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(54) **Apparatus based on electric motor that controls flow of conditioned air by opening and closing louvers of air outlet shutter**

(57) An apparatus that controls flow of air in central air-conditioning system into the building's rooms. The apparatus has an electric motor that is adjacent to the shutter installed over the conditioned air inlet into the room. A temperature sensor transmits a signal to a receptor that transmits a signal to the electric motor to close or open the shutter's louvers according to need, and thus control the flow of conditioned air into the room. The rotation of the electric motor leads to the opening or closing of the shutter so as to permit or prevent flow of conditioned air into the room.

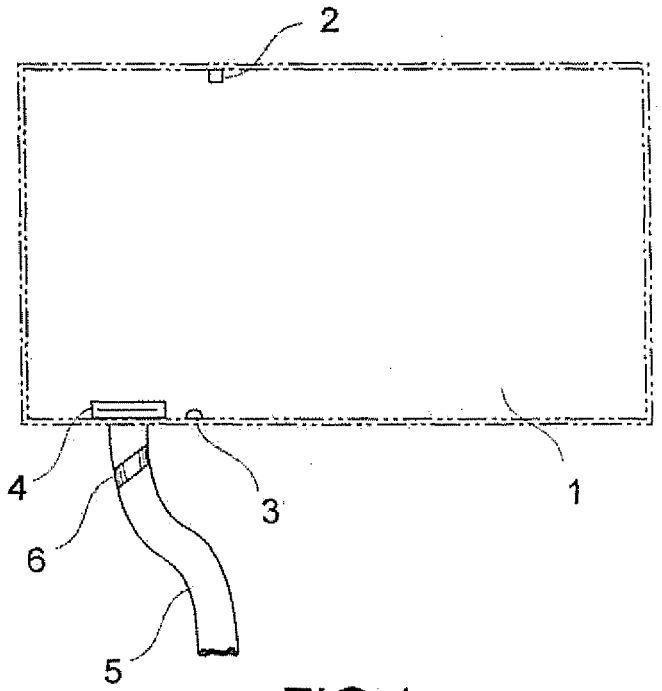

FIG 1

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Description

TECHNICAL FIELD

[0001] The present invention refers to an apparatus that controls the flow of conditioned air from the air-conditioning system into the rooms of a building. The apparatus has an electric motor that is installed near the shutter of the outlet of conditioned air into the room, and it is intended to replace the existing damper.

BACKGROUND ART

[0002] Many buildings are equipped with central and mini-duct central air-conditioning systems for cooling or heating of several rooms or spaces. Cold or hot air flows from the air conditioner's central section into ducts (5) (hereinafter referred to in this application as "the duct") that transport the conditioned air from the source to the outlet (1) into the relevant room. There is usually a separate duct for each room or space, leading directly from the air source to the relevant room. The duct outlet is equipped with a shutter (4), which, in most cases, can be closed or opened manually. It is customary that each room or space (1) (hereinafter referred to as "a room") is equipped with a remote control (2) that is used to set the desired temperature for that room. The remote control (2) has a temperature sensor, whereby when the temperature in the room reaches the desired temperature, the sensor senses it and transmits a signal (usually wireless) to a receptor (3), which is usually installed near the shutter (4). The receptor transmits a signal (usually via an electric wire) to the damper (6), which is located inside the duct (5). The damper is, in fact, a partition that can rotate about an axle and can assume several positions: Closed - such that it completely closes the duct and prevents flow of conditioned air into the relevant room; open - such that it does not impede the flow of air through the duct, from the air source into the relevant room; and midway position- such that it reduces the amount of air flowing into the room. The signal received from the receptor (3) determines the position of the damper. The damper is rotated by an electric motor.

So far this is all existing knowledge.

[0003] Two major problems stem from using dampers that are currently available.

[0004] First, when the damper (6) malfunctions, part of the acoustic ceiling must be removed and part of the duct (5), where the damper is located, must be disassembled to gain access in order to repair the damper or any of its accessories, including the electric motor that rotates the existing damper. Second, when installing the air-conditioning system, the duct must be cut at the point where the damper is to be located. Each cutting and reconnecting of the duct causes potential faults at that location and restricted access impedes execution of any work.

[0005] The present invention is an apparatus that is installed adjacent to the shutter (4) of the duct outlet (hereinafter referred to as "the shutter"), whereby the shutter itself acts as a damper, rendering the damper located within the duct, as is currently customary, unnecessary.

THE INVENTION

(The numbers in parentheses refer to the corresponding numbers in the drawings)

[0006] The apparatus, subject of the invention, is a device with an electric motor (11) that is installed adjacent to the shutter (4), preferably on the inner, concealed side of the shutter. The rotating axle of the electric motor is connected, by means of one or more gear wheels (9, 10), to the louvers (7) of the shutter (4), which can rotate about their axles (8) and thus close or open the shutter, or set it in several mid-way positions. This connection may be a direct connection between the motor and the shutter's louvers.

[0007] The sensor located in the remote control (2) transmits a signal to the receptor (3) to close or open the damper. The receptor is connected by means of electric wire (or wireless communication) to the electric motor (11) and instructs it to rotate the louvers (7) of the shutter (4) to the desired position (open, closed, mid-way position as pre-programmed, or to fan position, as explained below).

[0008] In fact, no fundamental changes are made in the remote control, sensor or receptor. The change is that, instead of transmitting the signal into the duct (5), to where the damper (6) was customarily located, the signal giving the instruction is now transmitted by the receptor (3) to the electric motor (11), which is located adjacent to the shutter (4).

The invention offers many advantages, including, among others:

[0009] First, in case of damper malfunction, there is no need to remove part of the acoustic ceiling and disassemble the duct at the location where the damper is installed. Access to the damper, subject of the invention, is simple and convenient.

[0010] Second, when installing the air-conditioning system, there is no need to cut the duct at the location where the damper was customarily installed. Such cutting and reconnecting of the duct leads to potential faults at that location which are avoided with the present invention. In addition, access to the duct outlet is more convenient than access to the location where the damper is currently customarily installed, a fact that makes execution of work easier.

[0011] Third, the damper, subject of the invention, can be used such that the shutter's louvers (7) move up and

down in a continuous manner like a fan, which leads to a more efficient distribution of the air flowing into the room.

[0012] Finally, the need to purchase and use the existing damper is rendered unnecessary.

[0013] The connection between the electric motor (11) and the shutter, and the transmission of power from the motor to open and close the shutter's louvers are based on the following components: The axle of the electric motor (11) is connected to a gear wheel (9) that is connected to another gear wheel (10), whose center (13) is physically connected to one of the axles of the shutter's (4) louvers (7). Thus, the rotation of the motor causes the louvers (7) to open or close.

[0014] The electric motor can be of the kind described in Specification No. 7.Components 12(1) - 12(5) can be made of metal or rigid plastic or any other rigid material. The gear wheels (9, 10) can be made of rigid plastic or metal or any other rigid material. The dowel (13) can also be made of metal or rigid plastic or any other rigid material.

[0015] While the present invention has been described in connection with what is considered the most practical and preferred embodiments, it is understood that this invention is not limited to the disclosed embodiments but is intended to cover various arrangements included within the spirit and scope of the broadest interpretation so as to encompass all such modifications and equivalent arrangements.

DESCRIPTION OF THE DRAWING

[0016] The drawings attached to the application are not intended to limit the scope of the invention and the possible ways of its application. The drawings are intended only to illustrate the invention and constitute only one of many possible ways of its application.

Drawing No. 1: Drawing No. 1 depicts the relevant room (1), remote control (2), receptor (3), shutter (4) located at the duct outlet (5), through which air flows from the air source into the room. Also shown is the currently existing damper (6).

Drawing No. 2: Drawing No. 2 depicts the currently existing damper (6).

Drawing No. 3: Drawing No. 3 depicts a standard shutter (4), although a wide variety of shutters is available.

Drawings No. 4a and 4b: Drawings No. 4a and 4b depict a standard shutter (4), in detail, including the shutter's louvers (7), which can rotate (open and close), and the axles (8) about which the louvers rotate. The axle (8) usually has a notch. The shutter may includes an additional shutter.

Drawing No. 5: Drawing Na. 5 depicts the components of the apparatus, subject of the invention: An electric motor (11), connected by means of an axle to a gear wheel (9) that is connected to another gear wheel (10). Hardware 12(1) - 12(5) that connect the electric motor (11) to the shutter (4). The center of the larger gear wheel (10) is denoted by the number 13, and on its other side (not shown in the drawing), there is a dowel (made of metal or any other rigid material) that transmits rotational power (the dowel is denoted in Drawing No. 6 by the number 14).

Drawing No. 6: Drawing No. 6 depicts the hardware mentioned in Drawing No. 5 from the other side, including the dowel (13) that is connected to the notch in the axle (8).

Drawings Nos. 8 and 9: Drawings Nos. 8 and 9 present two views of the apparatus.

Drawings Nos. 11 through 15: Drawings Nos. 11 through 15 depict the apparatus's hardware.

Claims

1. An apparatus that aimed to control the opening and closing of louvers of a shutter installed over an air-conditioning system's outlet into the room or space, which includes an electric motor that receives a signal from a receptor, as well as a connection between the said motor to the axle of one or more of the said shutter's louvers.

2. The apparatus as described in claim 1 further comprising an additional set of louvers behind the existing or the original louvers and wherein the said connection of the said motor is to the axle of one or more of the said additional louvers.

3. The apparatus as described in claim 2 wherein the said receptor receives signals from the original sensor of the system.

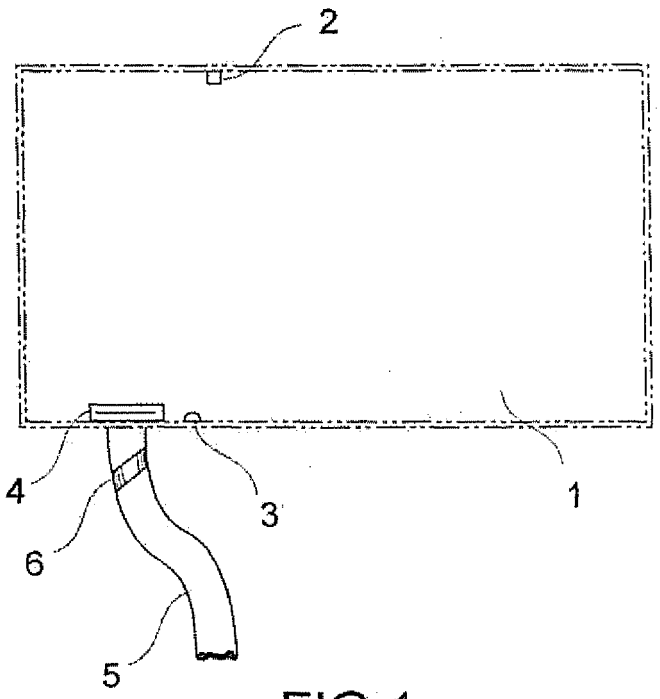

FIG 1

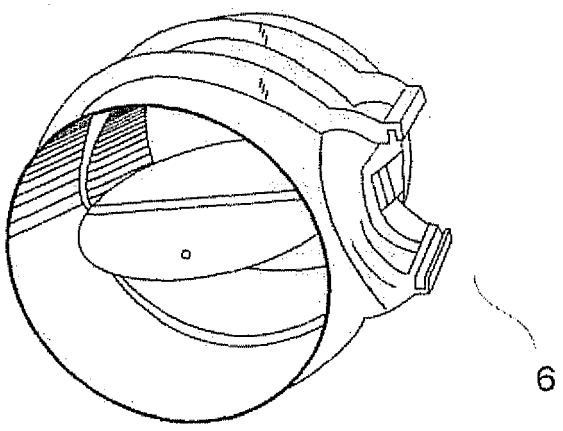

FIG 2

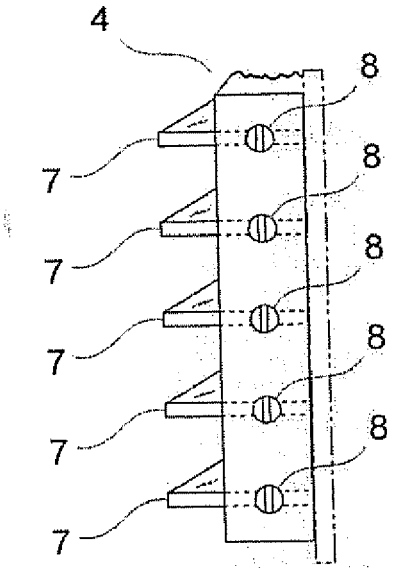

FIG 4a

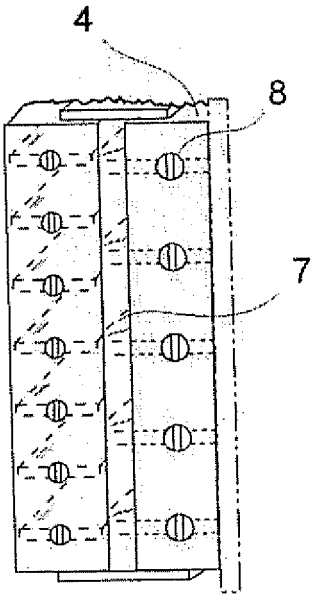

FIG 4b

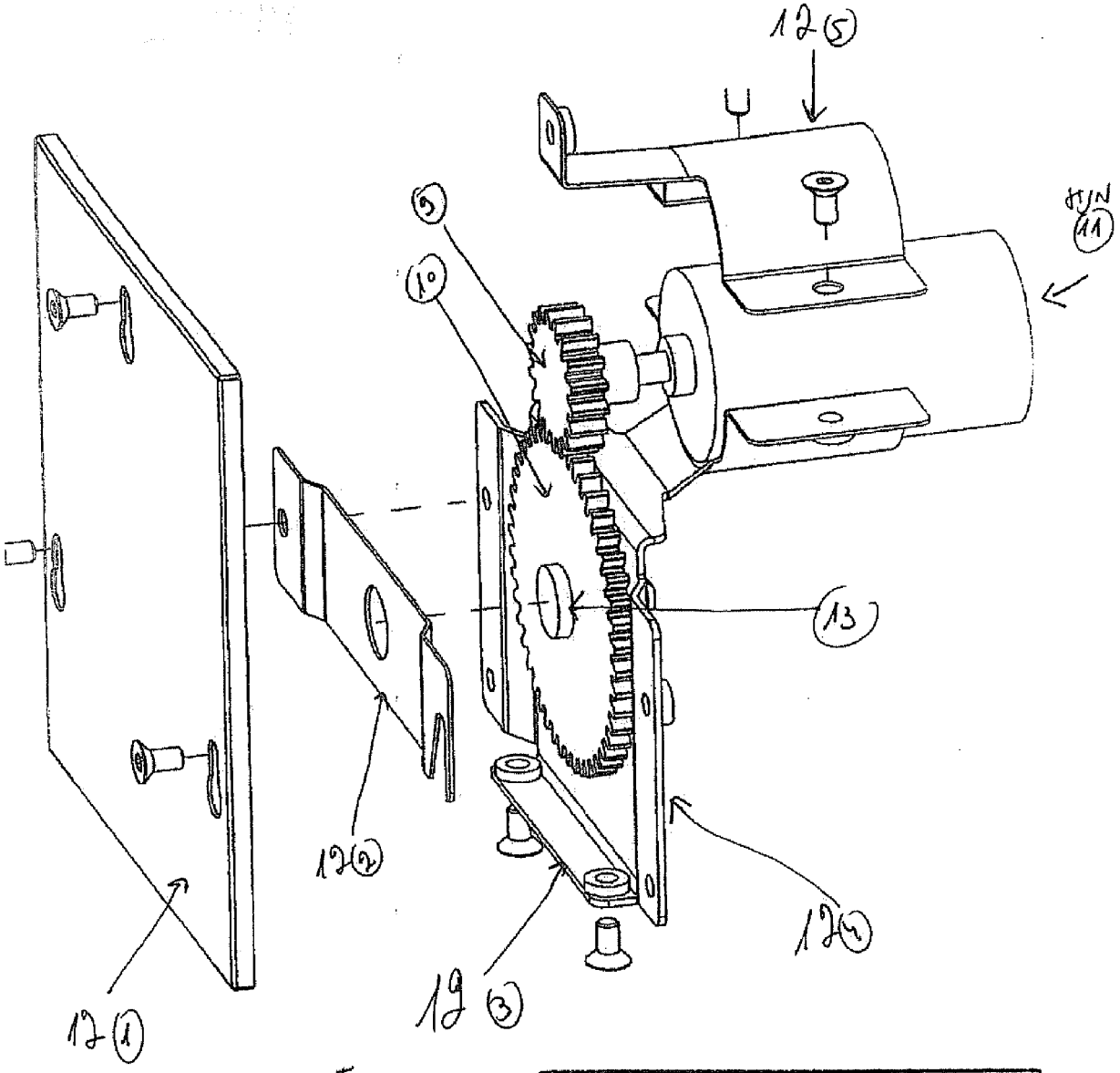

Fig.5

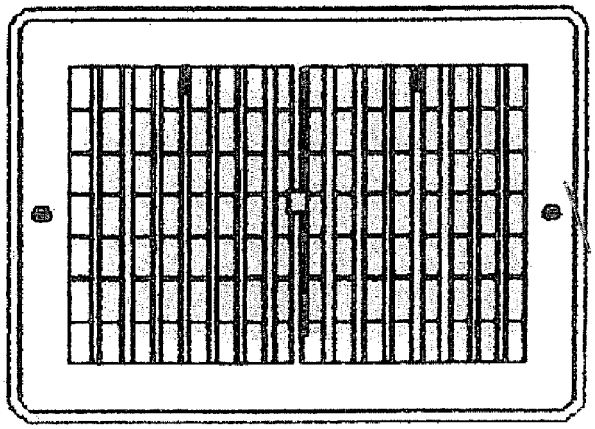

Fig.3 4

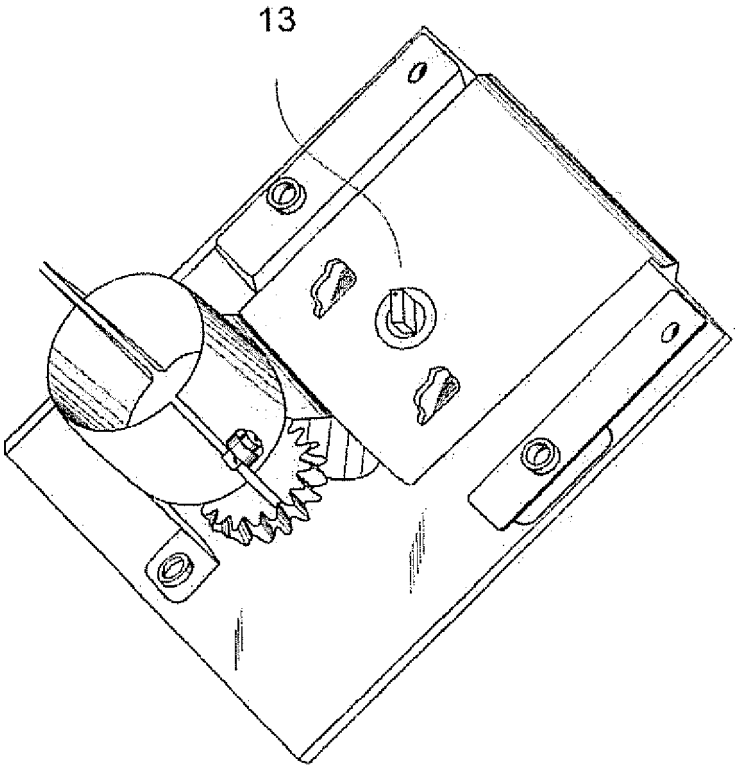

FIG 6

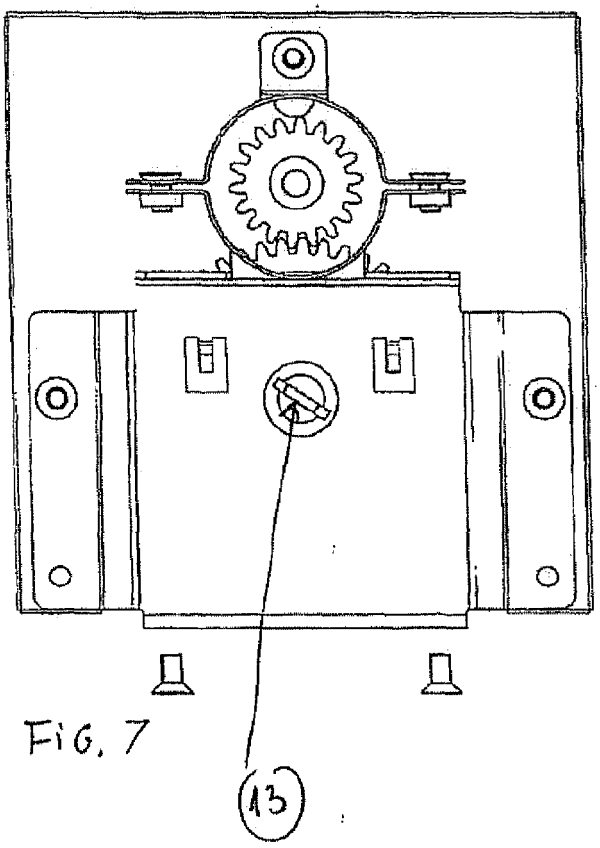

Fig. 7

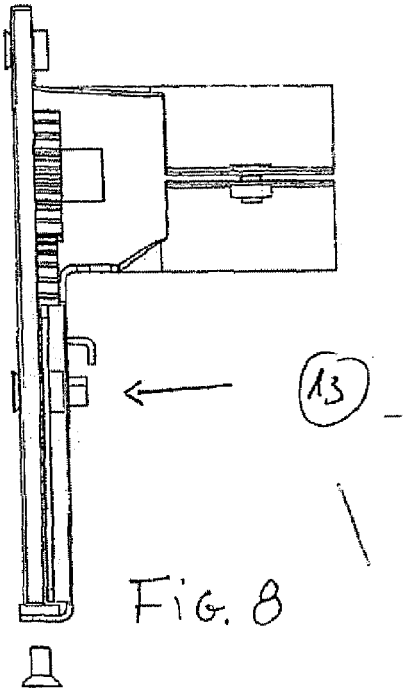

Fig. 8

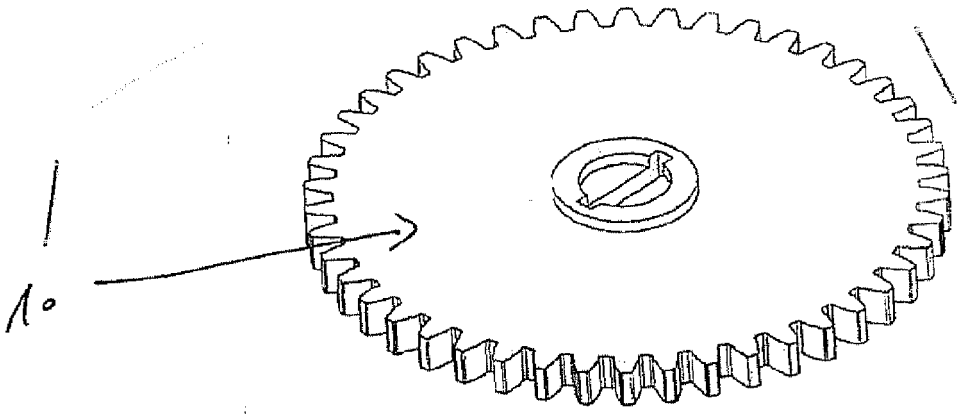

Fig. 9

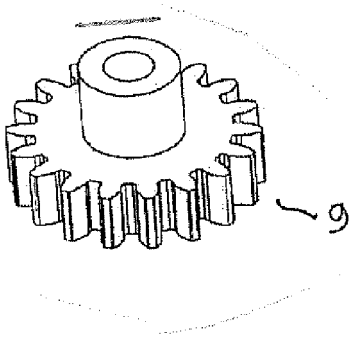

Fig. 10

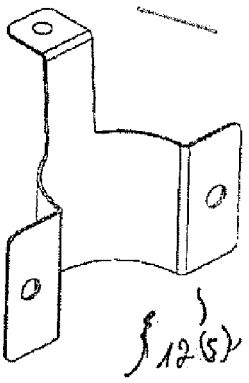

Fig. 11

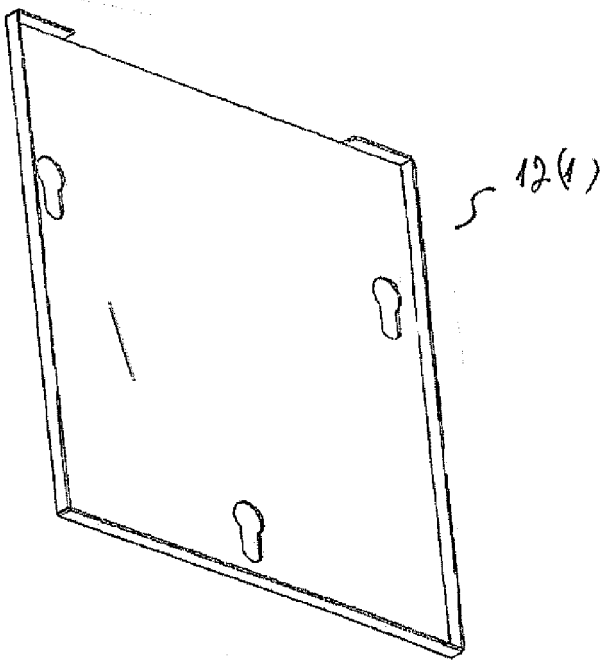

Fig. 13

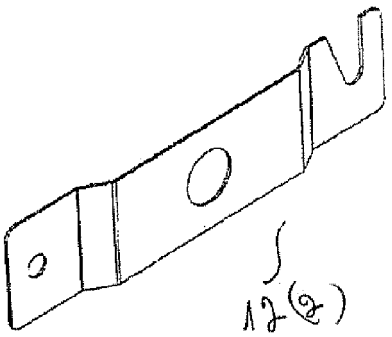

Fig. 12

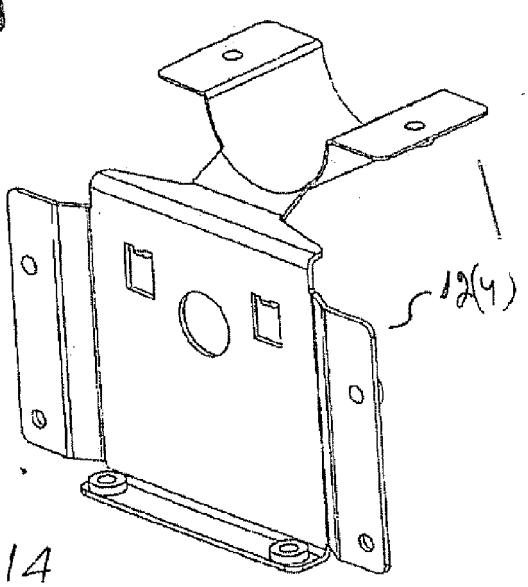

Fig. 14

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 08 15 4056

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
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X	JP 2000 028193 A (RISUTEMU KK; DAITO TEC KK) 25 January 2000 (2000-01-25) * the whole document *	1	
A	EP 0 644 381 A (SMITHS INDUSTRIES PLC [GB]) 22 March 1995 (1995-03-22) * the whole document *	2	
A	JP 03 230044 A (MITSUBISHI ELECTRIC CORP) 14 October 1991 (1991-10-14) * abstract; figures *	3	
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TECHNICAL FIELDS SEARCHED (IPC)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	22 September 2008	González-Granda, C

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO. EP 08 15 4056

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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22-09-2008

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