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(54) **Climate control machine structure**

(57) A climate control machine structure (10), comprising a cabinet (11) with heat exchange means (12) below which there are one or more fans (13) which are adapted to propel the treated air into the space under a raised floor (14); the heat exchange means extend diagonally within the cabinet, and have a front face (22) which is adapted to be crossed by the air flow; the heat exchange means (12) are associated with air filtering

means; at the upper edge (19) of the heat exchange means (12) there is a masking element (23) on which an opening (24) is provided which defines an auxiliary air flow through the upper face (25) of the heat exchange means (12). The air filtering means comprise a first filtering panel (26) for the front face (22) of the heat exchange means (12), and a second filtering panel (27) for the opening (24) in the masking element (23).

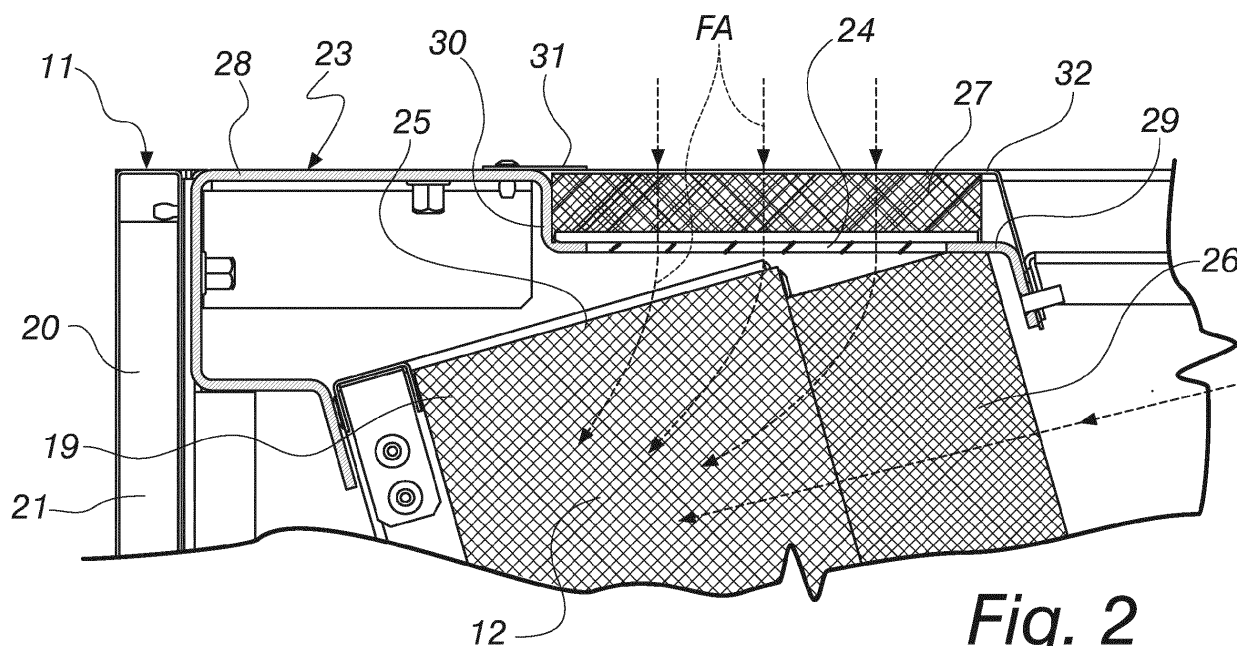


Fig. 2

Description

[0001] The present invention relates to a climate control machine structure.

[0002] Server rooms, and in general any site that contains numerous electronic devices and racks for supporting a plurality of servers, electrical and electronic instruments and the like, generally enclosed within adapted ventilated cabinets, require continuous climate control that is adapted to prevent the heat originating from the computers and from the electronic instruments themselves from accumulating and thus determining temperatures that are so high as to damage the internal components of such electronic instruments and the like.

[0003] Nowadays, in order to overcome these drawbacks, floor climate control plants are generally installed in server rooms, and are increasingly widespread particularly in environments installed on a raised floor.

[0004] In fact the space between the ground and the raised floor can be easily fitted out not only for the distribution of cables for connecting and powering the racks and computers, but also as a plenum space, i.e. as an area for the passage of conditioned air, fed in by one or more cooling and climate control machines, such plenum spaces conveying the air, by way of floor grilles, either to the overlying environment or directly into the rack cabinets.

[0005] Machines for such climate control are generally constituted by a cabinet within which heat exchange means are arranged below which there are, generally arranged, in whole or in part, below the raised floor, one or more fans which are designed to aspirate air from the upper part of the cabinet so that it crosses the heat exchange means and is then pushed, treated, into the underfloor space.

[0006] The heat exchange means are generally comprised of a bank of finned tubes which is arranged diagonally within the cabinet, with the lower edge proximate to the lower part of first, front, panels of the cabinet, and with the upper edge proximate to the upper part of second opposite, rear, panels of the cabinet.

[0007] The air aspirated before crossing the heat exchange means must be filtered, in order to prevent the deterioration of the heat exchange owing to the progressive fouling of the exchange surfaces.

[0008] In order to achieve the maximum heat exchange by the exchange means, and at the same time optimize the filtering, nowadays the aspirated air is passed through the front surface only, i.e. the surface with the largest area, of the exchange means, i.e. the surface defined by the height of the exchange means, starting from below and going upward, multiplied by the length of the exchange means, in the horizontal direction in the configuration for use, such front surface being entirely covered by a filtering panel, which is arranged thereupon.

[0009] Such solution, although widespread, results in the upper part of the heat exchange bank being partially penalized, since it is farther from the aspirating fan and

is marginally crossed by the air or not at all, with consequent corresponding reduction of the efficiency of the heat exchange means.

[0010] An alternative solution involves keeping the upper surface of the exchange means open as well, which is defined substantially by the thickness of the heat exchange means multiplied by the horizontal length.

[0011] The goal in such case is to recover the flow of air in that area as well, but by adopting a filter arranged horizontally in the upper part of the cabinet, above the heat exchange means.

[0012] The filtering surface of such horizontal filter is much smaller than the filtering surface of the filtering panel arranged to affect all of the front surface, and as a consequence such horizontal filter is much less efficient.

[0013] The first solution seeks to compensate for the problem of load losses, but it does not manage to solve the problem of unevenness of the air flow, which owing to construction requirements is substantially vertical and, for this reason, is throttled by the exchange means, which are oblique with respect to the substantially vertical direction of the air flow, in an uneven manner, as noted.

[0014] The second solution improves the problem of uniformity of the air flow through the exchange means but it does not solve the problems of filtering and load loss, owing to a filter which is much smaller than in the first solution.

[0015] The aim of the present invention is to provide a climate control machine structure that is capable of overcoming the above-mentioned drawbacks of conventional machines.

[0016] Within this aim, an object of the invention is to provide a climate control machine structure that is capable of maximizing the filtering surface and at the same time rendering the air flow over the heat exchange means more uniform.

[0017] Another object of the invention is to provide a climate control machine structure with increased maximum cooling capacity and sensible capacity, with reduction of the latent cooling capacity, under the same surrounding conditions as in conventional similar machines.

[0018] Another object of the invention is to provide a climate control machine structure which can be produced using known systems and technologies.

[0019] This aim and these and other objects which will become more evident hereinafter are achieved by a climate control machine structure of the type comprising a cabinet inside which there are heat exchange means below which there are one or more fans adapted to draw air from the upper part of the cabinet so that it passes through the heat exchange means to then propel it, once treated, into the space below a raised floor, said heat exchange means extending substantially diagonally inside the cabinet, with the lower edge proximate to the lower part of first, front, panels of the cabinet, and with the upper edge proximate to the upper part of second, rear, opposite panels of the cabinet, said heat exchange means having a front face designed to be crossed by the

air flow, air filtering means being associated with said heat exchange means, said climate control machine structure being **characterized in that** a masking element is present at the upper edge of said heat exchange means and extends above said upper edge and along its entire length horizontally, an opening being provided on said masking element and forming an auxiliary air flow through the upper face of the heat exchange means, said air filtering means comprising a first filtering panel which is arranged so as to affect the front face of said heat exchange means, and a second filtering panel which is arranged so as to affect said opening on said masking element and is designed to throttle said auxiliary air flow.

[0020] Further characteristics and advantages of the invention will become more apparent from the description of a preferred, but not exclusive, embodiment of the climate control machine structure according to the invention, which is illustrated by way of non-limiting example in the accompanying drawings wherein:

Figure 1 is a schematic sectional side view of a machine structure according to the invention;

Figure 2 is a detail of Figure 1.

[0021] With reference to the figures, a climate control machine structure according to the invention is generally designated with the reference numeral 10.

[0022] Such climate control machine structure 10 is of the type comprising a cabinet 11 inside which there are heat exchange means 12 below which there are one or more fans 13 adapted to draw air from the upper part of the cabinet 11 so that it passes through the heat exchange means 12 and then propel it, once treated, into the space below a raised floor 14.

[0023] The heat exchange means 12 extend substantially diagonally within the cabinet 11, with the lower edge 16 proximate to the lower part 17 of first, front, panels 18 of the cabinet, and with the upper edge 19 proximate to the upper part 20 of second opposite, rear, panels 21 of the cabinet 1.

[0024] The heat exchange means 12 are constituted, for example, by a bank of finned tubes.

[0025] Such exchange means 12 have a front face 22, i.e. the larger face, the surface of which is determined by the height of the exchange bank, i.e. substantially the distance from the lower edge 16 to the upper edge 19, multiplied by its horizontal length in the configuration for use, the front face 22 being adapted to be crossed by the main air flow FP.

[0026] The heat exchange means 12 are associated with air filtering means.

[0027] The particularity of the climate control machine structure 10 according to the invention is that at the upper edge 19 of the heat exchange means 12 there is a masking element 23 which extends above the upper edge 19 and along its entire horizontal length.

[0028] Such masking element 23 is clearly visible in Figure 2.

[0029] In such masking element 23 there is an opening 24 which forms an auxiliary air flow FA through the upper face 25 of the heat exchange means 12.

[0030] Such opening 24, which enables the flow of air through the upper face 25 of the heat exchange means 12, is not present in conventional climate control machines, in which as said previously, the air flow passes only and exclusively through the front face of the heat exchange means.

[0031] Such opening 24 and such auxiliary flow FA determine an overall increase and an equilibrium of the air flow in the whole bank of exchange tubes, with consequent increase of the maximum cooling capacity and of the sensible capacity of the machine structure 10.

[0032] The air filtering means comprise a first filtering panel 26 which is arranged so as to affect the front face 22 of the heat exchange means 12, and a second filtering panel 27 which is arranged so as to affect the opening 24 in the masking element 23, and is designed to throttle the auxiliary air flow FA.

[0033] The second filtering panel 27 cooperates in maximizing the filtering surface.

[0034] The first filtering panel 26 and second filtering panel 27 are understood to be made with conventional materials.

[0035] The masking element 23 is made, for example, of folded metal plate, and has an angular portion 28 for fixing within the cabinet 11, and a flat portion 29 in which the opening 24 is defined.

[0036] The second filtering panel 27 is arranged so as to rest against a step 30 which is defined between the angular portion 28 and the flat portion 29, and is kept in position by corresponding locking plates 31, 32.

[0037] In practice it has been found that the invention fully achieves the intended aim and objects.

[0038] In particular, with the invention a climate control machine structure is provided which is capable of maximizing the filtering surface and at the same time rendering the air flow over the heat exchange means more uniform.

[0039] What is more, with the invention a climate control machine structure is provided with increased maximum cooling capacity and sensible capacity, with reduction of the latent cooling capacity, under the same surrounding conditions as for conventional similar machines.

[0040] In addition, with the invention a supporting structure for a climate control machine is provided which can be produced using known systems and technologies.

[0041] The invention, thus conceived, is susceptible of numerous modifications and variations, all of which are within the scope of the appended claims. Moreover, all the details may be substituted by other, technically equivalent elements.

[0042] In practice the materials employed, and the contingent dimensions and shapes, may be any according to requirements and to the state of the art.

[0043] The disclosures in Italian Patent Application No.

PD2011A000347 from which this application claims priority are incorporated herein by reference.

[0044] Where the technical features mentioned in any claim are followed by reference numerals and/or signs, those reference numerals and/or signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly, such reference numerals and/or signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference numerals and/or signs.

Claims

1. A climate control machine structure (10) of the type comprising a cabinet (11) inside which there are heat exchange means (12) below which there are one or more fans (13) adapted to draw air from the upper part of the cabinet (11) so that it passes through the heat exchange means to then propel it, once treated, into the space below a raised floor (14), said heat exchange means extending substantially diagonally inside the cabinet, with the lower edge (16) proximate to the lower part (17) of first, front, panels (18) of the cabinet, and with the upper edge (19) proximate to the upper part (20) of second, rear, opposite panels (21) of the cabinet, said heat exchange means (12) having a front face (22) designed to be crossed by the air flow, air filtering means being associated with said heat exchange means (12), said climate control machine structure being **characterized in that** a masking element (23) is present at the upper edge (19) of said heat exchange means (12) and extends horizontally above said upper edge (19) and along its entire length, an opening (24) being provided on said masking element (23) and forming an auxiliary air flow (FA) through the upper face (25) of the heat exchange means (12), said air filtering means comprising a first filtering panel (26) which is arranged so as to affect the front face (22) of said heat exchange means (12), and a second filtering panel (27) which is arranged so as to affect said opening (24) on said masking element (23) and is designed to throttle said auxiliary air flow (FA).
2. The structure according to claim 1, **characterized in that** said masking element (23) is made of folded sheet metal and has an angular portion (28) for fixing within the cabinet (11) and a flat portion (29) in which said opening (24) is formed.
3. The structure according to one or more of the preceding claims, **characterized in that** said second filtering panel (27) is arranged so as to rest against a step (30) that is formed between said angular portion (28) and said flat portion (29) and is kept in position by corresponding locking plates (31, 32).

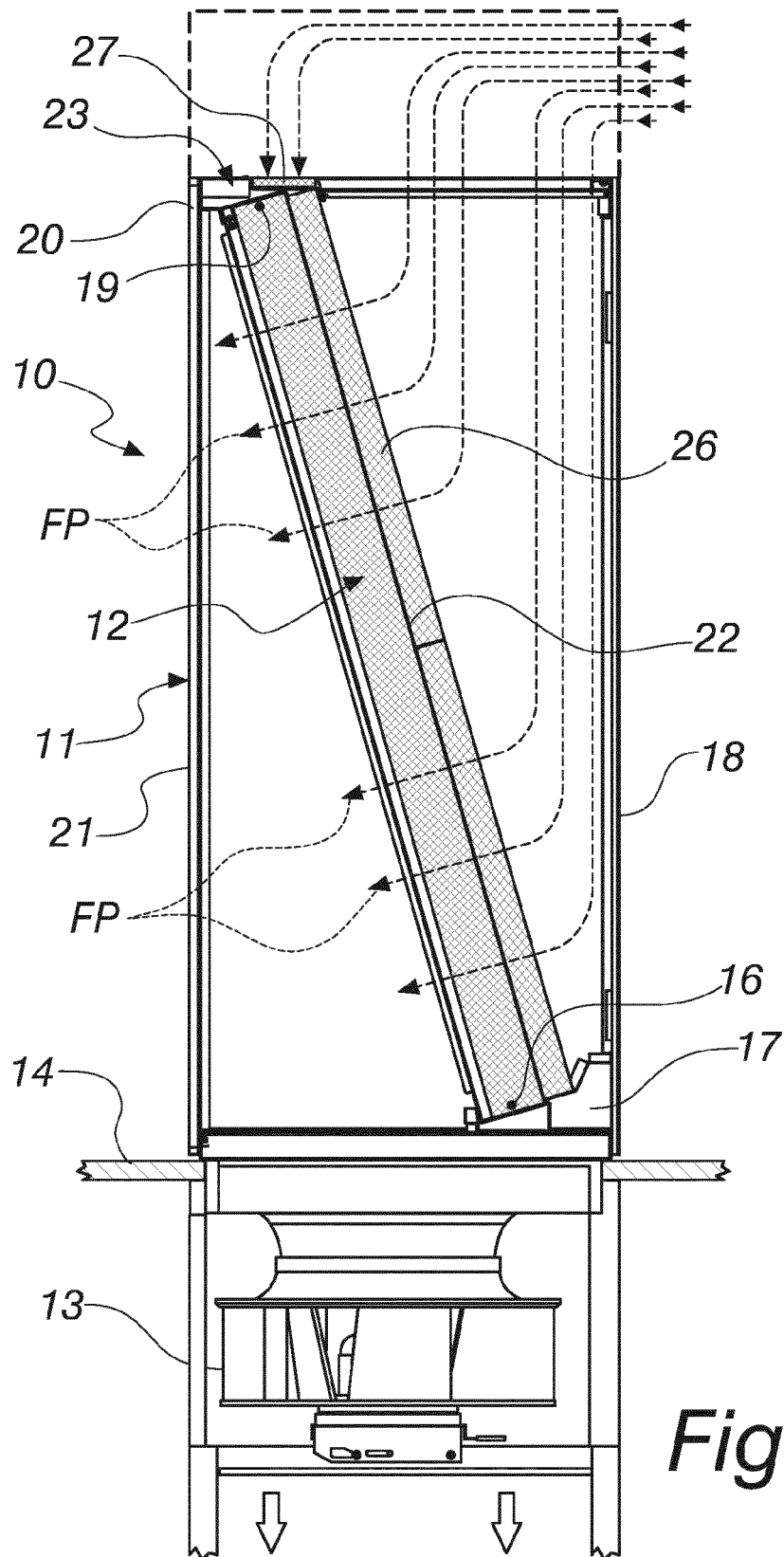


Fig. 1

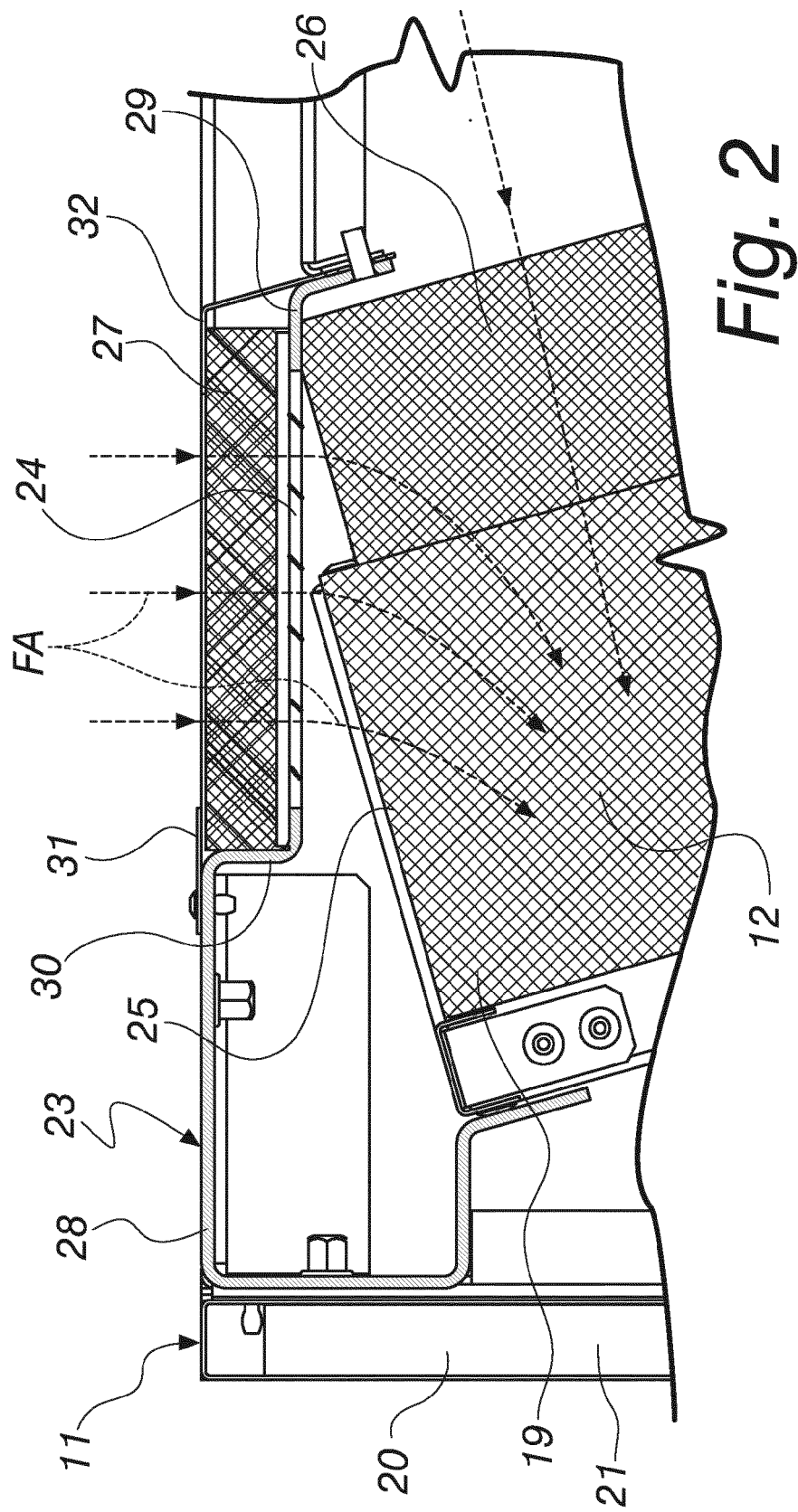


Fig. 2



EUROPEAN SEARCH REPORT

Application Number
EP 12 19 0540

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	EP 2 226 701 A1 (RITTAL GMBH & CO KG [DE]) 8 September 2010 (2010-09-08) * the whole document *	1-3	INV. F24F1/00 F24F3/044 F24F3/16 F24F13/28 F24F13/30
A	US 7 540 320 B1 (SEMME THOMAS MIDDLETON [US]) 2 June 2009 (2009-06-02) * the whole document *	1-3	
A	EP 1 571 402 A1 (LTG AG [DE]) 7 September 2005 (2005-09-07) * abstract *	1-3	
A	US 2008/160902 A1 (DESLER JOERG [US]) 3 July 2008 (2008-07-03) * abstract *	1-3	
			TECHNICAL FIELDS SEARCHED (IPC)
			F24F H05K
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 27 February 2013	Examiner Valenza, Davide
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**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 12 19 0540

This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report.
The members are as contained in the European Patent Office EDP file on
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27-02-2013

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

REFERENCES CITED IN THE DESCRIPTION

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