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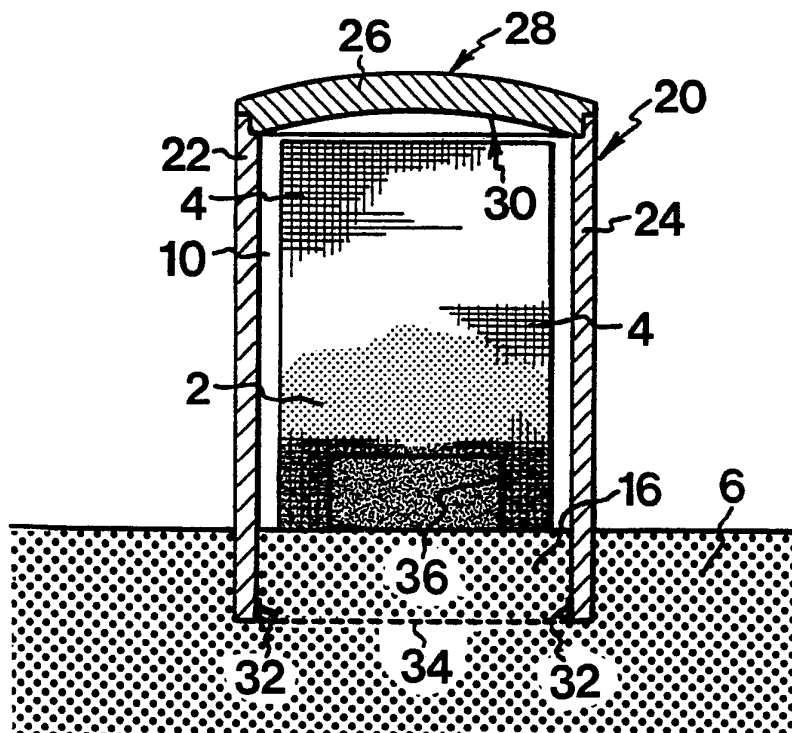
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Published*With international search report.**With amended claims.**In English translation (filed in Swedish).*

(54) Title: METHOD AND APPARATUS FOR COMPOSTING ORGANIC REFUSE



(57) Abstract

The present invention relates to a method and an apparatus for composting organic refuse containing animal domestic waste, use being only made of heat generated during the decomposition process. The apparatus comprises a heat-insulating, gas-tight casing (22, 24, 26). Further, there is provided a condensation and drainage zone (16) through which oxygen is conducted to the refuse by the action of a pressure difference produced between the interior of the casing and the ambient atmosphere, and to which liquid and reaction gases formed during the decomposition process are conducted.

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METHOD AND APPARATUS FOR COMPOSTING
ORGANIC REFUSE

The present invention relates to a method and an
5 apparatus for composting organic refuse, especially garden refuse and domestic waste.

Increasing amounts of waste and rising costs for waste management as well as an increasing insight into the necessity of economising on natural resources have in
10 recent years entailed a considerable need for technical solutions for easier management, storage and/or recovery of garden refuse and domestic waste.

A well-known method of dealing with the problem of waste management is to make a compost heap in which the
15 refuse waste is decomposed by microorganisms. For example, carbon dioxide and water are formed during the decomposition process. This method is quite satisfactory when it comes to garden refuse, but may give rise to sanitary problems if food waste becomes available to vermin which
20 may scatter the waste in the environment and contribute to spreading infectious diseases.

Known composting methods are usually based on isothermal principles, which means that a constant temperature is maintained in the refuse by supplying heat, e.g.
25 by means of a heater or hot air which is blown through the refuse by means of a fan. This principle is applied e.g. in industrial composting plants and in toilets in holiday houses.

DE-A1-3,736,889 discloses a method and an apparatus
30 in which the refuse is surrounded by heat-insulating surfaces. The apparatus operates in part according to the adiabatic principle. In accordance with this principle, there is no leakage of reaction heat from the microbial activity in the compost material into the ambient atmosphere. Moisture and gases formed during composting will
35 however diffuse through the heat-insulating surfaces, which are not vapourproof. By their unpleasant smell, the

gases may constitute a sanitary problem and also attract vermin, such as rats. To control the conditions in the compost material, use is made of different means for controlling the supply of oxygen, the temperature etc.

5 A simple composting device for use in gardens is disclosed in EP-A1-0,094,094, where the compost material is enclosed by a wire basket surrounded by a casing, and where heat is supplied externally by solar radiation on the casing of the composting device, thus heating the air
10 within the casing. Commercially available garden-type composting devices are essentially designed according to the principle described in EP-A1-0,094,094, i.e. the compost material is heated by the absorption of solar heat for increasing the temperature in the composting device.

15 The composting of domestic waste in an ordinary garden-type composting device however poses different problems, such as unpleasant odour, attraction of flies, etc. Another problem is that the composting device, because of cold or rain restricting the activity of the microorga-
20 nisms, will suffer from reduced efficiency, i.e. the waste is not decomposed or only slowly so. Ordinary composting devices also require a certain amount of attendance in that the compost material must be turned over at more or less regular intervals to increase the supply of oxygen
25 and/or watered when becoming dry as a result of excessive ventilation, which has the same adverse effect on the efficiency of the composting device as does cold or rain. Thus, the reliability of the composting device is considerably limited.

30 One object of the present invention is to provide a method for composting organic refuse, such as garden refuse and domestic waste, in a substantially odourless manner with a minimum of attendance.

35 Another object of the invention is to provide an apparatus for carrying out the inventive method, which primarily prevents emission of unpleasant smells.

The apparatus according to the invention should also be reliable in operation and so designed as to prevent the ingress of vermin in the compost material, while allowing worms to pass through to assist in the decomposition process and to spread the final compost material.

The use of the invention minimises the manual attendance/management of the compost material.

According to the present invention, these and other objects are achieved by means of a method for composting organic refuse containing animal domestic waste, in which use is only made of heat generated during the decomposition process, which method is characterised by the steps of enclosing the refuse in a heat-insulating, gas-tight casing, conducting oxygen to the refuse through a condensation and drainage zone by the action of a pressure difference produced between the interior of said casing and the ambient atmosphere, and conducting liquid and reaction gases formed during the decomposition process to said condensation and drainage zone.

For achieving the objects of the invention and carrying out the inventive method, there is further provided an apparatus for composting organic refuse containing animal domestic waste, in which use is only made of heat generated during the decomposition process, which apparatus is characterised by a heat-insulating, gas-tight casing containing said refuse, and a condensation and drainage zone through which oxygen is conducted to the refuse by the action of a pressure difference produced between the interior of the casing and the ambient atmosphere, and to which liquid and reaction gases produced during the decomposition process are conducted.

Further distinctive features of the invention will appear from the subclaims.

A preferred embodiment of the inventive apparatus will be described in more detail hereinafter with reference to the accompanying drawing.

Fig. 1 illustrates the principle of the present invention, and

Fig. 2 is a sectional view of a preferred embodiment of an inventive apparatus for composting organic refuse.

5 Fig. 1 illustrates the inventive method for composting organic refuse. Organic refuse 2 in the form of e.g. garden and domestic refuse is placed in an inner, gas- and water-permeable container, such as a wire basket 4. The basket 4 with the organic refuse 2 is placed on the ground
10 6. A heat-insulating, gas-tight casing 8 surrounds those sides of the refuse-containing basket 4 which do not make contact with the ground 6. Preferably, the casing 8 surrounds the basket 4 in spaced-apart relationship thereto, thus defining an air gap 10 between the basket and the
15 casing. To prevent surface water from leaking into the interior of the apparatus and to bring about an extended flow path of the ambient air which is supplied to the interior of the apparatus and which contains the oxygen necessary for the decomposition process, it is further
20 preferred to have the vertical boundary walls of the casing 8 extended into the ground 6 so as to terminate on a level below the ground surface.

The method according to the present invention permits decomposing the organic refuse without any external heat
25 supply, that is, use is only made of the heat which is generated during the decomposition process and which is retained by the vapourproof, heat-insulating casing 8. At the ground surface 6, there is then formed in the compost material a thermophilic zone 12 which, at a distance from
30 the ground 6, passes into a mesophilic zone 14. The thermophilic zone 12 has a temperature of 55-70°C, while the mesophilic zone 14 has a temperature of 35-45°C.

During the decomposition process, gases are generated and the air enclosed by the casing is heated to about
35 35°C, this giving rise to a pressure difference between the interior of the apparatus and the ambient atmosphere, which in turn produces an air flow from the ambient atmos-

phere, through the ground 6 and into the interior of the apparatus, which is illustrated in Fig. 1 by an arrow A. Since the ground section has no insulation, it will always have a lower temperature than the other inner boundary surfaces of the apparatus. This means that moisture inside the apparatus will condense in the ground 6, serving as a condensation and drainage zone 16. Since the vertical boundary surfaces of the casing are extended into the ground, the ambient air flowing into the interior of the apparatus will have an extended flow path through the ground 6, which is advantageous especially in winter, since the air is preheated to some extent when passing through the ground 6. Thanks to the air gap existing between the inner container 4 and the inner wall surface of the casing 8, the gases are free to circulate in the apparatus and liquid that may have condensed on the inner walls of the casing can drain off along these walls down to the condensation and drainage zone 16. Since the apparatus in its area making contact with the ground 6 is not closed, worms and certain insects can enter into the interior of the apparatus in order to affect the decomposition process and also to carry away a considerable part of the compost material, which means longer intervals between emptying operations.

Fig. 2 shows a preferred embodiment of an apparatus according to the invention for composting organic refuse, such as garden and domestic refuse. Since the preferred apparatus 20 is similar to the apparatus referred to when describing the inventive method, like parts have like reference numerals.

The preferred apparatus 20 has an inner, gas- and liquid-permeable container which here is an open-top wire basket 4. Vertical walls 22, 24 surround the wire basket 4 in spaced-apart relationship thereto. The vertical walls 22 and 24 extend into the ground and up to a level above the top opening of the wire basket. At the top, the apparatus 20 is closed by a vapourproof, heat-insulating cover

26, preferably having a convex upper side 28, such that precipitation in the form of rain or snow will drain or slide off the cover, and a concave underside 30, such that water condensed thereon will drain off along it towards the vertical walls and along these down to the condensation and drainage zone 16 in the ground 6. In an apparatus dimensioned for an average-size household, the cover 28 is openable. Thus, the top opening of the wire basket 4 permits placing garden and/or domestic refuse in the wire basket. For an average-size household, a suitable volume of the apparatus 20 is 200-300 l. The connection between the cover and the side walls is hermetically sealing to achieve the intended technical effect. Different techniques for achieving this are known in the art and will therefore not be described in more detail here. Between the lower ends, embedded in the ground, of the vertical walls 22, 24, there is disposed a netting 34, a grating or the like, allowing the passage of liquid and gas and also allowing the ingress of worms and certain insects, whereas not of rodents, such as mice and rats.

The inventive apparatus may in practice have any desired shape, i.e. the casing can be rectangular, conical, prismatic or cylindrical. From aesthetic and production-engineering points of view, it is however preferred to make the casing and also the wire basket cylindrical, numerals 22 and 24 designating the sectional areas of a single casing.

Before mounting the inventive apparatus, a hole is dug in the ground 6, which, for a cylindrical design of the apparatus, has a diameter exceeding the diameter thereof. An apparatus dimensioned for an average-size household is suitably embedded 100-200 mm below the ground surface, whereby surface water will be prevented from entering the apparatus. In a cylindrical apparatus, the vertical walls consist of a single piece which is bent into a cylindrical shape, whereupon the vertical edges are connected to each other. If required, the resulting joint

may also be sealed by welding and/or by means of a sealing compound placed in the joint. In the hole dug in the ground, there is placed a circular net 34 which is connected along its periphery to the lower end 32 of the casing. The apparatus is then filled, depending on the nature of the ground, with the excavated soil or with a mixture of the excavated soil and expanded clay up to a level corresponding to the surrounding ground level. The hole is filled also outside the apparatus, and for improved water runoff, the ground surface in the immediate vicinity of the outer walls of the apparatus is given a slight slope with respect to the horizontal plane, such that any surface water will drain off in a direction away from the apparatus. Finally, the vapourproof, heat-insulating cover is disposed in a hermetically sealing manner on the top opening of the casing.

For emptying the apparatus, this is preferably provided with a closable opening (not shown) which is arranged just above ground level and which through a corresponding opening 36 in the wire basket provides access to the compost material ready for use. Alternatively, the ground surrounding the apparatus is excavated and the connection between the outer casing and the net 34 fixed to the bottom thereof is undone, whereupon the outer casing is lifted to provide access to the compost material.

The vapourproof, heat-insulating casing, the wire basket and the net can be made of different suitable materials. The casing 22, 24, 26 can be designed as a sandwich construction with a vapourproof, corrosion-resistant surface layer of e.g. aluminium, combined with a heat-insulating cellular plastic material, such as expanded polyethylene. It is also possible to use other types of expanded plastic with closed cells, forming a hard surface layer in the manufacture. Alternatively, this surface layer may also be reinforced with e.g. glass-fibre-reinforced polyester. In an apparatus dimensioned for an average-size household, the thickness of the insulating

material is 10-100 mm, preferably 20-50 mm. The wire basket and the net arranged at the bottom of the apparatus are preferably made of a corrosion-resistant material, such as galvanised iron, stainless steel, aluminium or the like.

The invention thus provides a method and an apparatus for composting organic refuse, such as garden and domestic refuse, which by an adiabatic decomposition process in which additional heat energy need not be supplied thanks to the use of internally generated heat, requires minimum attendance and maintenance. By providing a condensation and drainage zone associated with the interior of the apparatus, where the decomposition process occurs, there are no emissions of odious gases, which are filtered in the ground. The apparatus of the invention further prevents the ingress of vermin, such as rats, whereas worms and insects participating in the decomposition process and spreading the compost material, will have access to the interior of the apparatus through the net disposed at the bottom thereof.

It is understood that other means and modifications for achieving the same technical effect are obvious to anyone skilled in the art. Such means and modifications, which fall within the scope of the inventive concept should therefore be considered to be comprised by the claimed scope of protection. The embodiment described above is only an example of the present invention and should in no way be considered restrictive of the claimed scope of protection.

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CLAIMS

1. A method for composting organic refuse containing
5 animal domestic waste, in which use is only made of heat
generated during the decomposition process, c h a r -
a c t e r i s e d by the steps of enclosing the refuse
in a heat-insulating, gas-tight casing (8), conducting
10 oxygen to the refuse through a condensation and drainage
zone (16) by the action of a pressure difference produced
between the interior of said casing (8) and the ambient
atmosphere, and conducting liquid and reaction gases
formed during the decomposition process to said condensa-
tion and drainage zone (16).

15 2. Method as claimed in claim 1, c h a r a c -
t e r i s e d by the steps of providing an inner, gas-
and liquid-permeable container (4) which accommodates the
organic refuse and which in spaced-apart relationship is
almost completely enclosed by said gas-tight casing (8),
20 disposing said inner container (4) on said condensation
and drainage zone (16), embedding part of the heat-insu-
lating, gas-tight casing (8) in said condensation and
drainage zone (16), and using as condensation and drain-
age zone (16) an existing layer of soil or a mixture of
25 soil and expanded clay or sand.

3. Apparatus for composting organic refuse containing
animal domestic waste, in which use is only made of heat
generated during the decomposition process, c h a r a c -
t e r i s e d by a heat-insulating, gas-tight casing (8,
30 22, 24, 26) containing said refuse, and a condensation and
drainage zone (16) through which oxygen is conducted to
the refuse by the action of a pressure difference produced
between the interior of the casing (8, 22, 24, 26) and the
ambient atmosphere, and to which liquid and reaction gases
35 produced during the decomposition process are conducted.

4. Apparatus as claimed in claim 3, c h a r a c -
t e r i s e d in that the vertical part (22, 24) of the
casing is partly embedded in the condensation and drainage
zone (16), and that the upper end of said vertical part
5 (22, 24) is located on a level above the upper boundary
plane of the inner container (4).

5. Apparatus as claimed in claim 4, c h a r a c -
t e r i s e d in that the lower end (32) of the vertical
part (22, 24) is connected to a means (34) allowing the
10 passage of gas, liquid and worms, while preventing the
ingress of large vermin.

6. Apparatus as claimed in any one of claims 3-5,
c h a r a c t e r i s e d by an inner container (4)
which in spaced-apart relationship is almost completely
15 enclosed by the gas-tight casing (8, 22, 24, 26) and
which is adapted to accommodate the refuse and disposed
on said condensation and drainage zone (16).

7. Apparatus as claimed in any one of claims 4-6,
c h a r a c t e r i s e d in that an upper opening in the
20 casing is hermetically sealed by a vapour-proof, heat-
insulating cover (26) whose outside (28) is so designed
that precipitation will drain off along it and whose
inside (30) is so designed that liquid condensed thereon
will drain off towards said vertical part (22, 24) and
25 drop on to said condensation and drainage zone (16).

8. Apparatus as claimed in any one of claims 3-7,
c h a r a c t e r i s e d by a gas-tight, closable open-
ing provided in the casing above the condensation and
drainage zone (16), and an opening (36) arranged in the
30 inner container (4), said openings allowing access to the
interior of the apparatus.

9. Apparatus as claimed in any one of claims 3-8,
c h a r a c t e r i s e d in that the condensation and
drainage zone (16) is an existing soil layer.

35 10. Apparatus as claimed in any one of claims 3-8,
c h a r a c t e r i s e d in that the condensation and
drainage zone (16) is a mixture of soil and expanded clay
or sand.

AMENDED CLAIMS

[received by the International Bureau on 8 May 1991 (08.05.91);
original claims 1-10 replaced by amended claims 1-10 (3 pages)]

1. A method for composting organic refuse, such as
5 garden refuse and domestic waste, the refuse being
enclosed in a heat-insulating casing, c h a r a c -
t e r i s e d by the steps of only using heat generated
during the decomposition process, enclosing the refuse in
a gas-tight casing (8), conducting oxygen to the refuse
10 through a condensation and drainage zone (16) by the
action of a pressure difference produced between the
interior of said casing (8) and the ambient atmosphere,
and conducting liquid and reaction gases formed during
the decomposition process to said condensation and drain-
15 age zone (16).

2. Method as claimed in claim 1, c h a r a c -
t e r i s e d by the steps of providing an inner, gas-
and liquid-permeable container (4) which accommodates the
organic refuse and which in spaced-apart relationship is
20 almost completely enclosed by said gas-tight casing (8),
disposing said inner container (4) on said condensation
and drainage zone (16), embedding part of the heat-insu-
lating, gas-tight casing (8) in said condensation and
drainage zone (16), and using as condensation and drain-
25 age zone (16) an existing layer of soil or a mixture of
soil and expanded clay or sand.

3. Apparatus for composting organic refuse, such as
garden refuse and domestic waste, the refuse being enclos-
ed in a heat-insulating casing, c h a r a c t e r i s -
30 e d in that use is only made of heat generated during the
decomposition process, that the refuse is enclosed in a
gas-tight casing (8, 22, 24, 26), and that there is pro-
vided a condensation and drainage zone (16) through which
oxygen is conducted to the refuse by the action of a pres-
35 sure difference produced between the interior of the cas-
ing (8, 22, 24, 26) and the ambient atmosphere, and to

which liquid and reaction gases produced during the decomposition process are conducted.

4. Apparatus as claimed in claim 3, characterised in that the vertical part (22, 24) of the casing is partly embedded in the condensation and drainage zone (16), and that the upper end of said vertical part (22, 24) is located on a level above the upper boundary plane of the inner container (4).

5. Apparatus as claimed in claim 4, characterised in that the lower end (32) of the vertical part (22, 24) is connected to a means (34) allowing the passage of gas, liquid and worms, while preventing the ingress of large vermin.

6. Apparatus as claimed in any one of claims 3-5, characterised by an inner container (4) which in spaced-apart relationship is almost completely enclosed by the gas-tight casing (8, 22, 24, 26) and which is adapted to accommodate the refuse and disposed on said condensation and drainage zone (16).

7. Apparatus as claimed in any one of claims 4-6, characterised in that an upper opening in the casing is hermetically sealed by a vapour-proof, heat-insulating cover (26) whose outside (28) is so designed that precipitation will drain off along it and whose inside (30) is so designed that liquid condensed thereon will drain off towards said vertical part (22, 24) and drop on to said condensation and drainage zone (16).

8. Apparatus as claimed in any one of claims 3-7, characterised by a gas-tight, closable opening provided in the casing above the condensation and drainage zone (16), and an opening (36) arranged in the inner container (4), said openings allowing access to the interior of the apparatus.

9. Apparatus as claimed in any one of claims 3-8, characterised in that the condensation and drainage zone (16) is an existing soil layer.

10. Apparatus as claimed in any one of claims 3-8,
c h a r a c t e r i s e d in that the condensation and
drainage zone (16) is a mixture of soil and expanded clay
or sand.

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FIG. 1

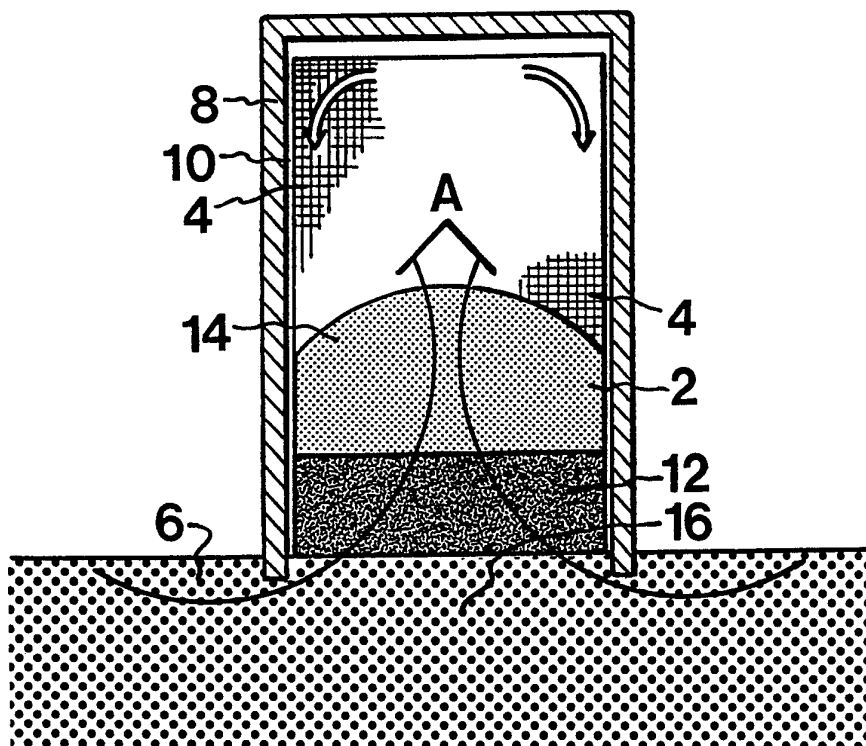
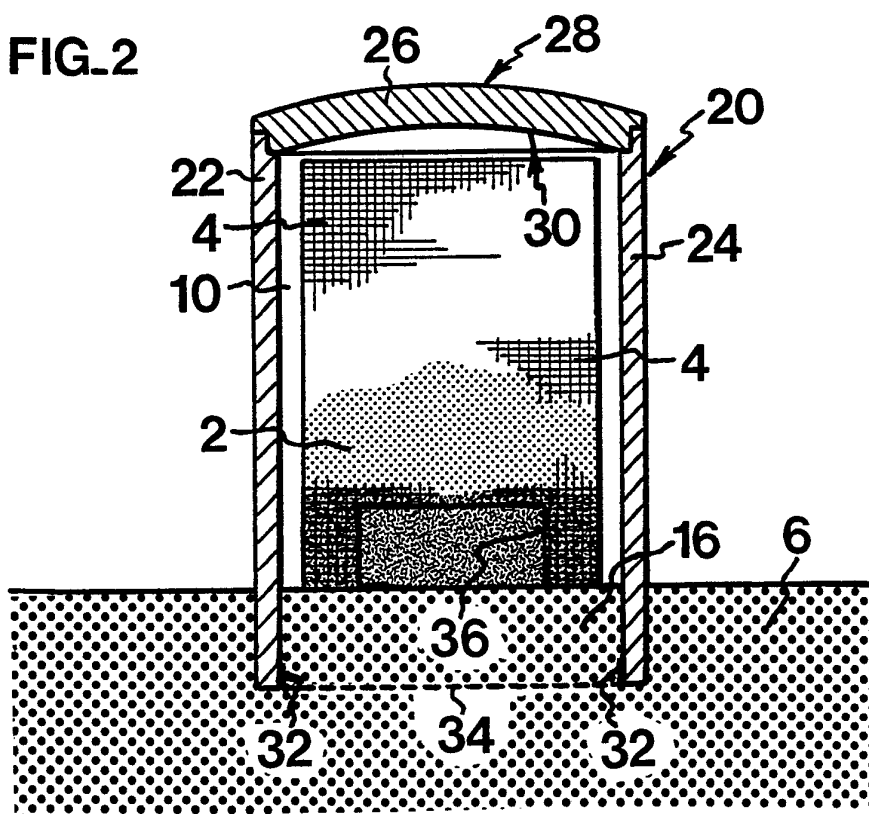


FIG. 2



SUBSTITUTE SHEET

INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 90/00872

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) ⁶ According to International Patent Classification (IPC) or to both National Classification and IPC IPC5: C 05 F 17/00, 17/02																	
II. FIELDS SEARCHED Minimum Documentation Searched⁷ <table style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%; border-bottom: 1px solid black;">Classification System</th> <th style="border-bottom: 1px solid black;">Classification Symbols</th> </tr> <tr> <td style="padding: 5px;">IPC5</td> <td style="padding: 5px;">C 05 F</td> </tr> </table> Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in Fields Searched⁸ SE,DK,FI,NO classes as above			Classification System	Classification Symbols	IPC5	C 05 F											
Classification System	Classification Symbols																
IPC5	C 05 F																
III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹ <table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 10%; padding: 5px;">Category *</th> <th style="width: 60%; padding: 5px;">Citation of Document,¹¹ with indication, where appropriate, of the relevant passages¹²</th> <th style="width: 30%; padding: 5px;">Relevant to Claim No.¹³</th> </tr> </thead> <tbody> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, C1, 3430761 (DÖRING, ERICH) 23 January 1986, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,3</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, C1, 3217725 (DÖRING, ERICH) 21 April 1983, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,2,3</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, A1, 3736889 (PHILIPP, JÜRGEN) 1 June 1988, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,3</td> </tr> <tr> <td style="text-align: center; vertical-align: top; padding: 5px;">A</td> <td style="padding: 5px;">DE, A1, 3802499 (NEUMANN, GEORG) 1 December 1988, see the whole document --</td> <td style="text-align: center; vertical-align: top; padding: 5px;">1,3</td> </tr> </tbody> </table>			Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³	A	DE, C1, 3430761 (DÖRING, ERICH) 23 January 1986, see the whole document --	1,3	A	DE, C1, 3217725 (DÖRING, ERICH) 21 April 1983, see the whole document --	1,2,3	A	DE, A1, 3736889 (PHILIPP, JÜRGEN) 1 June 1988, see the whole document --	1,3	A	DE, A1, 3802499 (NEUMANN, GEORG) 1 December 1988, see the whole document --	1,3
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A	DE, A1, 3802499 (NEUMANN, GEORG) 1 December 1988, see the whole document --	1,3															
* Special categories of cited documents:¹⁰ "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art. "&" document member of the same patent family																	
IV. CERTIFICATION <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;"> Date of the Actual Completion of the International Search 8th April 1991 </td> <td style="width: 50%; padding: 5px;"> Date of Mailing of this International Search Report 1991 -04- 11 </td> </tr> <tr> <td style="width: 50%; padding: 5px;"> International Searching Authority SWEDISH PATENT OFFICE </td> <td style="width: 50%; padding: 5px;"> Signature of Authorized Officer Bo Bergström </td> </tr> </table>			Date of the Actual Completion of the International Search 8th April 1991	Date of Mailing of this International Search Report 1991 -04- 11	International Searching Authority SWEDISH PATENT OFFICE	Signature of Authorized Officer Bo Bergström											
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International Searching Authority SWEDISH PATENT OFFICE	Signature of Authorized Officer Bo Bergström																

III. DOCUMENTS CONSIDERED TO BE RELEVANT (CONTINUED FROM THE SECOND SHEET)		
Category *	Citation of Document, with indication, where appropriate, of the relevant passages	Relevant to Claim No
A	DE, C2, 3019253 (DÖRING, ERICH) 26 August 1982, see the whole document --	1,2,3
A	AT, A, 358606 (WIENER BRÜCKENBAU- U. EISENKONSTRUKTIONS-AKTIENGESSELLSCHAFT) 25 September 1980, see claim 4 --	1,3
A	CH, A5, 589014 (HERMAN GÜTLIN) 30 June 1977, see the whole document -- -----	1

ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 90/00872

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report.
The members are as contained in the Swedish Patent Office EDP file on 91-02-28
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