrance of the accumulator of ozonized gas 4 and by a pipe 22 to the exit of the accumulator of ozonized gas 4. Hence, it is possible to establish a closed circuit between the accumulator of ozonized gas 4 and the ozone generator 1. This accumulator of ozonized gas 4 takes the form of a fluid-tight reservoir 4 of stainless steel or any other suitable material. Its volume is established correctly as a function of the characteristics of the ozone generator 1, on the one hand, and of the volume of the decontamination enclosure 5, on the other hand. The pipe 23 connecting the exit of the ozone generator 1 to the entrance 4bis of the accumulator of ozonized gas 4 comprises a pump 21 which facilitates the delivery of the ozonized gas from the generator 1 to the accumulator 4 and permits the pumping of the ambient air to bring it to the generator 1. The second pipe which connects the accumulator of ozonized gas 4 to the entrance of the ozone generator 1 comprises a three-way valve 19. This valve, disposed at the intersection of the pipe 22 connecting the accumulator of ozonized gas 4 to the ozone generator 1 and the pipe 24 connecting the gas source to the entrance of the ozone generator 1, permits the admission

into the generator 1 assembly of either a gas coming from the accumulator of ozonized gas 4 or a gas coming from an outside source aspirated by means of the pump 21 after passing through a desiccator 20.

5 This constitutes only one embodiment of the invention. As a matter of fact, by reason of the very simple configuration of the ozone generator 1, a device may be envisaged wherein there are several ozone generators disposed in parallel, some being fed by the ozonized gas coming from the
10 accumulator of ozonized gas 4, others being supplied directly by the external gas source. Hence, high ozone concentrations are obtained very rapidly in the ozonized gas stored within the accumulator of ozonized gas 4. Moreover, this type of installation permits working directly with the
15 ambient air by reason of an extremely high output of the ozone generator 1 owing to the configuration of the assembly. Hence, a major drawback of the existing devices is eliminated, all of which are supplied starting from pure oxygen, necessitating a suitable source of oxygen nearby.
20 In the installation described here, the device is completely autonomous and does not require any particular source of gas. It will be noted that the accumulator of ozonized gas 4 includes a third opening 4ter which permits it to be connected, by means of a pipe 23, to the waste decontamination
25 enclosure 5 proper. This connection is effected via the pipe 25, the three-way valve 27, and the pump 28.

The enclosure for decontamination of the waste 5 is composed of a body 5bis of stainless steel or of any other

suitable material and comprises at its lower part a grating 7 forming a double bottom and delimiting a lower space 6 intended for the recovery of the treatment gases. The waste to be treated is placed above this grating, and the enclosure 5 is closed by a cover 9 locked by means of a preferably electric-catch lock 35, the fluid-tightness being ensured by an O-ring 10. This cover 9 may comprise an entry air lock 9bis permitting the continuous or nearly continuous introduction of waste within the decontamination enclosure 5, i.e., including at the time of a decontamination cycle. This entry air lock 9bis may, for example, be produced according to Figure 2.

In this case, this entry air lock takes the form of a cylindrical rotary drawer made up of a double envelope so as to delimit an outer cylinder 11 integral with the cover and comprising upper openings 12 and lower openings 12bis through which the waste may be introduced and evacuated from a rotary inner cylinder 13 comprising a single opening 14 on its surface of revolution. Thanks to this embodiment of the air lock, the lining-up of opening 12 with opening 14 permits the introduction of the waste into the inner cylinder 13 without letting the highly ozone-enriched air go out again from the assembly 5 where the waste in the course of treatment is contained. Then, rotation of the inner cylinder 13 by 180° causing the opening 14 of the inner cylinder 13 to line up with the lower opening 12bis of the outer cylinder 11 permits the waste deposited in the inner cylinder 13 to drop into the treatment enclosure 5 by simple gravity,

without the treatment gas being able to escape to the outside. Furthermore, the lining-up of the openings 12bis and 14 establishes in the body of the inner rotary cylinder 13 a disinfectant atmosphere comparable to that of the enclosure 5, ensuring its autodecontamination after passage of the pollutant waste having contaminated its surface. Moreover, this drawer, and especially the inner cylinder 13, may be provided with heating means 34 which permit the destruction of ozone within this inner cylinder 13 before the latter is put in communication with the outside for filling with waste. The waste introduced into the inner cylinder 13 reaches the decontamination enclosure 5 after possibly having been ground by means of a grinding device disposed in the decontamination enclosure 5. This grinding device is preferably made up as follows:

Taking into account the heterogeneous nature of the waste (needles, blood bags, various tubing, rubber, compresses, etc...), a grinding device may be appended at the exit of the air lock in the treatment enclosure.

This device may be advantageously produced by the use of a shaft rotating at very high angular velocity and bearing one or more knives made of a suitable material and constituting around this rotating assembly a ^{cylindrical} hemispherical housing bearing on its surface a number of fixed knives or asperities, as well as calibrated openings.

The assembly thus constituted permits textiles to be dilacerated and hard constituents of the waste to be broken and to eject them into the treatment volume at the level of



the ozonized-air injectors, increasing the gas-waste contact surface, thus improving the efficacy and the rapidity of treatment while giving the treated residues the look of ordinary waste.

5 Of course, any other embodiment of means for introducing the waste into the decontamination enclosure may be envisaged. It is likewise possible to provide within the enclosure an additional removable, interchangeable recipient for one-time use. This recipient receives the waste and
10 presents a conical shape (two inverted cones) with a neck substantially in its middle part. Furthermore, it is capable of being closed at both ends by means of covers closing the recipient by simple stamping. Hence, a decontamination procedure may be envisaged wherein the waste is stored with-
15 in this container or recipient, decontaminated by sending ozonized gas within said container. Once the decontamination is terminated, the recipient is permanently closed, and the whole thing is extracted from the decontamination enclosure
20 5 after destruction of the ozone within said enclosure, and the container is directly evacuated to a garbage dump. By this means, any risk is eliminated of injury to a user who would have to manipulate this waste.

 The device shown in Figure 1 further comprises an ozone destroyer. This destroyer is made up of a generally
25 cylindrical body 16 closed at both ends and connected on one side to the exit pipe 31 connecting this body 16 to the decontamination enclosure 5 via an automatic overpressure valve 29 and on the other side to the general evacuation

pipe 32 which leads into the atmosphere. This body is separated into two chambers by means of a grating 33. The first chamber comprises a resistor 17 heated as soon as voltage is applied to the device. The rôle of this resistor is to destroy the ozone before any evacuation of gas to the outside. The second chamber 15, for its part, comprises a sand filter 18 intended, on the one hand, to complete the destruction of any ozone which might have been able to escape the action of the heated resistor 17 and, on the other hand, to prevent the exit of pollutant particles at the time of draining the enclosure 5. Of course, the above description is only an exemplified embodiment of an ozone destroyer well known in the state of the art. It will be noted that a pipe 30 disposed between the automatic overpressure valve 29 and the decontamination enclosure 5 permits part of the ozonized gas to be returned to the decontamination enclosure 5 when a selective overpressure has occurred but the gas-destruction cycle has not yet started.

Consequently, with a device of the type described in Figure 1, the mode of operation of the device and the decontamination process are as follows: voltage is applied to the ozone generator 1, and it is connected to the atmosphere so as to establish a circuit of production of highly ozone-enriched air starting from the oxygen contained in the atmospheric air. Of course, any other gaseous source may be envisaged, air remaining the most practical gas to use. This gradual ozone enrichment of the ambient air is obtained by establishing a closed loop between the ozone generator 1

and the accumulator of ozonized gas 4. Thus, the air pumped by means of the pump 21 and dried out by the desiccator 20 is, via the three-way valve 19, sent by means of the pipe 24 to the interior of the ozone generator 1, which it traverses, then to pass into the pipe 23 and end up via the opening 4bis in the interior of the accumulator of ozonized gas 4. This ozonized gas, once introduced within the accumulator of ozonized gas 4, may have two possibilities.

Either, in the case where it is desired to further increase the concentration of the ozonized gas, one returns, via the opening 4bis and the pipe 22, then passage through the three-way valve 19, to the ozone generator 1, and this loop is reiterated until the ozone concentration of the gas is sufficient. Or air is again introduced by orienting the three-way valve 19 toward the pipe placed at atmospheric pressure. When a sufficient concentration is reached, i.e., when the successive passages of ozonized gas contained in the accumulator of ozonized gas 4 through the ozone generator tube 1 have permitted an ozone concentration on the order of 10,000 ppm to be obtained, the ozonized gas is then pumped by means of the pump 28 disposed on the pipe 25 to be sent in the direction of the decontamination enclosure 5.

The mixture of ozonized gas contained in the accumulator of ozonized gas 4 is then injected into the decontamination enclosure 5. This injection is effected by means of a peripheral diffuser 8 placed in the top part of the decontamination enclosure 5. Successive injections of this ozonized gas bring about a slight compression of the gas, and a

pressure in the decontamination enclosure 5 on the order of 2 to 3 bars generally results. Means for draining the decontamination enclosure 5 are likewise provided. They may especially be composed of an admission pipe 26 connected to
5 the atmospheric air, permitting the admission of air by means of the pump 28 into the decontamination enclosure 5, then toward the ozone trap or ozone destroyer through the three-way valve 29.

When the decontamination enclosure 5 has a sufficient
10 concentration of ozonized gas, particularly of ozone, the decontamination cycles start so as to cause maximum contact of the waste with the ozonized air. This waste may already be placed in the enclosure or, on the contrary, introduced by means of the feed air lock. Generally, it is provided
15 that upon each introduction of waste into the enclosure 5, via the entry air lock 9bis, the pump 28 withdraws a quantity of ozonized air with a high ozone concentration, which ozonized air will sweep the surface of the new deposit of waste. The repetition of this procedure creates an increase
20 of the local pressure 5 as a function of the performances of the pump 28 and of its check valve 28bis. This pressure is furthermore limited by the calibration of the safety valve 29. The ozone injected upon each introduction of waste has a tendency, because of its density, to accumulate at the
25 bottom of the enclosure 5. To ensure the efficacy of the treatment of the last layers deposited which have been subjected to a lesser number of ozone injections, the appended automatisms impose the carrying out of a sufficient number

of injection cycles outside of any new operation of the air lock and, therefore, of introduction of waste since this [air lock] is locked.

At the time of this treatment program in the absence
5 of any additional introduction of waste, this waste, particularly if it has been torn up or ground, may be stirred by an agitating device bringing about maximum contact between its surface and the ozonized air. During this second phase of treatment, the air lock is locked in closed position, and
10 the impossibility of opening the cover 9 is maintained, as since the starting up of the apparatus, by an automatic lock 35. Unlocking of the closure 35 through the programming of the apparatus can be obtained only after complete carrying out of the entirety of the cycles of the two successive pro-
15 grams, thus ensuring the safety of decontamination. The piloting automatism of these cycles likewise ensures the locking of the lock 35 if the entirety of the phases of the two programs provided for has not taken place completely, a possibly sound or visual alarm being set off.

20 Finally, when the decontamination cycles are finished, the ozonized gas destruction cycle is started. To practice this elimination of the ozone contained in the system, one drains starting from the ambient air blown into the decontamination enclosure 5 by means of the pump 28 and the valve
25 27 connected via the pipe 26 to the ambient air. Hence, the ozone-loaded air is driven via the pipe 31 and passage through the valve 29 into the ozone destroyer 16 described above. There, the ozonized gas is heated and filtered

before being discharged into the atmosphere. To perfect the security of the device, a number of automatisms appended to the devices are provided, whereby, as soon as the apparatus is started up, the heating resistor 17 of the ozone de-
5 stroyer 16 is ignited, and if the latter presents a dysfunction, the voltage is removed from the low-pressure pump 21 and the wire 3 of the ozone generator tube 1. The high-pressure pump 28 brings about drainage of the whole system by air coming from the admission pipe 26 through the three-
10 way valve 27.

Furthermore, very sensitive colored indicators are disposed at each location where the ozone might escape, warning the user of the necessity of carrying out energetic ventilation of the premises in case an accidental exit of
15 ozone has occurred despite the active and passive safety devices.

In the exemplified embodiment described above, the decontamination enclosure is a fluid-tight, closed enclosure. As a function of the applications, this enclosure may likewise be an open enclosure. This enclosure may contain a
20 medium to be treated taking the form of solid or liquid or gaseous materials. Thus, in the case of treatment of water, the medium to be treated will be contained either in pipelines or in generally open containers. In the case of, for
25 example, gently treated [sic - read "household"?] waste, stored in bulk in containers, the enclosure will generally be open on its top surface. The term enclosure must therefore be understood as a very general term capable of

designating either a closed enclosure or an open enclosure, this enclosure being capable of containing liquid, solid, or gaseous materials, these materials having to be treated by a surface treatment which may be a decontamination or any
5 other treatment capable of being obtained by means of the use of an ozonized gas. Other treatment is especially understood to mean the disinfection or the deodorization of the medium to be treated. As a consequence of what has just been said, the device described above constitutes only an
10 embodiment of the invention cited by way of example. The major interest of this type of installation is the possibility of being able to vary at will the ozone concentration of the gas injected into the interior of the treatment enclosure 5. Hence, the decontamination cycles may be modulated
15 as desired as a function of the origin of the waste. Moreover, this device can operate virtually continuously to the extent that the production of ozonized gas and the treatment are composed of totally independent circuits, and that the feeding with waste may take place in several stages. Consequently, the production of ozonized gas may occur even when
20 waste is being decontaminated. Finally, by means of ozone generators disposed in parallel, it is possible to arrive at a not very costly but particularly efficient device permitting particularly short decontamination cycles to be carried
25 out.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. Device for the treatment, particularly the decontamination, the disinfection and/or the deodorization, of liquid, gaseous, or solid materials such as waste, particularly that coming from the medical environment, the device
5 comprising an enclosure for treatment of the materials to be treated, an ozone generator capable of feeding this enclosure with ozonized gas, an ozone destroyer capable of destroying the ozone of the ozonized gas contained in the treatment enclosure wherein the device further includes an accumulator of
10 ozonized gas inserted between the ozone generator and the treatment enclosure, the accumulator being capable of establishing with the ozone generator, via suitable pipes, a closed circuit so as rapidly to increase and vary the ozone concentration in the gas intended to circulate in the decontamination enclosure.

2. Device according to claim 1, wherein the accumulator of ozonized
15 gas further comprises a direct connection with the treatment enclosure, said connection being capable of being blocked.

3. Device according to claim 1, wherein the ozone generator is of the wire-cylinder type and has a generator body mounted removably on a support
20 comprising means for connection to a gaseous-fluid source and to a high-voltage source.

4. Device according to claim 1, wherein the ozone generator is supplied with gas either by an external gas source or by the ozonized gas coming
25 from the accumulator, the passage from one source to another being effected by automatic tilting of a blocking element disposed between the accumulator of ozonized gas and the ozone generator.

5. Device according to any one of the claims 1 to 4, wherein the ozone
30 generator is made up of at least two ozone generators disposed in parallel, one being supplied by the ozonized gas coming from the ozone accumulator, the other



being supplied by an external gas source or by the ozonized gas coming from the ozone accumulator.

5 6. Device according to any one of the claims 1 to 5, wherein the treatment enclosure comprises means for feeding the waste permitting the introduction of the waste into the decontamination enclosure, including at the time of an operating cycle of the treatment device.

10 7. Device according to claim 6, wherein said waste feeding means of the enclosure includes a receptacle preferably disposed at the top of the enclosure and mounted integral with the cover closing said enclosure, said receptacle being made up of a double envelope delimiting a cavity, the inner envelope being capable of being driven rotatively within the outer envelope and comprising an aperture capable at the time of its rotation of coming opposite either
15 an upper aperture of the outer envelope for permitting the introduction of waste into said receptacle, or opposite a lower aperture of the outer envelope for permitting the passage of the waste from the receptacle to the decontamination enclosure.

20 8. Device according to claim 7, wherein the inner envelope comprises means for destruction of the ozone, such as heating means.

25 9. Device according to claim 7, wherein the treatment enclosure further comprises means for grinding the waste disposed either in the receptacle for introduction of the waste into the interior of the decontamination enclosure or in the decontamination enclosure proper.

30 10. Device according to any one of the claims 1 to 9, wherein the ozone destroyer is made up of a body closed at both ends and disposed outside the treatment enclosure and connected to the latter, said body being divided into two chambers, one containing means for destruction of the ozone such as heating



means, the other containing means for retaining the ozone such as filtration means.

11. Device according to any one of the claims 1 to 10, wherein a
5 disposable receptacle for one-time use, capable of being blocked at both ends after decontamination, is disposed in the contamination enclosure before each decontamination cycle and receives the waste.

12. Process for treatment, particularly for decontamination, of preferably
10 solid materials such as waste, particularly coming from the medical environment, disposed in a treatment enclosure subjected to the action of an ozonized gas produced by an ozone generator and eliminated by an ozone destroyer, wherein an accumulator of ozonized gas capable of establishing a closed circuit with the
15 ozone generator so as to enrich the ozonized gas with ozone is integrated between the treatment enclosure and the ozone generator.

13. Device for the treatment of waste materials substantially as herein described with reference to the accompanying drawings.

14. Process for the treatment of waste materials substantially as herein
20 described with reference to the accompanying drawings.

DATED: 21 January, 1997

25 PHILLIPS ORMONDE & FITZPATRICK

Attorneys for:

CARBA SOCIETE ANONYME



ABSTRACT

The invention relates to a device for the decontamination of waste of the type comprising a decontamination enclosure (5), an ozone generator (1) capable of feeding this enclosure (5) with ozonized gas, an ozone destroyer (16) capable of destroying the ozone of the ozonized gas contained in the decontamination enclosure (5).

The device according to the invention further includes an accumulator of ozonized gas (4) inserted between the ozone generator (1) and the decontamination enclosure (5), this accumulator (4) being capable of establishing with the ozone generator (1), via suitable pipes (22, 23, 24), a closed circuit so as rapidly to increase and vary the ozone concentration in the gas intended to circulate in the decontamination enclosure (5).

Application to the decontamination of medical waste.

Figure 1.

FIG. 1

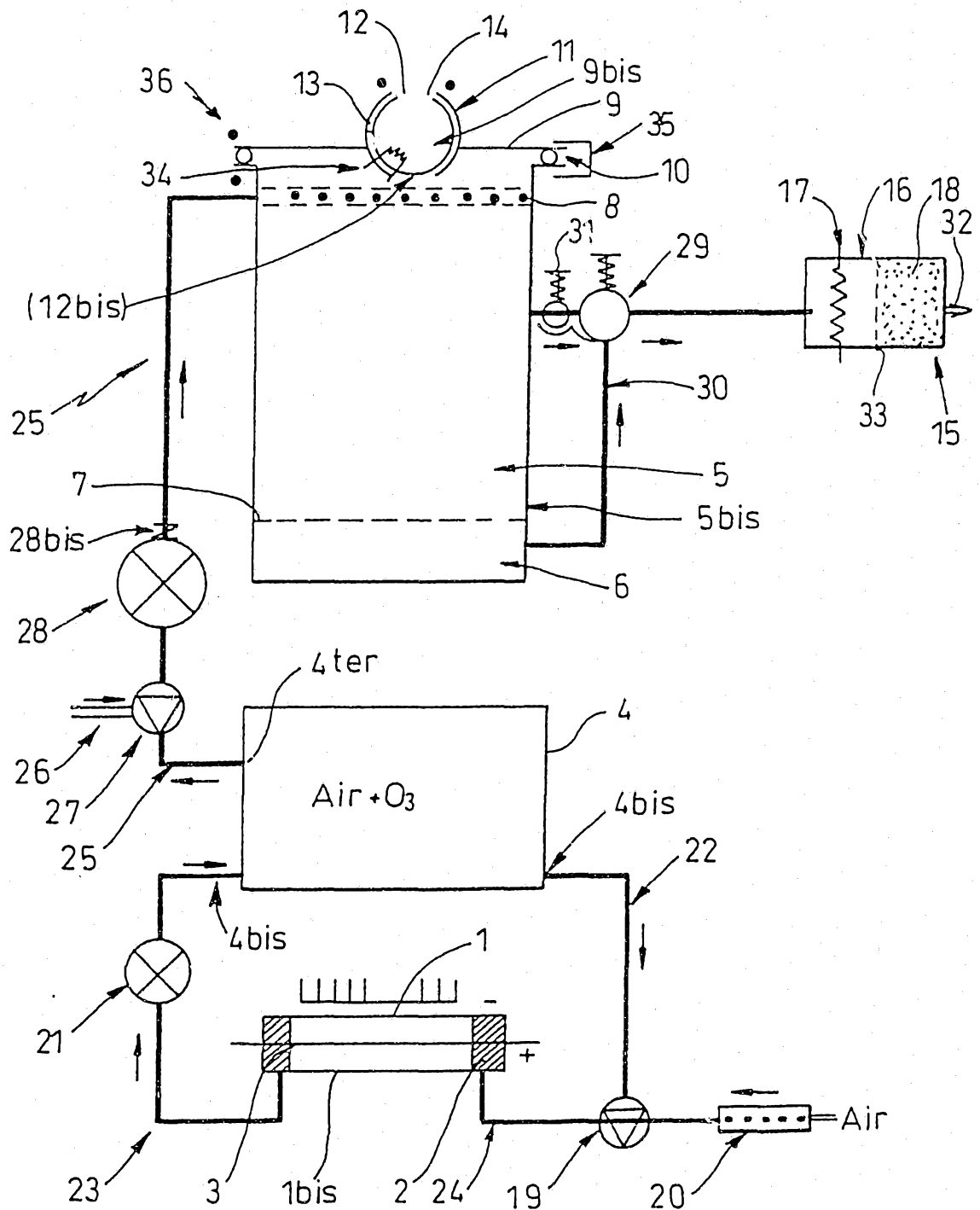


FIG. 2

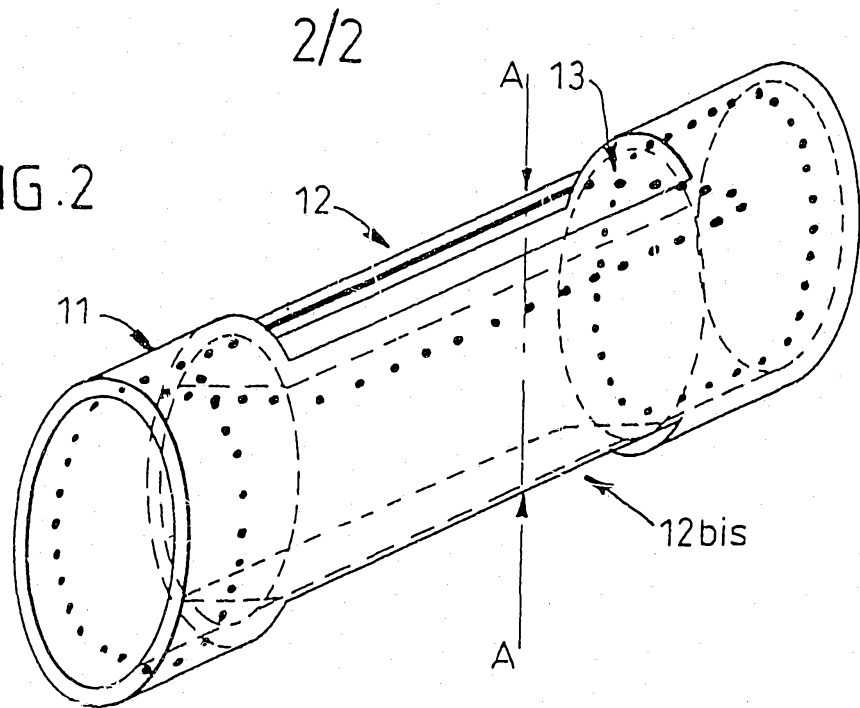
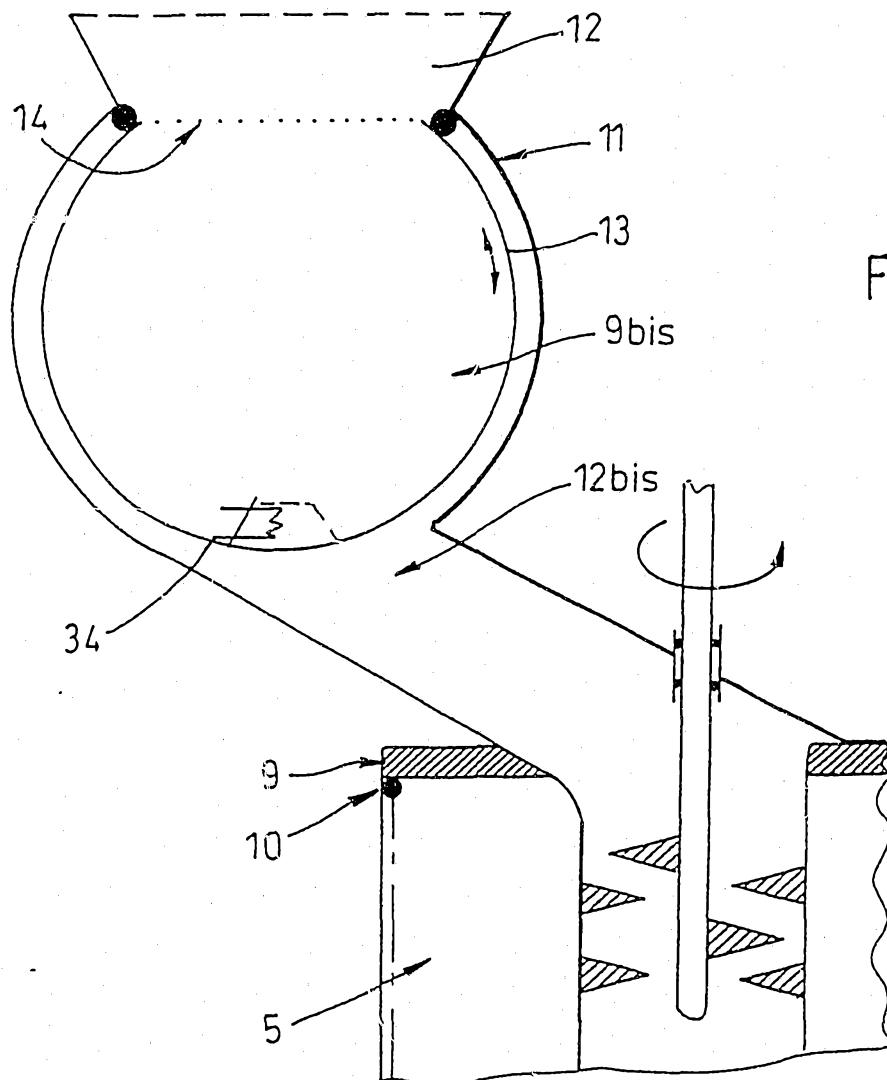


FIG. 3



INTERNATIONAL SEARCH REPORT

International Application No.
PCT/FR 93/00908

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 A61L11/00 A61L2/20

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 5 A61L

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 practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP,A,0 281 870 (S. MASUDA) 14 September 1988 see claims; figure 1 & FR,A,2 611 343 cited in the application ---	1
A	US,A,5 087 419 (G. LUTZ) 11 February 1992 ---	
A	US,A,4 156 652 (R. WIEST) 29 May 1979 -----	

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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- *A* document member of the same patent family

Date of the actual completion of the international search

19 November 1993

Date of mailing of the international search report

02.12.93

Name and mailing address of the ISA

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Fax (+31-70) 340-3016

Authorized officer

COUSINS-VAN STEEN, G

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/FR 93/00908

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A-0281870	14-09-88	JP-A- 1181869	19-07-89
		JP-A- 63209657	31-08-88
		JP-A- 1011553	17-01-89
		AU-B- 609777	09-05-91
		AU-A- 1212088	01-09-88
		DE-A- 3806230	08-09-88
		FR-A- 2611343	02-09-88
		GB-A, B 2201344	01-09-88
		US-A- 5120512	09-06-92

FR-A-2611343	02-09-88	JP-A- 1181869	19-07-89
		JP-A- 63209657	31-08-88
		JP-A- 1011553	17-01-89
		AU-B- 609777	09-05-91
		AU-A- 1212088	01-09-88
		DE-A- 3806230	08-09-88
		EP-A- 0281870	14-09-88
		GB-A, B 2201344	01-09-88
		US-A- 5120512	09-06-92

US-A-5087419	11-02-92	NONE	

US-A-4156652	29-05-79	NONE	

RAPPORT DE RECHERCHE INTERNATIONALE

Den . Internationale No

PCT/FR 93/00908

A. CLASSEMENT DE L'OBJET DE LA DEMANDE
CIB 5 A61L11/00 A61L2/20

Selon la classification internationale des brevets (CIB) ou à la fois selon la classification nationale et la CIB

B. DOMAINES SUR LESQUELS LA RECHERCHE A PORTE

Documentation minimale consultée (système de classification suivi des symboles de classement)

CIB 5 A61L

Documentation consultée autre que la documentation minimale dans la mesure où ces documents relèvent des domaines sur lesquels a porté la recherche

Base de données électronique consultée au cours de la recherche internationale (nom de la base de données, et si cela est réalisable, termes de recherche utilisés)

C. DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Identification des documents cités, avec, le cas échéant, l'indication des passages pertinents	no. des revendications visées
X	EP,A,0 281 870 (S. MASUDA) 14 Septembre 1988 voir revendications; figure 1 & FR,A,2 611 343 cité dans la demande	1
A	US,A,5 087 419 (G. LUTZ) 11 Février 1992	
A	US,A,4 156 652 (R. WIEST) 29 Mai 1979	

☐ Voir la suite du cadre C pour la fin de la liste des documents☒ Les documents de familles de brevets sont indiqués en abrégé

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A document qui fait partie de la même famille de brevets

Date à laquelle la recherche internationale a été officiellement achevée

19 Novembre 1993

Date d'expédition du présent rapport de recherche internationale

08.12.93

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RAPPORT DE RECHERCHE INTERNATIONALE

Renseignements relatifs aux membres de familles de brevets

Den. . Internationale No

PCT/FR 93/00908

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		DE-A- 3806230	08-09-88
		EP-A- 0281870	14-09-88
		GB-A, B 2201344	01-09-88
		US-A- 5120512	09-06-92

US-A-5087419	11-02-92	AUCUN	

US-A-4156652	29-05-79	AUCUN	
