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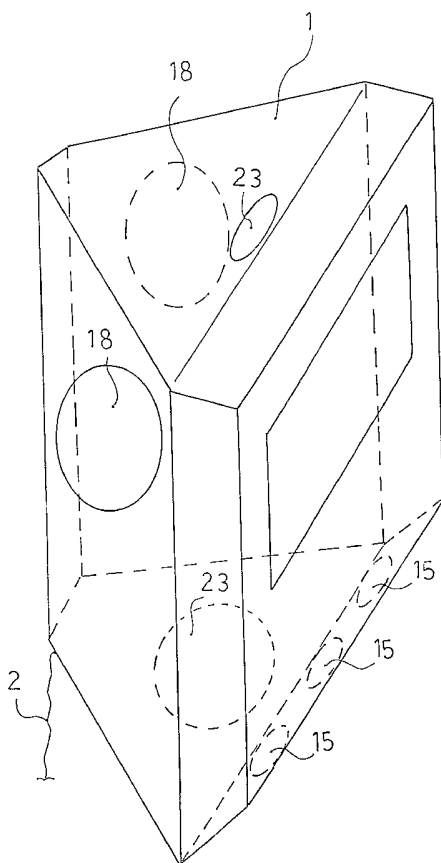
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(54) Title: MODULAR AND INTEGRATED HEATING AND AIR CONDITIONING APPARATUS



(57) Abstract: The invented apparatus consists of a box-shaped body (1) with three inside parts (1A, 1B, 1C) connects to the electric power by means of wire (2) and drives by a board (3). Said box-shaped (1) has and angular disposition so to be placed onto everyone inside corner of a room communicating with the outside wall with scheme and shapes of the components for a minimum encumbrance solution.

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## MODULAR AND INTEGRATED HEATING AND AIR CONDITIONING APPARATUS

The invention refers to a new apparatus for the treatment of the air into the rooms of the modern building, whether or not residential. Said apparatus consists, with the elements integrated inside a containment and disposition box-shaped frame, of a conditioning, heating and air dehumidification plant according to a scheme and a shape of the elements with angled disposition for solution of minimum encumbrance. Said solution comes to determine the fulfilment of the different necessities of air treatment into the room by using one containment body to be placed on any inside corner of a room to be made available and in communication with an outside wall. It is known that, particularly in the indirect residential or not building, while the central or single heating plant comes to be part of the work given by the builder, the air conditioning room plants are to be chosen to the resident and they are, however, connected with the laying, during the building or the restructure, of necessary installations such as pipes, canalizations, drain pipes and components placed inside and outside of the building. Said workings particularly difficult are expensive and heavy in the case of a plant to be mounted in an occupied building with furnished rooms. Then it is to consider that both the inside spaces than the outside ones of a building in particular in the modern building have aesthetics characteristics with architectonic and town-planning limitations and in generally with furnish limitations and consequently with the installation of the outside parts of the known air conditioning plant is created a changing of said characteristics not always possible and also a temporary unfitness for use of the rooms during the mounting workings. To find a solution to the above cited problems the known art has tried to realize the different elements with forms of minimum encumbrance so to reduce the space to be used onto the inside wall and so to limit the aesthetics variations onto the outside wall. The invented

apparatus gives a problem solution realizing both the heating and air conditioning plants and also the dehumidification and changing air plants and actuating the outside body placing, in a minimum encumbrance, in any upper wall corner connected with the outside. Moreover, in said solution the only one  
5 aesthetic variation, to be put onto the building outside wall, is the presence of a grille for the air passing of small dimensions of the same type used and permitted normally in the common building. Fundamental characteristics of the invented apparatus are to actuate the heating, the air conditioning, the dehumidification and the stuffy air changing without the necessity of plants, tubes and difficult  
10 hydraulic works with expensive wall works. On this base the invented apparatus gives a technological innovation in the sector first of all realizing the following advantages: a) it permits an installation costs reduction being the apparatus extremely compacted and to be positioned onto the upper wall corner by means of joint onto the support without hydraulic works and with the realization of only  
15 a hole of air passing into the outside wall to be realized with common tools with the use of unskilled labour; b) it permits the elimination of expositive parts in the outside of the building reducing the same to an only one grille of small dimension like one already using in building, c) it needs a small encumbrance space onto the expositive inside wall permitting the mounting onto the upper  
20 wall corner, normally not used, this by using very small components with a scheme and an angular disposition for minimum encumbrance solution; d) it determines the optimization of the energetic use running the use of each unit with a minimum used of the available and limited electric power and independently room for room; e) it permits the quick changing of the apparatus with a simply unhooking working of the support so creating a working  
25 simplifying and a reduction of the costs of conduction, maintenance and/or replacement; f) it permits the total elimination of the condensation water extracted in the room during the conditioning or during the dehumidification by means of a inside processing that eliminates said water toward in form of steam;  
30 g) it determines the improvement of the electric efficiency and the apparatus global efficiency. Another innovative characteristic of the apparatus is given to

the reversibility of the installation such as it provides back air passages which permit to choose from which side and onto which wall to make the hole without damage the function. Then it is to consider that the invented apparatus gives the possibility to have an air changing obliged in the building in particular in the commercial and public sectors. For offsetting the depression produces to the going out of said air from the room is introduced new air from outside in the quantity requested to the building rules. The invented apparatus provides a box-shaped body 1 with triangular setting out consists of three inside parts 1A, 1B and 1C that come to form a cooling and/or heating system of the air with single or reversible refrigerating cycle with cooling compression and with heating exchangers. Said inside parts 1A, 1B and 1C use schemes and shape of the elements for solutions of minimum encumbrance and are connected inside the box-shaped body 1, by means of wire 2, to the electric power and are driven by a board 3. Then it is provided a refrigerator compressor 4 for the compression of the coolant through a piping 5 and a directional valve 6. Said valve permits to direct the coolant in two directions so to have hot air or cold air. For the production of hot air, through the directional valve 6, the very hot coolant flows through the piping 7 to and exchanger 8 where it is transformed from steam to liquid given head. Said liquid, through a piping 9, comes inside a rolling element 10 and to an exchanger 11 where it passes again in steam absorbing heat. Then, through a piping 12 and crossing again the directional valve 6, said steam is sucked up, by means of a piping 13, to the compressor 4 to repeat the cycle. In this phase, the cold air to heat, coming from the outside, is sucked by a fan 14, through an exchanger 8 where it absorbs heat given to the exchanger and to the coolant to go back in the room heated through suitable oriented mouths or grilles 15. In the same time the outside air is sucked up from a fan 16 through a wall hole 17 and it is forced to cool the compressor 4 and to cross the exchanger 11 into which the coolant evaporates with lower temperatures of the air temperature that crosses the same. The hotter air gives heat, through the exchanger 11, to the coolant and it is got out through a conduit 18 inserted inside the wall hole 17. In the case that the outside air was so cold to not give a thermic help to the

exchanger 11, said air is heating through resistors 19. Said resistors 19 work also to the condensation water discharge that is generated inside the small basin 20 during the working. For the production of cold air, through the piping 5 and the directional valve 6, the coolant comes, through the piping 12, inside the exchanger 11 where is transformed condensing from steam to liquid giving heat. Said cooling coolant comes, by means to the rolling element and the piping 9, inside the exchanger 8 where it passes again at the steam state absorbing heat. At the end the same comes back, through the piping 7, the directional valve 6 and the piping 13, to the compressor 4 to repeat the cycle. The hot air to be cooled, coming from the inside room by fan 14, crosses the exchanger 8 given heat to return in the room cooling through oriented mouths or grilles 15. In the same time the outside air is sucked from the fan 16 through the wall hole 17 and it is forced to cool the compressor 4 and to cross the exchanger 11 and the small basin 20. The air is then got out through the conduit 18 inserted inside the wall hole 17. For the air dehumidification is used the same working used for the production of cold air with the functional variations to obtain a major water boiling by means of the small basin 20 and the resistors 19. In particular the two inside parts 1A and 1B have the function to avoid that the outside air comes to mix itself with the inside air already treated and in the same time they isolate from heat loss. In a version said inside parts 1A and 1B are making communicating through a gauged screen 21 that permits the air passing from the inside to the outside to permit a change of the stuffy air into the rooms. To offset the depression products with the discharge of the stuffy air from the room through the screen 21 is realized a second screen 22 able to introduce new air from the outside if requested. Said exchange is automatically actuated during the working and it no requests other workings during the mounting and it needs no wall or plant working. Moreover, for the safety of the rooms and of the persons, in particular for the use in the public, touristic and hospital sectors, the apparatus is provided to have a safety-lamp 23 which automatically enters in function in the case of interruption of the electric power with the characteristics of this kind of devices. In the heating phase, instead of the heating action by reversibility of

the refrigerating cycle, the apparatus can be equipped with self-regulating heating ceramic elements able to heat with every temperature without having a reduction performances typical of the reversible cycle. The invented apparatus determines a sector innovation in particular based onto the installation

5 reversibility permits to the back inlets 17 and 18 and for the elimination of the condensation water produced to the damp extracted from the rooms by means of the sequential action of the piping 5, of the heating element 19 and of the boiling basin 20. In this way the water is automatically eliminated toward through the piping 18 in form of steam and it is not requested the use of particular piping for

10 the water discharge. The invented apparatus is illustrated in a merely indicative way in the drawings of sheets 1, 2, 3, 4, 5 and 6. In sheet 1 figure 1 is perspective view of the apparatus. In sheet 2 figure 2 is scheme of the different inside elements. In sheet 3 figure 3 is schematic view in transversal section. In sheet 4 the figures 4 and 5 are views to point out the reversibility of the invented

15 apparatus. In sheet 5 the figure 6 is view of a corner of a room inside to a building with the body 1 of the invented apparatus mounted in the version with the safety lamp 23. In sheet 6 the figure 7 is view of a plant of a building with the invented apparatus mounted on some corners of wall. It is to be noted that the invented apparatus comes to diffuse heating or cooling in the points of the

20 room not to be reached from the known apparatuses. Moreover, such as the treated air flow goes on approximately for the room diagonal a better and more efficient diffusion is created.

## CLAIMS.

- 1) Heating and air conditioning modular and integrated apparatus providing a box-shaped body (1) consists of three inside parts (1A, 1B, 1C) connects to electric power by means of wire (2) and drives by a board (3), characterized in that it has an angular disposition and it is to be placed onto everyone inside corner of a room communicating with the outside wall.
- 2) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that it provides a small basin (20) with resistors (19) for the total elimination of the condensation water produced during the conditioning air or during the dehumidification air, said condensation water to be got out to the outside of the room in form of steam by means of the pipe (18).
- 3) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that it actuates a changing of the stuffy air by means of a screen (21) that permits the passage of the air from inside to the outside and a second screen (22) able to introduce new air from the outside.
- 4) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that a safety lamp (23) is provided which is automatically activated in case of loss of electric power.
- 5) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that it is suitable for everyone corner of a room such as it is equipped with side conduits (18) communicating with the outside that permit the mounting reversibility on each corner of a wall having at least a wall in connection with the outside.
- 6) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that it has the box-shaped body (1) with a corner shape to be coupled in set along the side without the conduit (18) not in

communication with the outside so to satisfy the necessity of very large room.

- 5 7) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that it has units with limited use of electric power so to have in working also the units necessary for the conditioning or heating of the used rooms.
- 10 8) Heating and air conditioning modular and integrated apparatus, as per claim 1, characterized in that in a version it is equipped, in the heating phase, of self-regulating heating ceramic elements able to heat in each temperature without having the reduction performances typical of the reversible cycle.



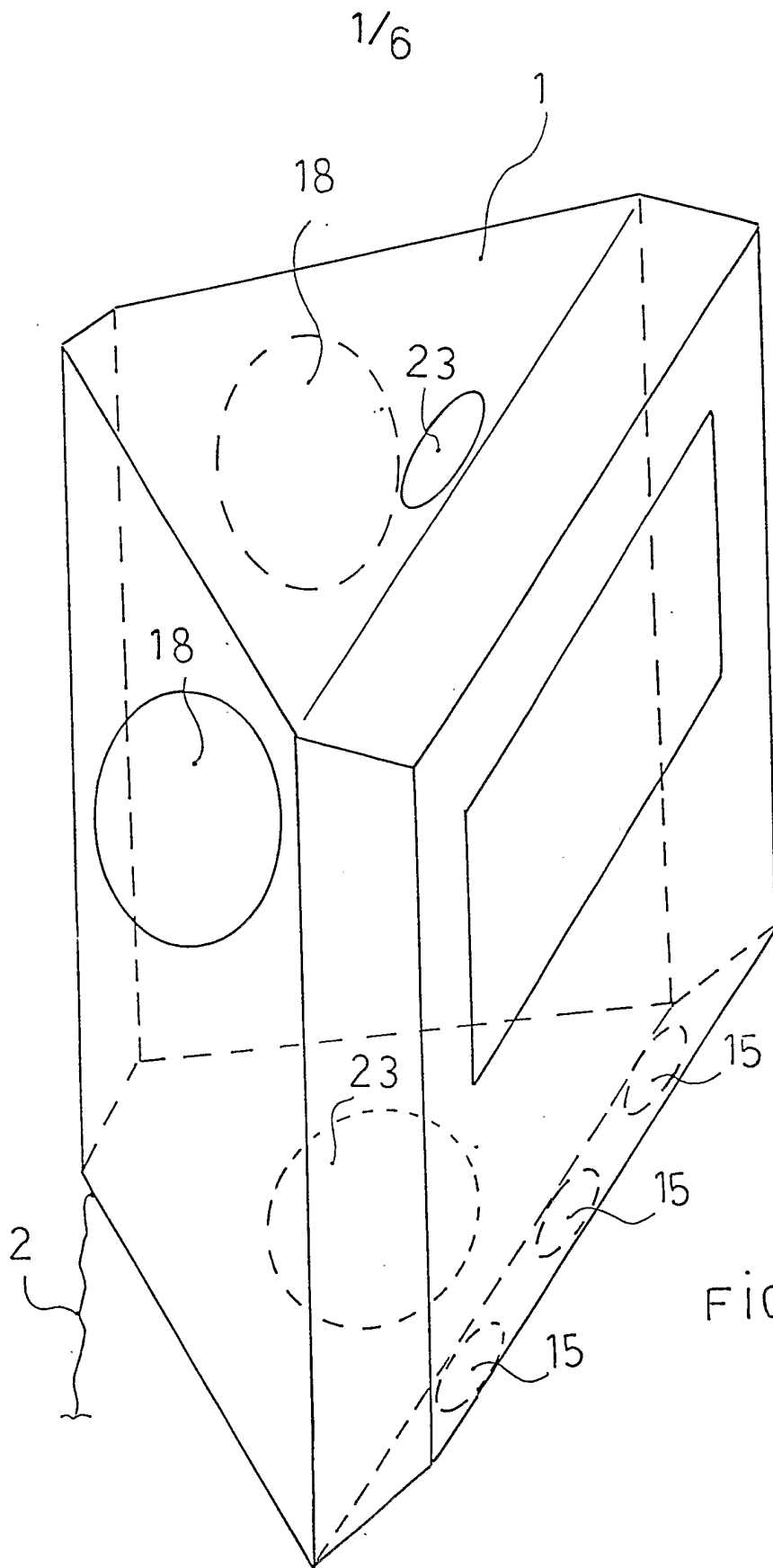


FIG. 1

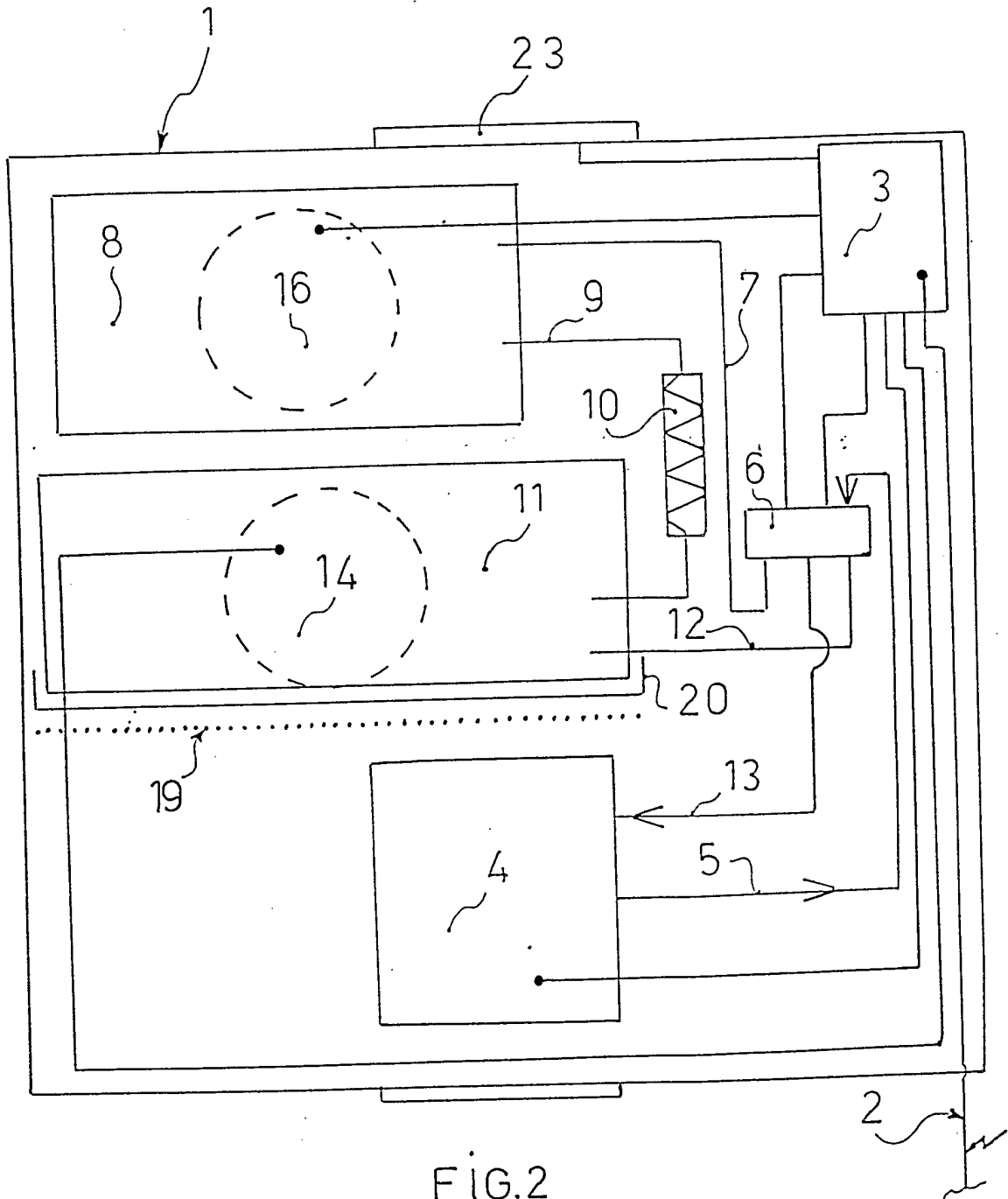


FIG. 2

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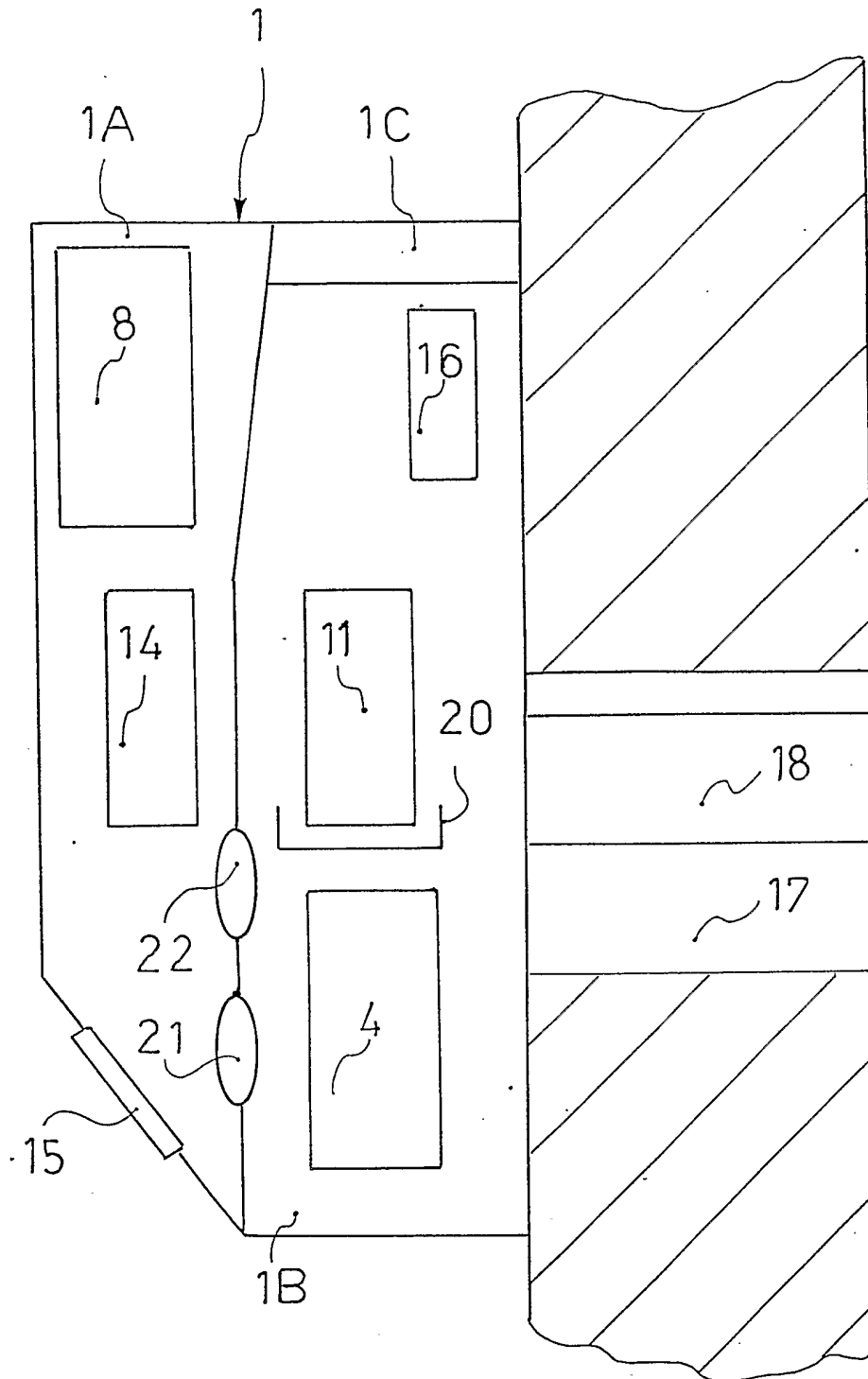


FIG.3

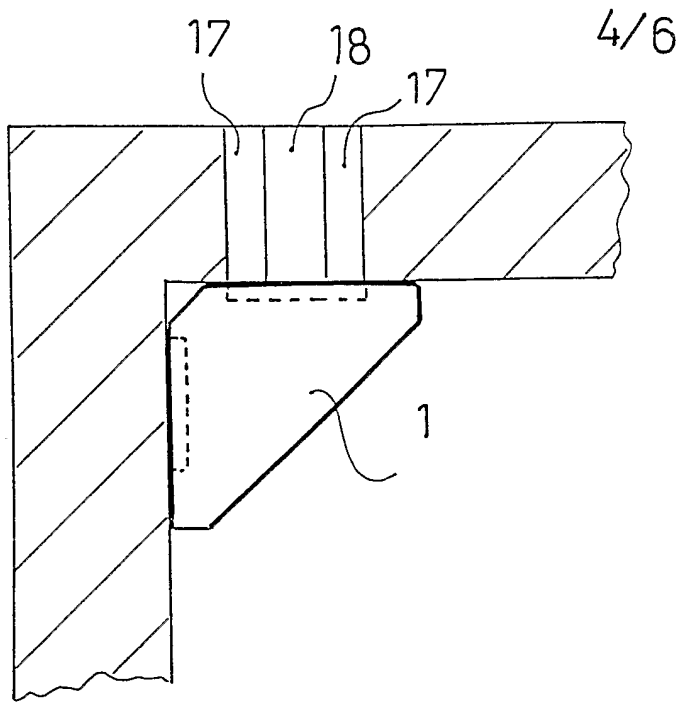


FIG. 4

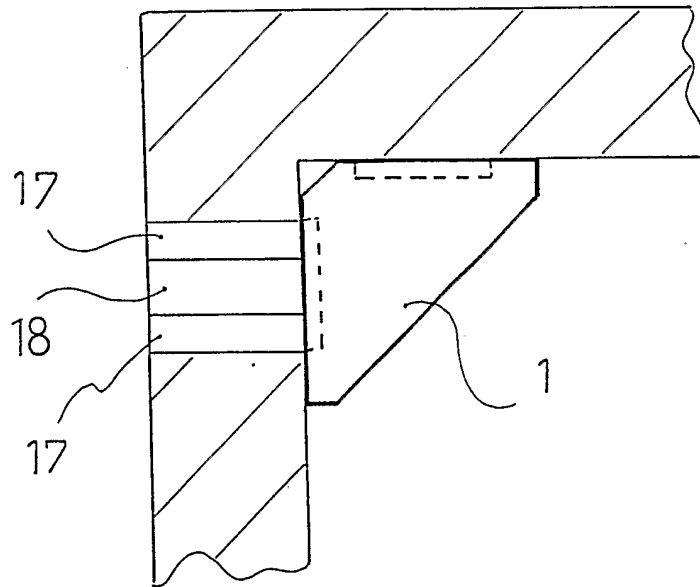


FIG. 5

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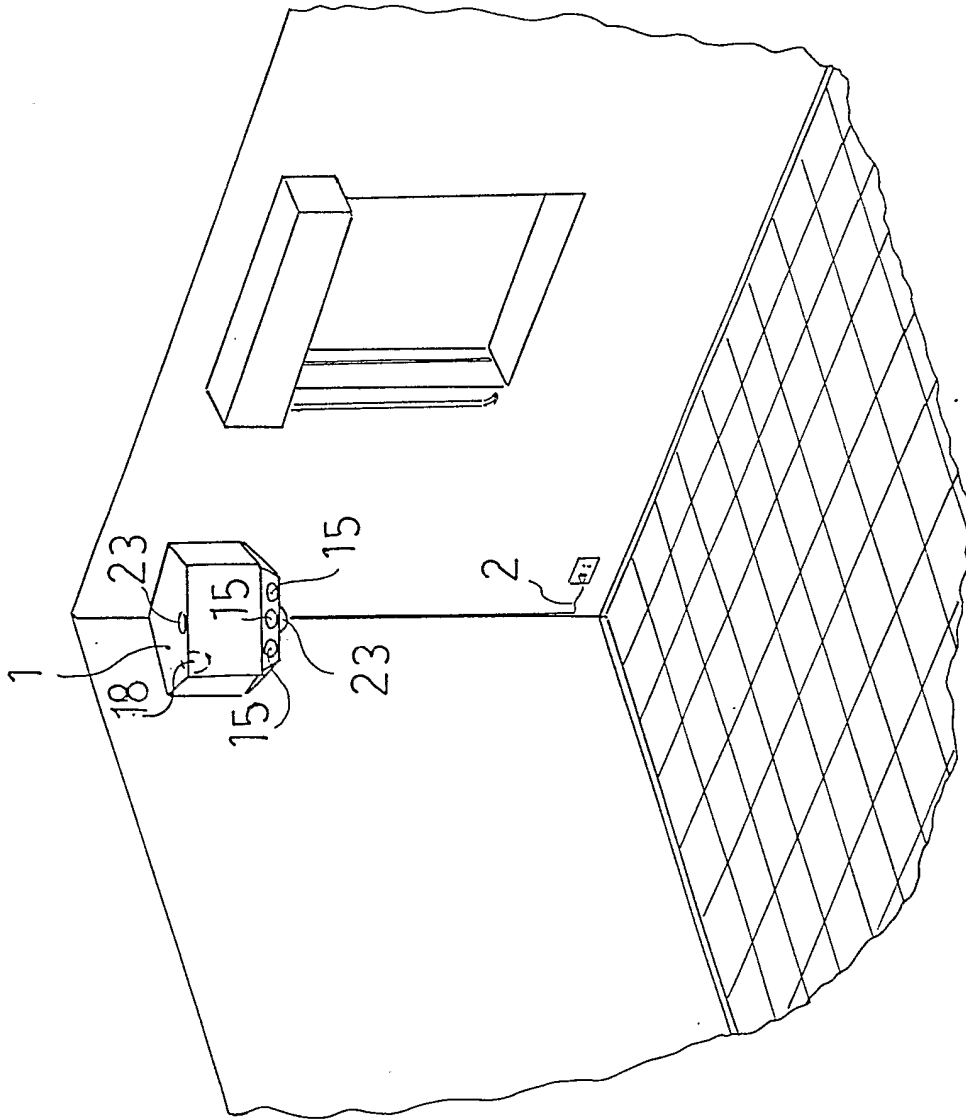


FIG.6

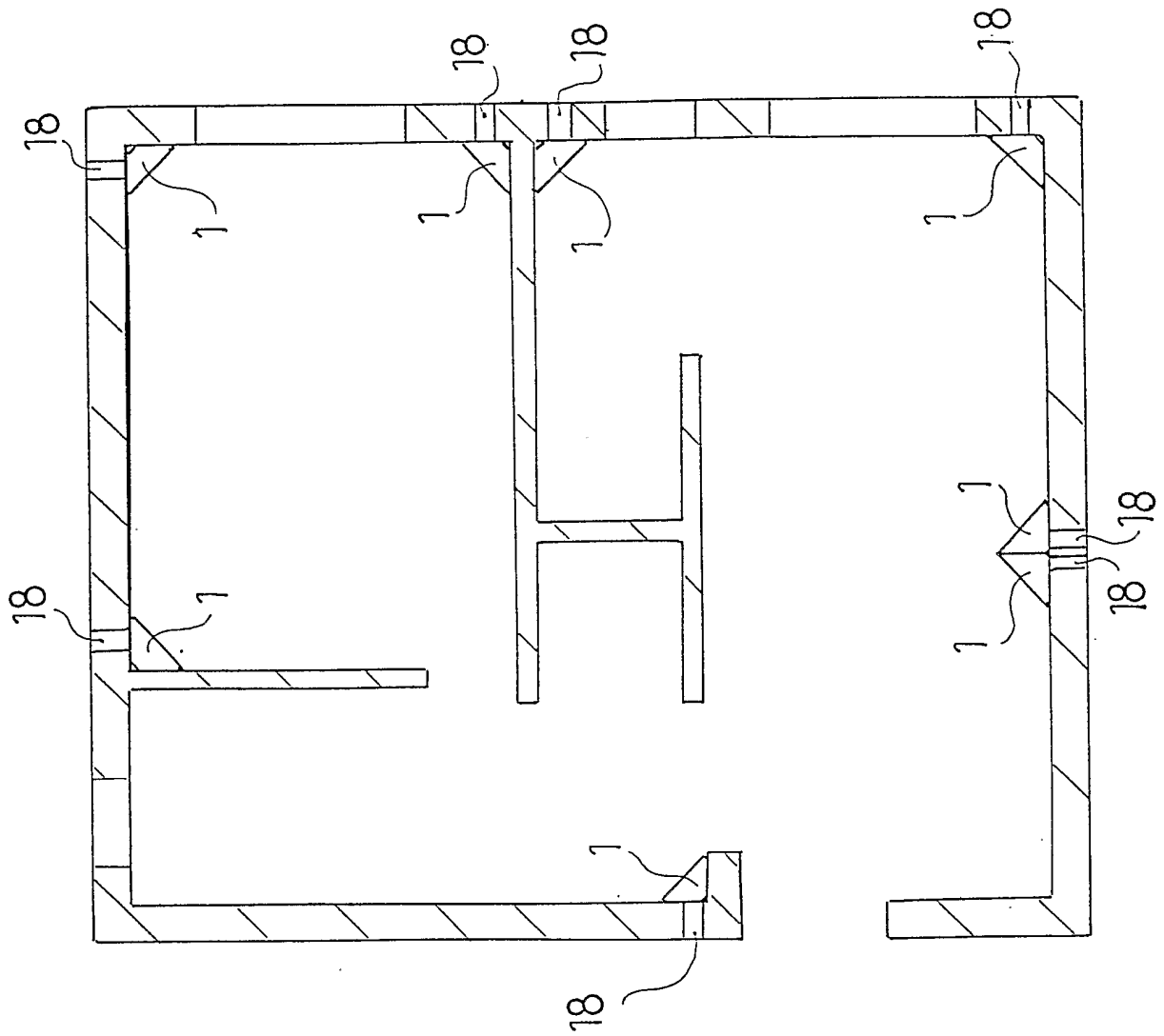


FIG.7

INTERNATIONAL SEARCH REPORT

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A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 F24F13/20 F24F1/02

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)  
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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)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 485 878 A (DERKS IRVIN L) 23 January 1996 (1996-01-23)	1,3-7
Y	column 4, line 45 - column 9, line 19; figures 1-26	1,2,5,8
X	US 5 732 565 A (RAMAKRISHNAN RENGASWAMY ET AL) 31 March 1998 (1998-03-31)	1,3-7
Y	the whole document	1,5,8
Y	US 3 347 025 A (MANNIE WILEY) 17 October 1967 (1967-10-17)	1,5
Y	abstract; figures 1,3,4	
Y	US 4 950 871 A (POLLAK WALTER ET AL) 21 August 1990 (1990-08-21)	1,5
	column 1, line 40 - column 3, line 19; figures 1,2	
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Further documents are listed in the continuation of box C.

Patent family members are listed in annex.

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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