



(12) **EUROPEAN PATENT APPLICATION**

(43) Date of publication:
10.08.2005 Bulletin 2005/32

(51) Int Cl.7: **A63C 19/10**

(21) Application number: **05396004.3**

(22) Date of filing: **08.02.2005**

(84) Designated Contracting States:
AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU MC NL PL PT RO SE SI SK TR
 Designated Extension States:
AL BA HR LV MK YU

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(30) Priority: **09.02.2004 FI 20040193**

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(54) **Building and method for arranging sports facilities**

(57) The invention encompasses a building (1), which comprises sports facilities, typically for winter and summer sports, as well as a method for erecting the building. The building (1) comprises two elongated cor-

ridors (2), at least one of those being endless. Additionally, the building (1) comprises air-conditioning devices (20) for maintaining the temperature existing in at least a lower section of one of the corridors (2) at a temperature of below 0°C, when desired.

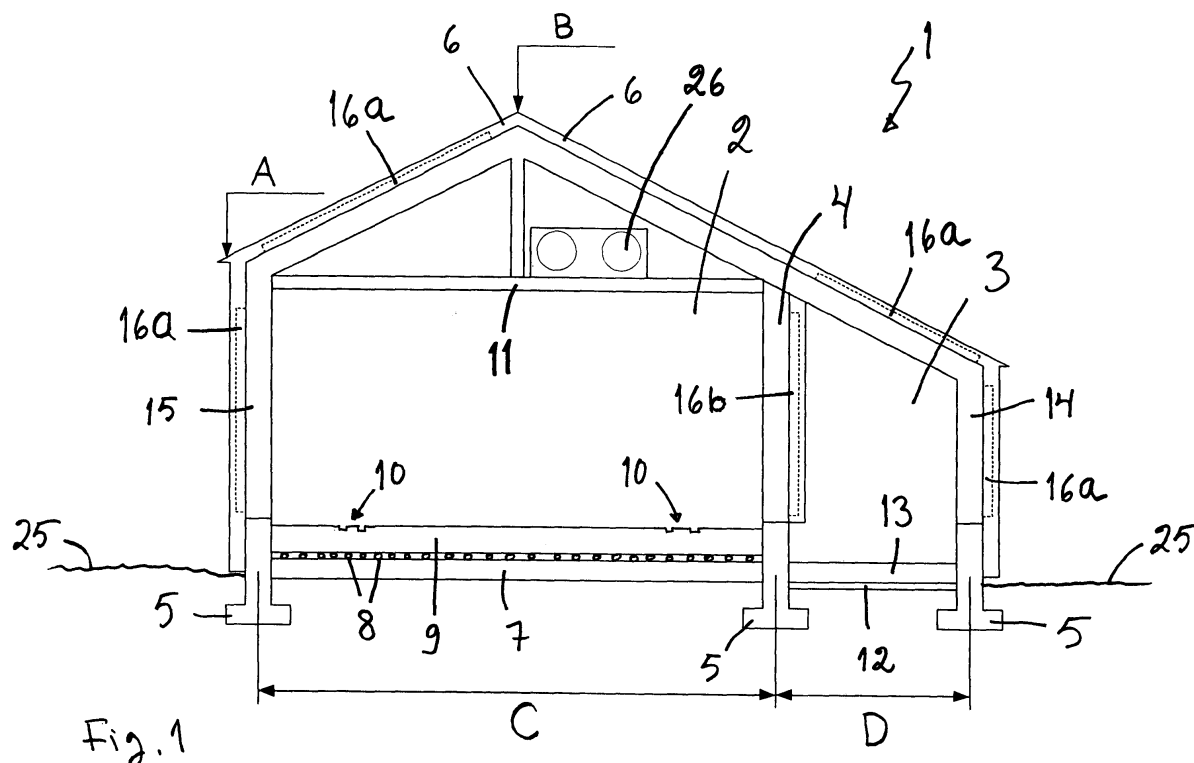


Fig. 1

Description

TECHNICAL FIELD OF THE INVENTION

[0001] The invention relates to a building as set forth in the preamble section of the appended independent claim, comprising sports facilities, typically for winter and summer sports, as well as to a method for arranging sports facilities. In particular, the invention relates to a building including a ski tunnel or the like elongated sports facility useful for winter sports.

PRIOR ART

[0002] A typical ski tunnel is an elongated corridor a few meters in height and width, whose temperature can be controlled for providing therein conditions constantly suitable for cross-country skiing. The United States patent publication US 3,250,530 describes a ski tunnel designed for alpine skiing. US 6,722,995 B1 discloses a course for winter sports, arranged in a large indoor arena. US 2003/0153392 A1 discloses a covered rotary disc for alpine skiing on it. The Finnish patent publication FI 90372 B also shows one ski tunnel solution. The ski tunnels existing in Finland have been built underground. The objective here is to minimize the sensitivity of a tunnel's indoor temperature to external temperature variations.

[0003] One of the drawbacks of prior known ski tunnels is for example the fact that their underground construction calls for high-cost earth-moving operations. In prior known ski tunnels, there is no straightforward application for the heat generated by the air-conditioning equipment. In prior known solutions, consistent climatic conditions are only provided for those practicing winter sports. The air conditioning of elongated sports facilities has not thus far been arranged as effectively as possible. Regarding their design and technical aspects, elongated sporting buildings have not thus far been effectively integrated with facilities surrounding them.

OBJECT AND DESCRIPTION OF THE INVENTION

[0004] It is a principal object of the present invention to alleviate or even eliminate some of the foregoing problems of the prior art.

[0005] It is a particular object of the present invention to provide a building, which offers conditions for both winter and summer sports, which are consistent and better than those obtained in prior known buildings.

[0006] Another particular object is to provide a building, which includes elongated sports facilities and which has cooling, heating and air-conditioning of the facilities arranged more effectively than in similar prior known buildings.

[0007] In order to accomplish, among others, the above-listed objectives, a building of the invention is characterized by what is set forth in the characterizing

clauses of the appended independent claims.

[0008] The embodiments and advantages mentioned in this specification apply, as appropriate, both to a building and to an erection method according to the invention, even if that is not always specifically pointed out.

[0009] A typical building of the invention comprises sports facilities, typically for both winter and summer sports. Sports facilities refer to facilities suitable for practicing some sporting discipline. Winter sports refer to sporting disciplines that require a foundation comprising snow or ice, such as, for example, skiing, curling, ice hockey, figure skating. Summer sports refer to any sporting discipline typically practiced on a foundation not comprising snow or ice, for example running or cycling.

[0010] A typical building of the invention comprises a first elongated corridor and first air-conditioning devices for maintaining the temperature existing at least in a lower section of the first corridor at a temperature of below 0°C, when desired. Thus, the first elongated corridor is suitable for practicing winter sports. Corridor refers to a space defined by walls. Typically, the corridor has also a ceiling and a floor. Elongated means that the corridor has a length which by far exceeds its width. For example, the first corridor may have a width of 6-10 meters, 7-9 meters or about 8 meters. In this case, the corridor's length could be for example 500, 600, 700 or 800 meters or even more. The first elongated corridor of a typical building of the invention is arranged to be endless, for example in the shape of a circle or an oval. Endless means that the track or space for practicing a sporting activity comprised in a corridor of the invention is endless. For example, there is no end to a ski track or a skating oval. Consequently, a skier or skater need not stop or turn around in the middle of their training session. In this case, the above-mentioned length of a corridor means the distance of one lap.

[0011] In addition to the first elongated corridor, a typical building of the invention comprises a second elongated corridor arranged to extend at least substantially side by side with the first corridor. The corridors may have a common partition at least along a main section of their distance. A twin-corridor building enables the construction of mutually separated and possibly different types of sports facilities side by side upon a single foundation and possibly under a common roofing. The sometimes highly different types of in-house engineering aspects required by corridors running next to each other, for example electrical wires, water mains and air-conditioning ducts, can be conveniently accommodated in a common space, for example in a maintenance space.

[0012] In a typical method according to the invention for arranging sports facilities, a building according to the invention is designed and/or built.

[0013] One major benefit offered by the invention is that an athlete training in the corridor shall never reach the end of said corridor. Thus, there is no need for him/

her to make a turn at the end of the corridor as required, at short intervals, in prior known skiing tunnels. By means of the invention, even a short building is sufficient for performing long continuous distances.

[0014] If the corridor contains snow and has a skiing track arranged therein, the snow temperature can be easily kept always the same. Hence, waxing conditions are always constant, as well. Air temperature in the tunnel can also be always kept more or less the same, for example at a temperature of 0°C, so skiing can be practiced in ideal conditions throughout the year.

[0015] In a building of the invention, all traffic in a given corridor can be arranged in parallel, i.e. as a one-way traffic, thereby reducing the risk of exercisers colliding with or bruising each other. Such corridor of a given width can accommodate safely and comfortably a considerably larger number of people exercising than a prior known two-way corridor of the same width.

[0016] In an endless building of the invention, the engineering required by the building, such as heat exchange pipelines of the cooling equipment and air circulation by means of fans, can be arranged in a new manner so as to be continuous.

[0017] If the second corridor is endless the same way as the first one, the advantages gained by continuity become even more pronounced. Of course, a building of the invention can be provided even with a larger number of side-by-side elongated corridors, which may all be endless. The number of side-by-side corridors essentially separated from each other can be for example 2, 3, 4, 5, 6 or 2-10.

[0018] Various corridors in a building of the invention are preferably more or less of equal length. This is advantageously the case especially if the corridors extend side by side over the entire distance of their length. The difference in lengths between the side-by-side running corridors of a same building is typically just a few meters, generally less than 10 meters. Corridors of equal length can be conveniently used for organizing simultaneously training sessions or competitions over distances of equal length.

[0019] In one embodiment of the invention, the building comprises means for directing, when desired, heat generated by first air-conditioning devices into the second corridor, for heating the second corridor. In this way, it is possible to economically implement a building having its first corridor maintained at a temperature suitable for winter sports and its second corridor at a temperature suitable for summer sports. For example, the floor of a first elongated corridor can be maintained throughout the year covered with snow at a temperature of more or less -2°C and the snow can be provided with an endless ski track parallel to the corridor. A second elongated corridor can be simultaneously adapted to maintain an endless running or walking track, having its floor surface arranged permanently at a temperature substantially higher than 0°C for keeping it defrosted even at cold winter temperatures. The second corridor may also comprise

for example a mountain-bike course or a swimming lane.

[0020] In one embodiment of the invention, the first air-conditioning devices comprise one or more heat exchangers known as such, which are used for refrigerating a cooling agent. Typical first air-conditioning devices comprise additionally a cooling agent pipeline, arranged in a lower section of the first elongated corridor substantially parallel to the corridor, the cooling agent being arranged to flow therein. Substantially parallel to the corridor means that, over some of their extent, the cooling agent pipes may extend in a direction other than parallel to the corridor, for example crosswise, but regarding the pipeline as a whole, the flow of cooling agents progresses nevertheless parallel to the corridor. Typically, the corridor has its lower section provided with several cooling agent pipes arranged to extend side by side. The side-by-side extending cooling agent pipes can be arranged at equal distances from each other. The circulation of a cooling agent in the building can be arranged to be endless the same way as the corridor.

[0021] The invention may comprise second air-conditioning devices for maintaining the second corridor permanently at a given temperature, for example at a temperature substantially higher than 0°C. It is possible that the heating effect required by the second corridor be principally extracted from the heat produced by the first air-conditioning devices, but if this effect is not enough, the second air-conditioning devices will have a capability of providing a required additional output. It is also possible that the second air-conditioning devices be used for cooling the second corridor in the event that, for example due to a high external temperature, the second corridor's temperature would otherwise rise too high. If a building of the invention has more than two corridors, the building can be provided with even a larger number of separate air-conditioning equipments, for example one for each corridor.

[0022] In one embodiment of the invention, the building comprises fan equipment for circulating air substantially parallel to the corridor. The fan equipment can be arranged in such a manner that air circulates in the building's endless corridor along an endless route. In this case, the corridor is fitted at one or more spots with fresh-air intake means and at one or more spots in the corridor with air outlet means. The endless circulation of air serves to obviate the prior art problem of having to arrange the downstream end of a dead-end corridor so as to expel all the air coming there and the upstream end so as to supply all necessary air therein in a single batch.

[0023] If one or more connecting corridors are arranged between the parallel first and second corridors of a building, the exercising people will have an opportunity of changing for another corridor and also for another type of exercise in the middle of a lap.

[0024] According to one embodiment of the invention, the first and second corridors are arranged, at least for

the most part, preferably entirely, above the ground level. Thereby, the building will be economical to construct. The air needed for air conditioning is obtained directly from beyond the walls or roof. The building can have its walls provided with windows for bringing genuine natural light into the corridors and beautiful sceneries for more pleasant training conditions. The windows can be readily made openable and closable, whereby the windows can be opened, for example, for rapidly equalizing the temperature between the corridor and its exterior. The corridor walls can be readily provided with quickly and safely functioning emergency exits, for example doors. The windows can also be designed as emergency exits.

[0025] If a building of the invention comprises solar panels and means for the conversion of energy generated by the solar panels into service energy for the first air-conditioning devices, at least some of the required energy can be produced on site and in an environmentally sound fashion. It is conceivable that the solar panels be arranged on the building's roof, for example movably on slide bars. In this case, the panels are movable on the roof either lengthwise or crosswise of the corridor to a location and position for receiving a maximum output from the sun.

[0026] If the building and the corridors comprised therein are circular with essentially vacant space on the inner side of the innermost corridor, such space will provide a sort of courtyard. The courtyard can be arranged to have for example a swimming pool or a football field. Water in the swimming pool or the football field surface can be warmed up for example by means of heat generated by the first air-conditioning device or by energy obtained from the solar panels. Another advantage of the courtyard is that the building will be supplied with natural light also from that direction.

[0027] It is also possible to arrange the building's corridors on top of each other. Hence, the building can be erected on smaller patch of land. At the same time, the consumption of energy can be made more efficient than before.

BRIEF DESCRIPTION OF THE FIGURES

[0028] The invention will now be described in more detail with reference to the accompanying schematic drawing, in which

Fig. 1 shows a twin-corridor building of the invention in cross-section as viewed in the direction of corridors, and

Fig. 2 shows a building of the invention in a plan view.

DETAILED DESCRIPTION OF ILLUSTRATED EXEMPLARY EMBODIMENTS

[0029] Like elements are designated with like refer-

ence numerals.

[0030] Referring to figure 1, a building 1 of the invention is illustrated in cross-section. The building has an endless skiing corridor 2 and an endless running corridor 3. The corridors 2 and 3 are arranged side by side with a common partition 4 there between. The entire building 1 is arranged upon a common foundation 5. Both corridors 2 and 3 are covered by a common roofing 6. The skiing corridor 2 has its concrete floor 7 provided with a cooling pipeline 8 substantially parallel to the corridor 2. The cooling pipeline 8 is used for circulating a fluid refrigerated in a cooling equipment 20 (fig. 2), with the aid of which fluid the floor's 7 surface is maintained at a temperature of about -2° throughout the year. On top of the floor 7 is arranged a layer of snow 9 with two tracks 10 formed thereon. In the upper section of the corridor 2, fans 26 supported by bars 11 are arranged for circulating air around a circle formed by the corridor 2. The running corridor 3 has its own fans, which are not shown. The running corridor 3 has its base consisting of a concrete floor 12, on top of which is arranged a material layer 13, for example gravel and binders, for providing a proper foundation for running.

[0031] The building 1 is arranged in such a way that the running corridor 3 extends as an inner lane in a circle constituted by the building and the skiing corridor 2 extends as an outer lane in a circle constituted by the building. Both the running corridor's 3 inside facing wall 14 and the skiing corridor's outside facing wall 15, as well as the roofing 6, are all provided with large windows 16a for allowing natural light and sceneries inside the building. The wall 4 between the corridors 2 and 3 is also provided with large windows 16b for passing natural light and sceneries throughout the building 1. The windows 16a and 16b are openable and, thus, may function as emergency exits as necessary. The ground level 25 is depicted schematically. Figure 1 discloses by way of example a few dimensions for the illustrated preferred building 1. The building 1, illustrated in the figure, has an eave height A from the ground level 25 of 4,3 m, and its rooftop height B from the ground level 25 is 6,4 m. The skiing corridor 2 has a width C of 8 m and the running corridor 3 has a width D of 3 m. Naturally, the dimensions can always be worked out for each appropriate purpose.

[0032] In reference to figure 2, the building 1 of the invention is shown in a plan view. The figure illustrates how there is a space 17 left within an endless circle constituted by the building 1, said space having a swimming pool 18 arranged therein. Alongside the building 1 is constructed a maintenance annex 19, in which is visibly marked a cooling equipment 20. The cooling equipment 20, which comprises e.g. heat exchangers, is used for refrigerating a cooling agent contained for example in the pipeline 8 shown in fig. 1. The heat generated by the cooling equipment 20 can be used for heating the running corridor's 3 air and/or the material 13 on its floor. In figure 2, a schematic sketch shows how a pipeline 21,

represented by an arrow, can be used for heating the running corridor 3 and/or water in the swimming pool 18 by the heat generated by the cooling equipment 20.

[0033] Schematically shown in fig. 2 is also a solar panel system 22, which is arranged to be mobile on the building's 1 roof 6 along slide bars represented by dash lines 23. Because the slide bars 23 follow the building's curving design with a matching curvature, the panels' 22 position can be controlled relative to the sun's position in order to obtain a maximum amount of solar power. Electricity produced by means of the solar panels 22 can be stored for example in suitable batteries. Solar power can be used, say, for lighting, heating or as service energy for the cooling equipment 20. Fig. 2 shows also three schematically marked doors 24 included in the partition 4 for thereby moving from one corridor to the other.

[0034] The figures only illustrate preferred exemplary embodiments of the invention. It is obvious for a person skilled in the art that the invention is not limited to just the above examples, but the invention is subject to variations within the scope of the appended claims. The dependent claims disclose a few possible embodiments of the invention and, as such, those may not be considered as limiting the scope of protection of the invention.

Claims

1. A building (1), which comprises sports facilities, typically for winter and summer sports, said building (1) comprising

- a first elongated corridor (2) and
- first air-conditioning devices (20) for maintaining the temperature existing at least in a lower section of the first corridor (2) at a temperature of below 0°C, when desired,

characterized in that the building (1) additionally comprises

- a second elongated corridor (3) arranged to extend at least substantially side by side with the first corridor (2),
- and that the first elongated corridor (2) is arranged to be endless, for example in the shape of a circle or an oval.

2. A building as set forth in claim 1, **characterized in that** the second elongated corridor (3) is arranged to be endless.

3. A building as set forth in claim 1, **characterized in that** it additionally comprises

- means (21) for directing, when desired, the heat generated by the first air-conditioning de-

vices (20) into the second corridor (3), for heating the second corridor.

4. A building as set forth in any of the preceding claims, **characterized in that** the first air-conditioning devices comprise a cooling agent pipeline (8) arranged in a lower section of the first elongated corridor (2) substantially parallel to the corridor.

5. A building as set forth in any of the preceding claims, **characterized in that** the first elongated (2) corridor contains snow (9) and on the snow is arranged an endless skiing track (10) extending parallel to the corridor.

6. A building as set forth in any of preceding claims 2-5, **characterized in that** the second elongated corridor (3) has an endless running or walking track (13), having its floor level arranged at a temperature of substantially higher than 0°C.

7. A building as set forth in any of the preceding claims, **characterized in that** it comprises one or more connecting corridors (24) between the first and second corridors.

8. A building as set forth in any of the preceding claims, **characterized in that** the first and second corridors are arranged underneath a common roofing so that they have a common partition (4) at least along a main section of their distance.

9. A building as set forth in any of the preceding claims, **characterized in that** the first and second corridors (2, 3) are arranged at least mostly, preferably entirely above the ground level (25).

10. A building as set forth in any of the preceding claims, **characterized in that** it comprises solar panels (22) and means for the conversion of energy generated by the solar panels into service energy for the first air-conditioning devices (20).

11. A building as set forth in any of the preceding claims, **characterized in that** the building (1) and the corridors (2, 3) comprised therein are circular in such a way that there is essentially no building on the inner side (17) of the innermost corridor (3).

12. A building as set forth in any of the preceding claims, **characterized in that** the building has its walls (4, 14, 15) provided with windows (16a, 16b).

13. A building as set forth in any of the preceding claims, **characterized in that** at least the first corridor (2) is provided with fans (26), which are arranged to circulate air around the first corridor's (2) endless course.

14. A method for providing sports facilities, comprising the steps of

- arranging a first elongated corridor (2)
- arranging first air-conditioning devices (20) for maintaining the temperature existing in a lower section of at least the first corridor (2) at a temperature of below 0°C, when desired,

characterized by

- arranging a second elongated corridor (3) to extend at least substantially side by side with the first corridor (2),
- and having the first elongated corridor (2) arranged to be endless, for example in the shape of a circle or an oval.

15. An erection method as set forth in claim 14, **characterized by**

- further arranging means for directing, when desired, the heat generated by the first air-conditioning devices (20) into the second corridor (3), for heating the second corridor.

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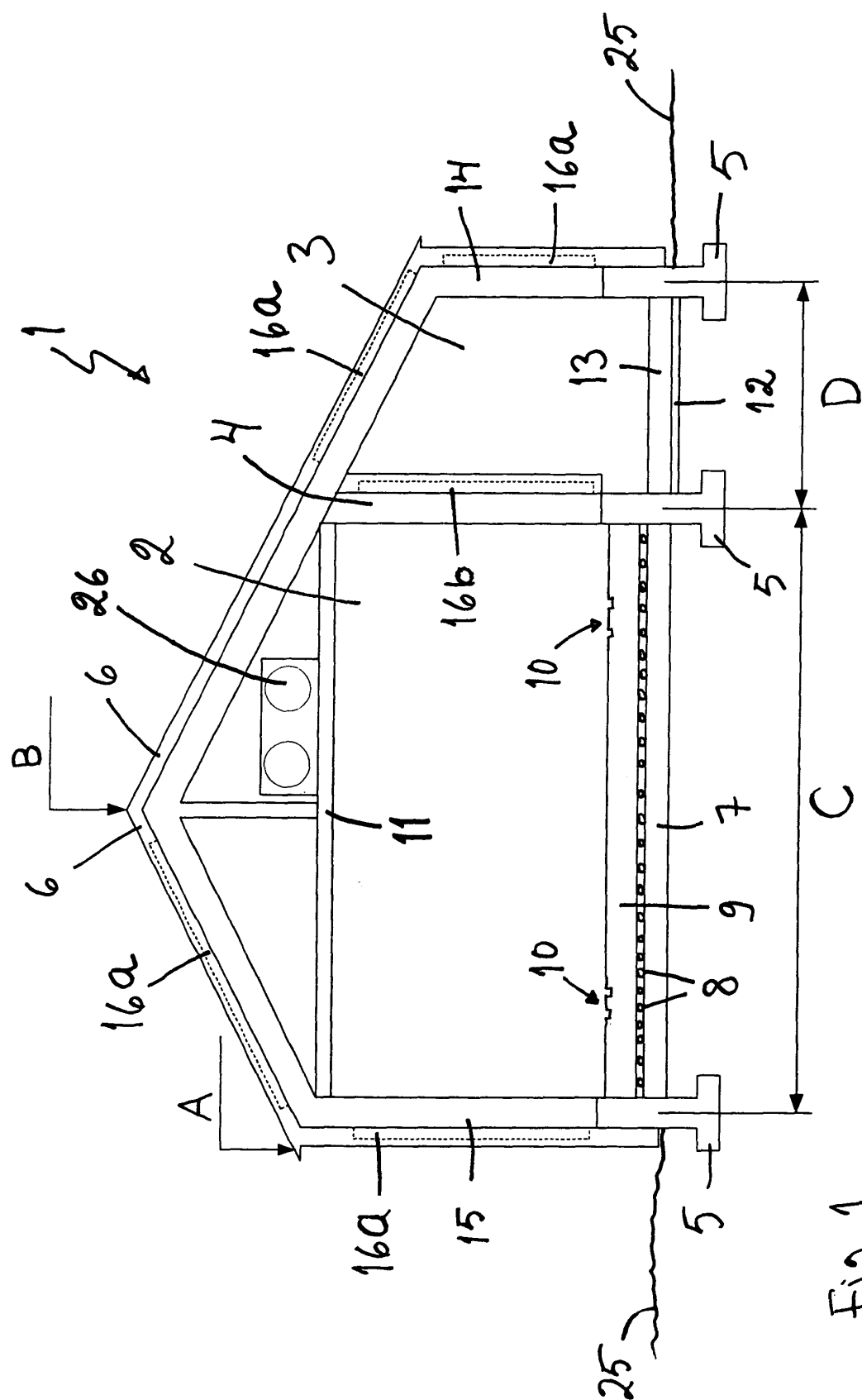
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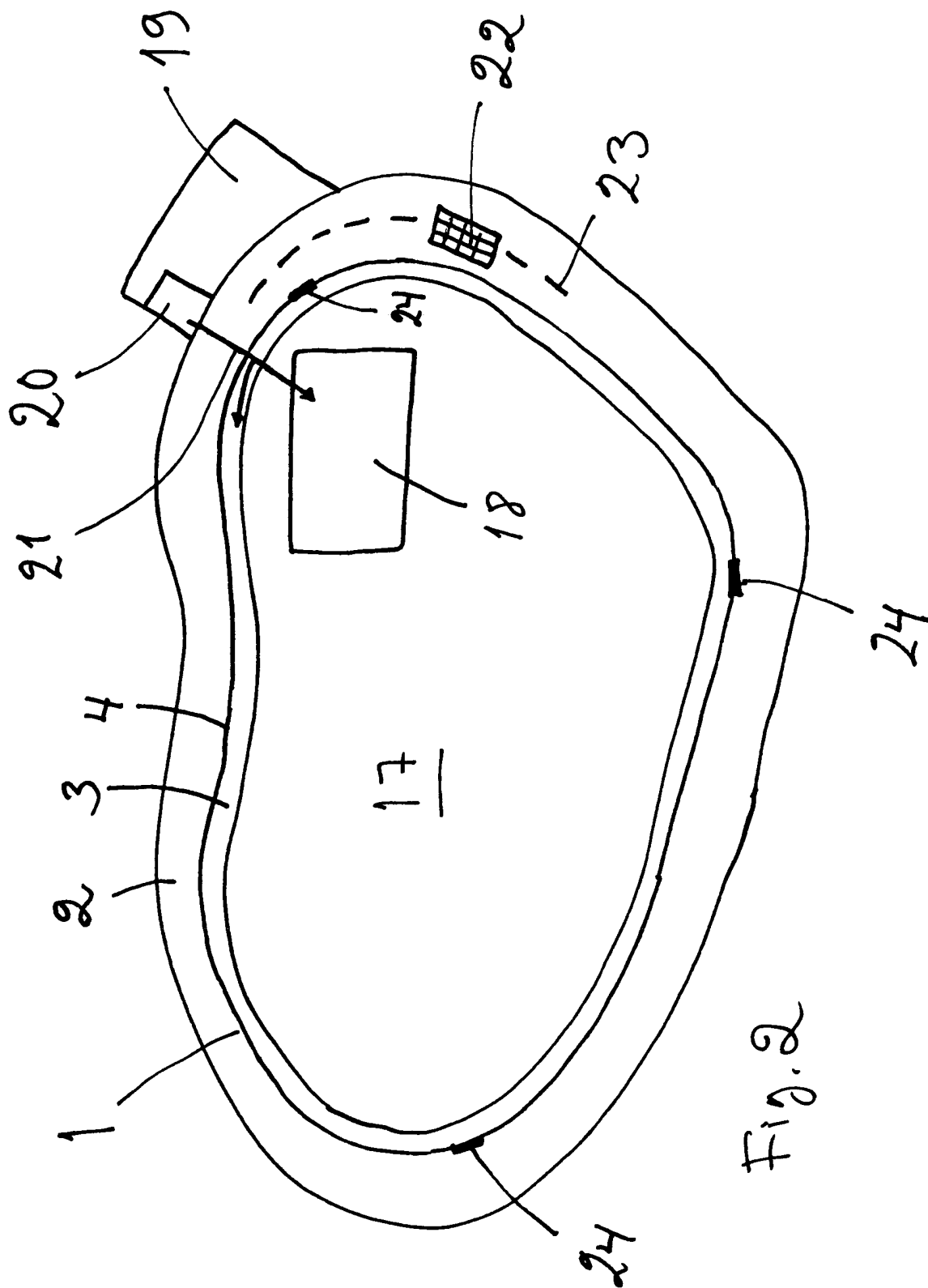
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EUROPEAN SEARCH REPORT

Application Number
EP 05 39 6004

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
Munich		18 April 2005	Stefanescu, R
CATEGORY OF CITED DOCUMENTS X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03 82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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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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