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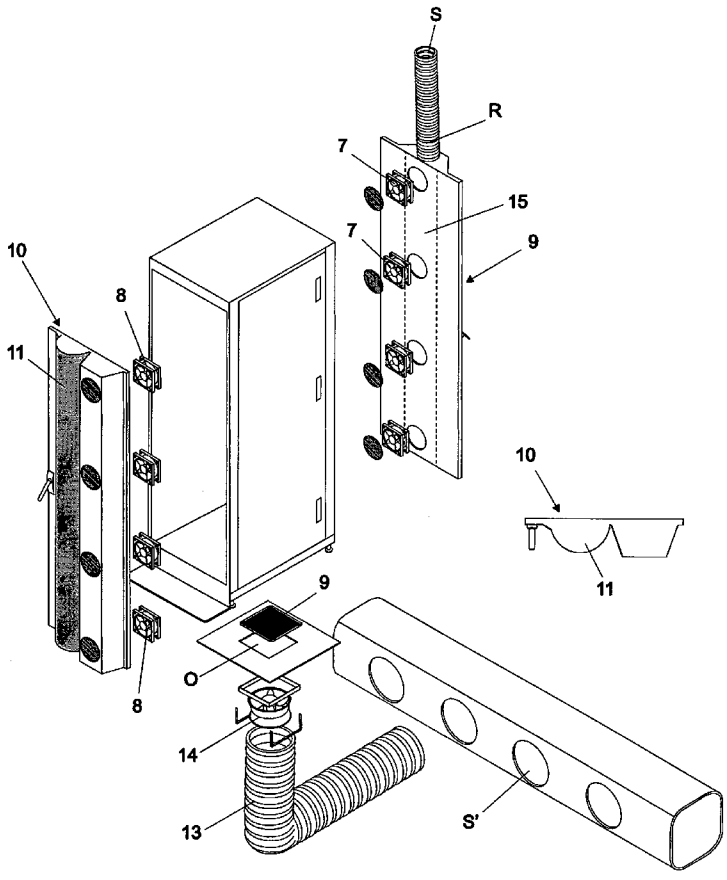
(54) **Title:** SYSTEM OF COOLING FOR DATA CENTER AND SIMILAR



(57) **Abstract:** System of cooling for data center and similar is applied to all and any data center (D), being destined to the appropriate cooling of the server racks (1) in a punctual way, standing out the present system for using equipments of cooling (3) external redundant, of smaller potency that the conventional ones, being an equipment (3A) for ambient cooling, above the high floor (4) and a second equipment (3B) for punctual cooling (P) of the server racks (1), being the air directed by a main duct (5) and distributed in a modular way (M) in the inferior portion of the said rack (1), aided by a turbine (6) of great flow and ventilators (7) and turbines (8) located respectively in the subsequent door (9) and previous door (10) in order to optimize the change of heat among the hot air of the interior of the server rack (1) and the cold air of the equipment of cooling (3) in that the hot air is extravasated by the return (R) of the air conditioner in the superior exit (S). Another advantage of the invented system is that even without supply of air under the high floor (4) the turbines (8) existent in the front door (10), aided by the ventilators (7) of the opposite door, keeps the internal temperature of the rack (1) by the re-circulation of the ambient air, facilitated by the internal concave profile (11) of the front door (10).

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"SYSTEM OF COOLING FOR DATA CENTER AND SIMILAR"

BRIEF INTRODUCTION

The present request of Patent of Invention refers to a new **"SYSTEM OF COOLING FOR DATA CENTER AND SIMILAR"**, especially of a system of cooling located susceptible to be applied in a personalized way in a assembly of server racks that constitute a data center, which are great areas destined to receive this kind of equipment; and the present system stands out for the use of a duct of main distribution with modulated exits to assist the racks positioned equally in a modular way, for that using an inferior turbine that throws the cold air to the interior of the rack that changes heat with the hot air of the server by the combination of ventilators and turbines existent in the subsequent and previous doors respectively, being the hot air thrown to the return of the air conditioner.

The great advantage of this system is the maintenance of the ideal temperature, as inside the rack as in its external atmosphere, due to the punctual distribution of the cold air inside the rack.

STATE OF THE TECHNIQUE

Means and devices for cooling of data center are known thoroughly, whose principle of action is to keep a very low temperature under the false floor of the data center, about 5°C, in order to compensate the inefficiency of the current systems of cooling. That because, by the physics laws, the tendency of the cold air is to go down, while the hot air arises, then the need to compensate that fact through the super dimensioning of the temperature below the false floor.

It is of the technicians' knowledge in the subject that the false floors are formed by plates sustained in "little cranks" that elevate it to an ideal quota, being that destined portion the passage of threads of force, command and other components that assist the server racks. Such floors are structured in appropriate profiles, however in a modulated way to assist the mentioned racks.

Like this, the conventional systems are constituted by machines of cooling destined to the cooling below the false floor, about 5°C from where was concluded that they should be equipments of great cooling capacity, of high acquisition cost and more susceptible to the maintenance. There is also the need of machines for cooling of the ambient of the data center, in other words, above the high floor. By norm, all those equipments should be duplicated, in that way if some of the equipments fails there will be always a second available equipment of "standby". It is easy to conclude that the system of cooling of a data center is a point neuralgic in the whole system, of high implantation cost and due to the sophistication of the machines susceptible to frequent maintenances.

What happens in the practice is that the conventional systems, in spite of the high cost, are totally inefficient. This because the interior of the server racks, for its high density, doesn't allow the appropriate change of heat with the air refrigerated originating from the low of the high floor, fact compensated by the low temperature, which is not enough to solve the problem. In compensation, the working environment, above the work floor, becomes a little uncomfortable, because of the low temperature, for the people that act in it.

THE NEW SYSTEM

The system in subject possesses a series of advantages regarding some items considered important in the acting of the cooling of data centers;

advantages that are related fundamentally with a system of punctual cooling, where each server rack is supplied of cold air by its inferior portion, helped by a turbine that plays such a cold air to great speed for the interior of the same. Complementing the requested system, the server racks have doors, previous and subsequent, differentiated, having a group of turbines and ventilators that capture the cold air thrown upward by the turbine and changing heat with hot air of the interior of the server racks in order to keep the internal temperature appropriate. In that change of heat the hot air search the superior portion of the referred rack leaving to the external atmosphere by the return of the air conditioner. The homogeneous and continuous cooling, producing high efficiency of cooling with energy consumption sensibly reduced in relation to the traditional patterns.

A second outstanding point consists of the operation of the same system without the supply of inferior air (under the high floor) that due to the embodiment of doors of the racks of the system, provide a re-circulation of the ambient air, where the turbines of the front door capture the external air (ambient) and throws it in front of the server. The front door, for possessing a concave profile internally, there is a natural re-circulation of the air inside the server rack so that said internal air will always be to an ideal temperature.

To follow the invention will be explains, presenting the following drawings of a illustrative way and not a limited way, demonstrating the application of the invention in a data center:

Figure 1: General perspective view of the system applied to a data center;

Figure 2: General exploded perspective view of the system applied to a data center;

Figure 3: Lateral view in cut of the system applied to a data center;

Figure 4: General perspective view of the rack applied in the invented system;

Figure 5: General exploded perspective view of the rack applied in the invented system;

Figure 6: General perspective view of the system applied to a data center showing use.

DETAILED DESCRIPTION

The **"SYSTEM OF COOLING FOR DATA CENTER AND SIMILAR"**, object of this request of Patent of Invention, is applied to all and any data center (D), being destined to the appropriate cooling of the server racks (1) in a punctual way, standing out the present system for using equipments of cooling (3) external redundant, of smaller potency that the conventional ones, being an equipment (3A) for cooling ambient, above the high floor (4) and a second equipment (3B) for punctual cooling (P) of the server racks (1), being the air directed by a main duct (5) and distributed in a modular way (M) in the inferior portion of said rack (1), aided by a turbine (6) of great flow and ventilators (7) and turbines (8) located respectively in the subsequent door (9) and previous door (10) in order to optimize the change of heat among the hot air of the interior of the server rack (1) and the cold air of the equipment of cooling (3) in that the hot air is extravasated by the return (R) of the air conditioner in the superior exit (S). Another advantage of the invented system is that even without supply of air under the high floor (4) the turbines (8) existent in the front door (10), aided by the ventilators (7) of the opposite door, keep the internal temperature of the rack (1) by the re-circulation of the ambient air, facilitated by the internal concave profile (11) of the front door (10).

In a more defined way, the system contemplates external equipments of cooling to the data center (D), both redundant, it means, duplicated, being an equipment (3A) for supply of ambient air for comfort and other equipment (3B) for punctual supply (P) of air for the server racks (1), colder positioned of a modular way (M) on the high floor (4). The last mentioned equipment (3B) has the refrigerated air channeled through a main duct (5) that travels certain longitudinal strip under the high floor (4), having modular exits (S') in accordance with the dimension of each rack (1). Of the referred exits (S') derive hoses (13), preferentially flexible, connected through flange (14) to a hole (O) located in the inferior portion of the referred rack (1). In this portion, there is a turbine (6) with enough potency to suck and to direct the refrigerated air in ascending direction inside the same, by nature of high density and hot. When insufflating the refrigerated air, there is a thermal change between such refrigerated air and the hot air of the equipments installed in said rack (1). This thermal change is optimized by the turbines (8) located in the front door (10) that have a concave internal profile (11) that propitiates a re-circulation of the air inside the rack (1), in other words, the punctual air (P) and the refrigerated air captured by said turbines (8) of the ambient air.

When of the thermal change, the back door (9) having ventilators (7) that end in a central tunnel (15) aligned with the medium point of the referred door (9), capable to drive the hot air upward towards the return (R) of the air conditioner in the superior portion of the rack (1), not allowing the re-circulation of "addicted" air inside the rack (1).

Like this, the air inside the rack or racks (1) will always be to the ideal temperature, once the air blown by the turbines (8) of the front door (10) is going of encounter to the hot parts of the server rack (1), that by the concave internal configuration (11) of the referred door (10) will make a re-circulation

that, together with punctual refrigerated air (P), will always keep the internal temperature of the rack (1) ideal. On the other hand, the ventilators (7) of the subsequent door (9) contribute in that operation, driving the hot air by the central tunnel (15) in that the hottest air, with tendency to arise, is thrown for the return (R) of the air conditioner, in other words, in an external atmosphere to the data center.

As already commented, even with the lapse in the supply of the punctual refrigerated air (P), the turbines (8) of the previous door (10) are enough to keep the temperature inside the server rack (1), in an acceptable level due to the re-circulation generated by the united action of the ventilators (7) of the back door (9); the turbines (8) of the previous door (10) and its concave profile (11) that makes with that the air re-circulate inside such rack (1).

With such system is possible to reduce the cost of implantation of a data center (D) considerably as well as to make it less susceptible to the maintenance due to the temperature elevation.

Therefore, the invention differs of the called conventional systems in function to have, in this invention, a punctual distribution of refrigerated air (P) and by the united action of the turbines (8) of the front door (10) concave (11) facilitating the re-circulation and, the back door (9) whose ventilators (7) suck the hot air and direct the hot air to the central tunnel (15) taking the hot air to the return (R) of the conditioned air; what is an extraordinary differential.

CLAIM

1) **"SYSTEM OF COOLING FOR DATA CENTER AND SIMILAR"** is applied to all and any data center (D), being destined to the appropriate cooling of the server racks (1), contemplating external equipments of cooling to the data center (D), both redundant or duplicated, being an equipment (3A) for supply of ambient air for comfort and other equipment (3B) characterized by being in a punctual way (P) channeled through a main duct (5) that travels certain longitudinal strip under the high floor (4), having modular exits (S') in accordance with the dimension of each rack (1); of the said exits (S') derive hoses (13), preferentially flexible, connected through flange (14) to a hole (O) located in the inferior portion of the said rack (1), in that portion, there is a turbine (6) with enough potency to suck and to direct the refrigerated air in ascending direction inside the rack (1); the thermal change is optimized by the turbines (8) located in the front door (10) that have a concave internal profile (11) that propitiates a re-circulation of the air inside the rack (1), in other words, the punctual air (P) and the refrigerated air captured by said turbines (8) of the ambient air; on the other hand, the ventilators (7) of the subsequent door (9) contribute in that operation, driving the hot air by the central tunnel (15) in that the hottest air, with tendency to arise, is thrown to the return (R) of the air conditioner, in other words, in an external atmosphere to the data center (D).

FIGURA 1

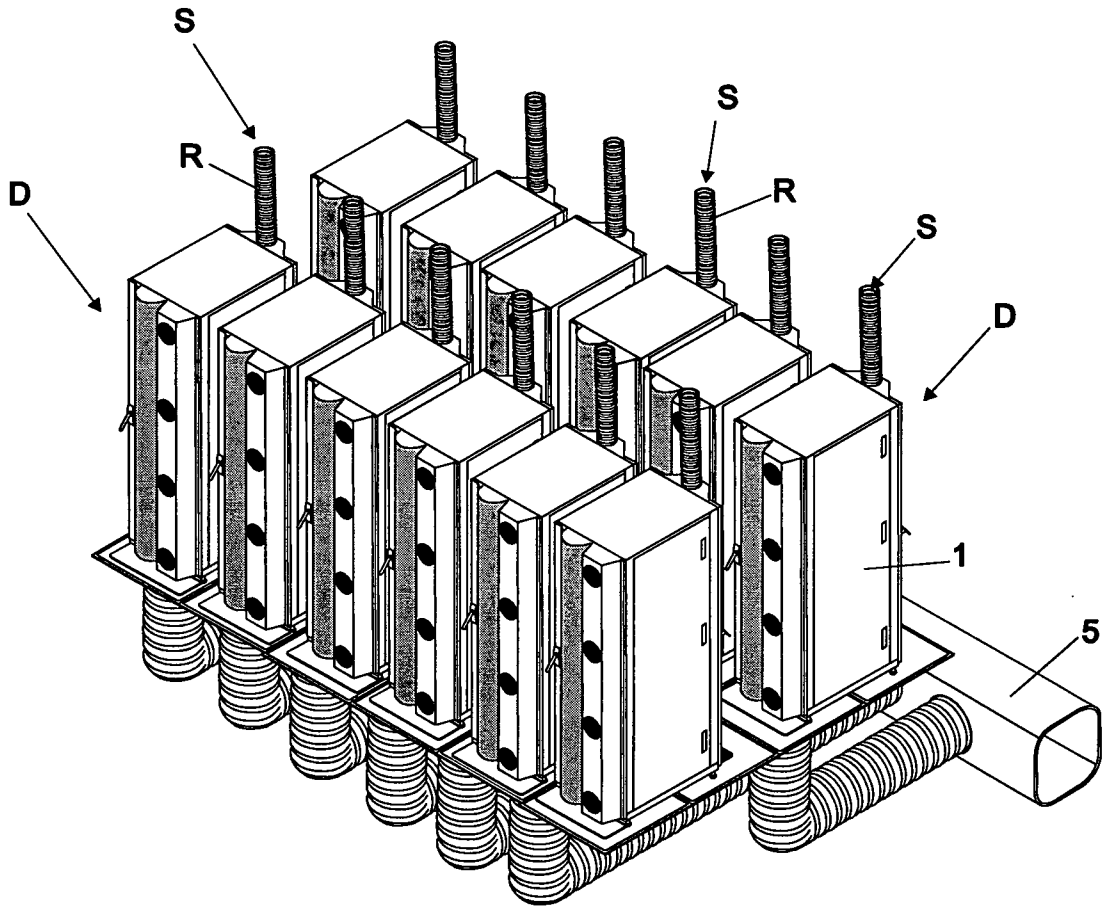


FIGURA 2

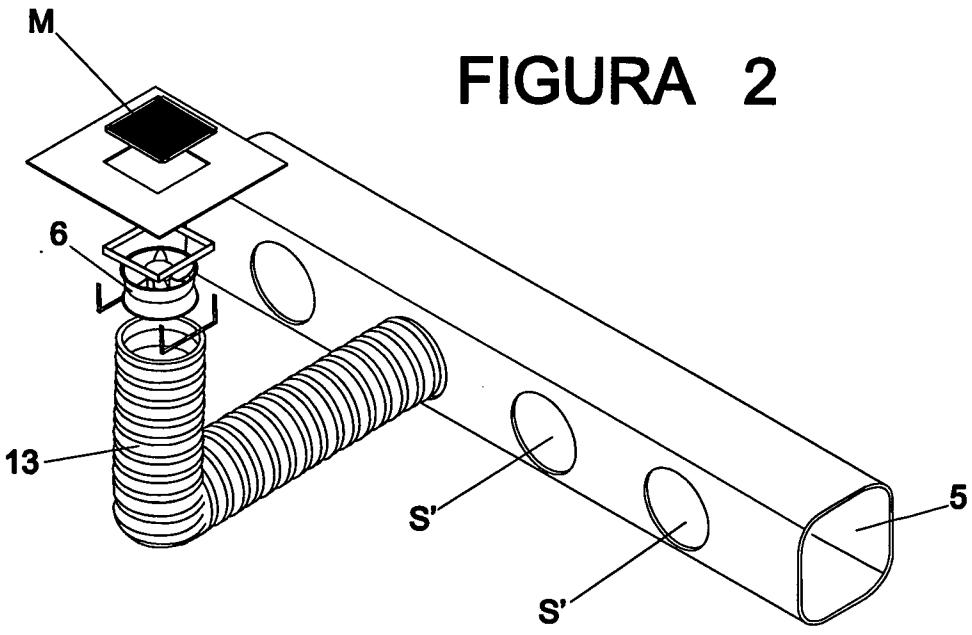


FIGURA 3

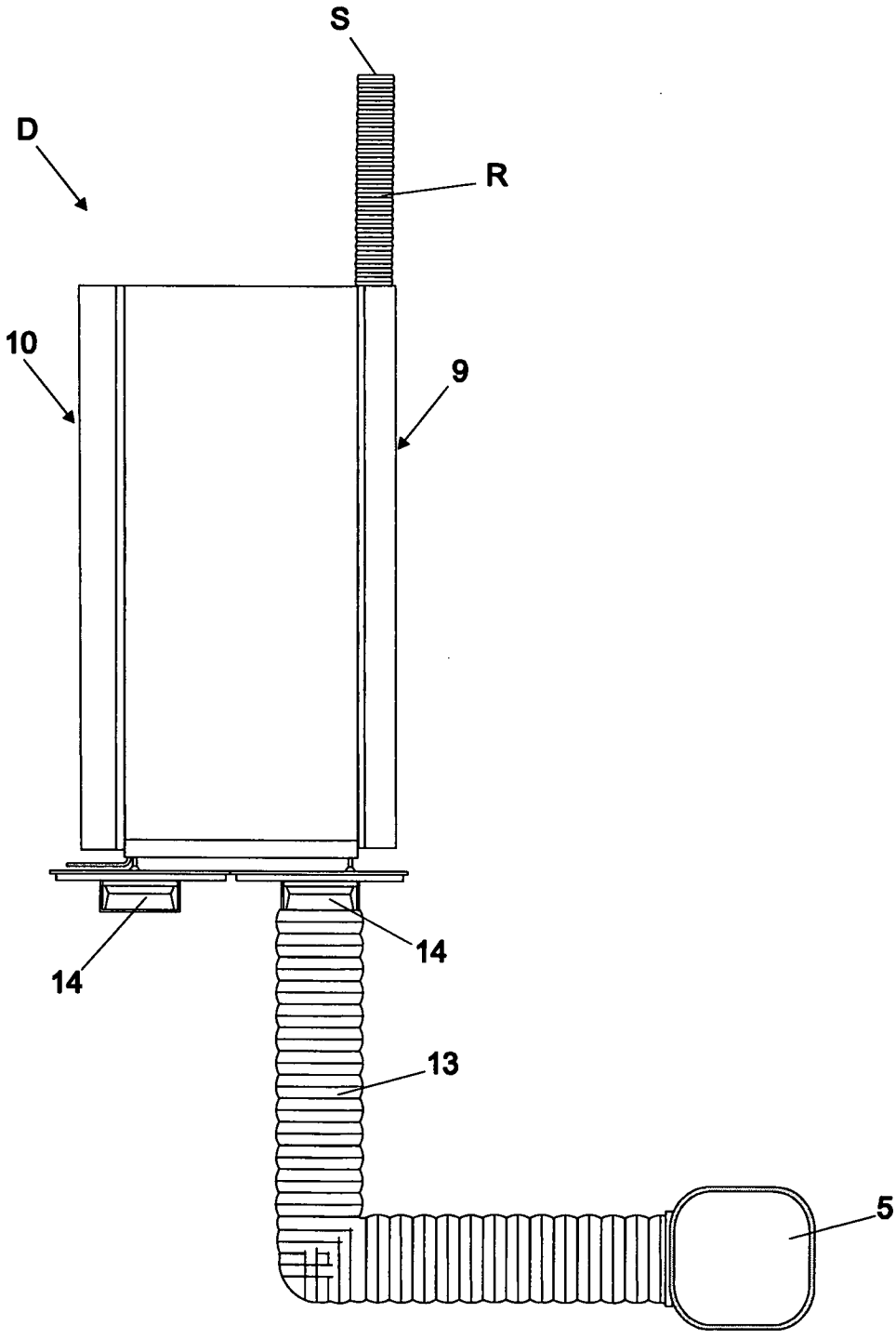


FIGURA 4

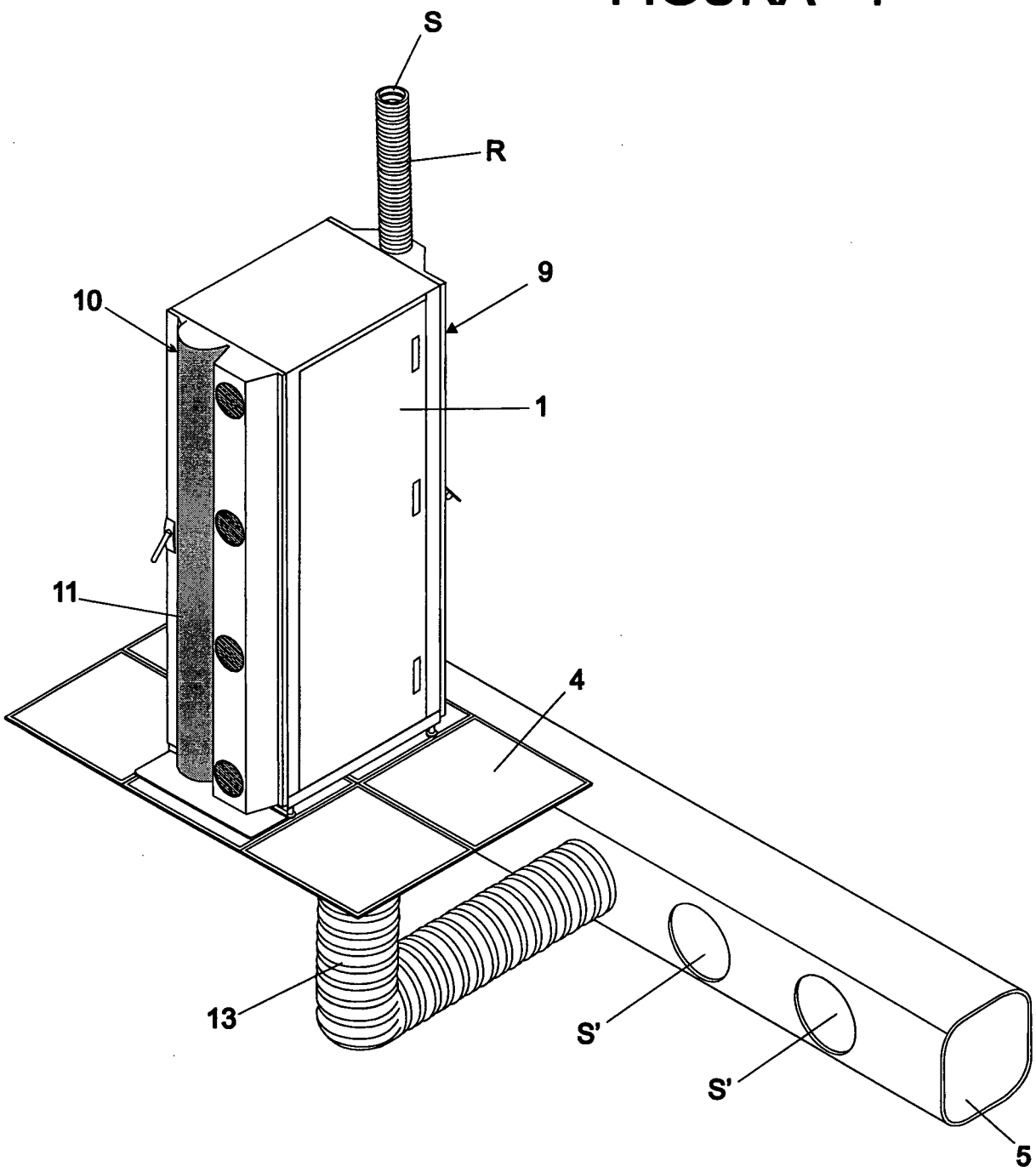


FIGURA 5

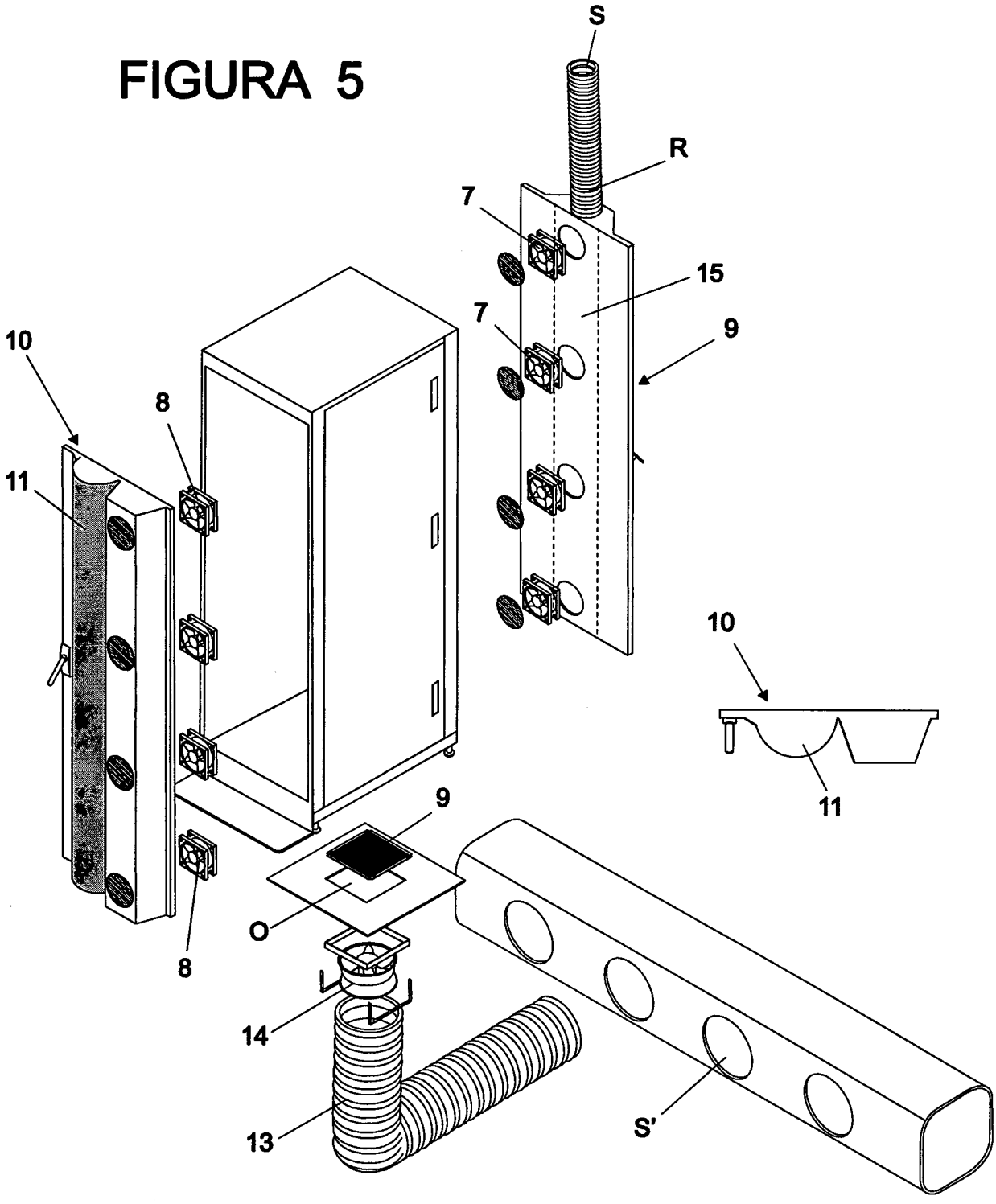
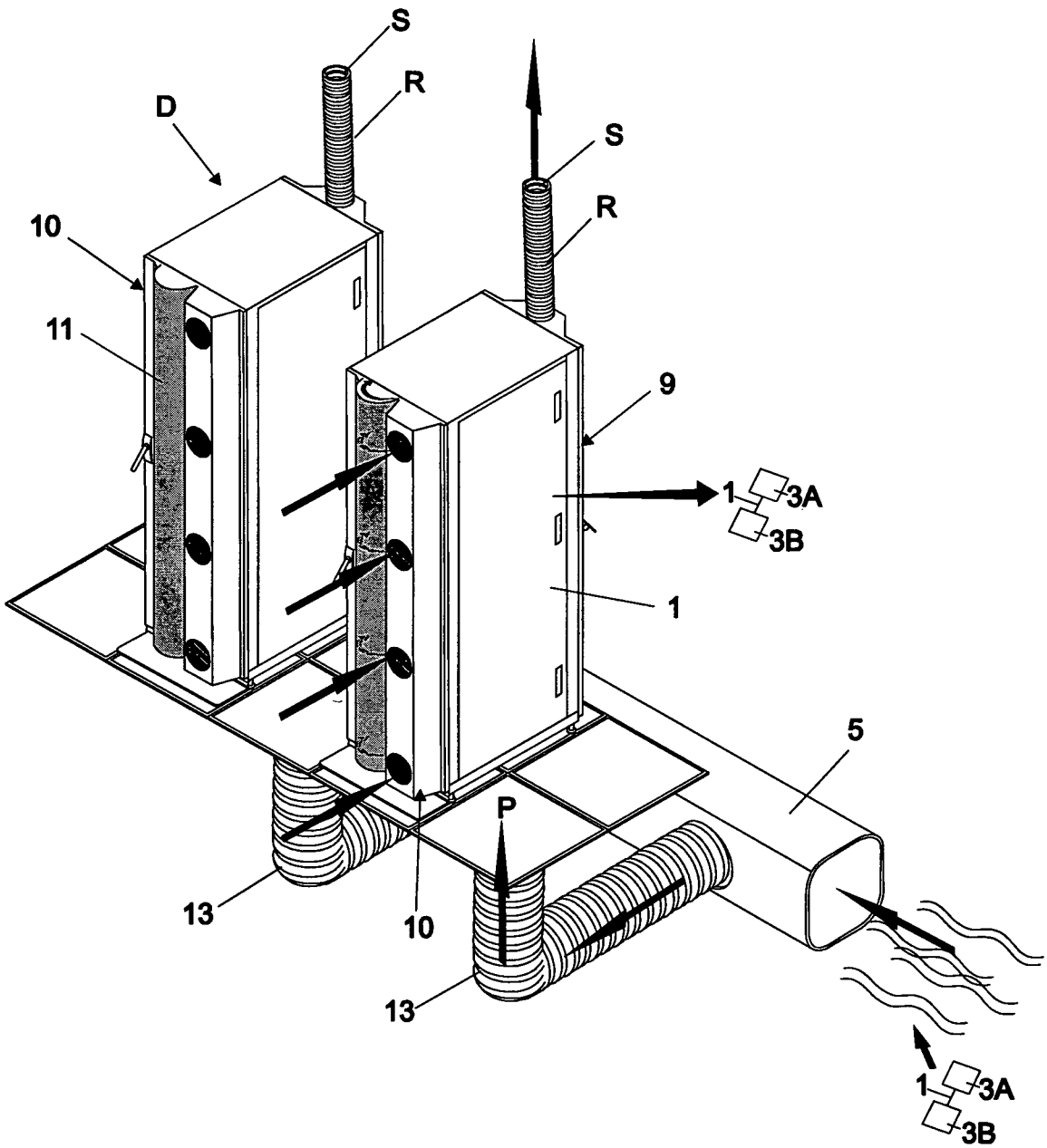


FIGURA 6



INTERNATIONAL SEARCH REPORT

International application No.
PCT/BR 2007/000198

A. CLASSIFICATION OF SUBJECT MATTER
IPC[8]: ***G06F 1/20*** (2006.01); ***H05K 1/20*** (2006.01)
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC[8]: G06F, H05K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Internet

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
WPI, EPODOC, TXTEN, TXTDE, NPL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JP 2005/182610 A (APISUTE KK) 7 July 2005 (07.07.2005) *Abstract; Figs.1,2,3a,3b and their associated descriptions; Claims* --	1
A	US 2004/100770 A1 (CHU RICHARD C. ET Al.) 27 May 2004 (27.05.2004) *Entire document* --	1
A	EP 1 571 532 A2 (HITACHI LTD.) 7 September 2005 (07.09.2005) *Abstract; Fig.1 and its associated description; Paragraphs 6-11; Claims* --	1

☒ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
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Date of the actual completion of the international search	Date of mailing of the international search report
12 October 2007 (12.10.2007)	25 October 2007 (25.10.2007)
Name and mailing address of the ISA/ AT **Austrian Patent Office** Dresdner Straße 87, A-1200 Vienna Facsimile No. +43 / 1 / 534 24 / 535	Authorized officer KÖGL C. Telephone No. +43 / 1 / 534 24 / 440

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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A	US 6 819 563 B1 (CHU RICHARD C. ET AL.) 16 November 2004 (16.11.2004) *Abstract; Fig.3 and its associated description; Column 2, line 37 to column 3, line 30; Claims 1 to 25* ----	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCZ/BR 2007/000198

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