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(54) **Air conditioning device.**

(57) The invention relates to an air conditioning device for ceiling mounting comprising a number of box-shaped modules (2,3,30,31,36,37) which each has on either side in longitudinal direction a front side and a rear side and substantially the same breadth and height, wherein each module has on its rear side an air inlet (4) and on its front side an air outlet (5) and is provided with connecting means (7) for mutually connecting the modules in lengthwise direction. Arranged herein on the sides are mounting supports (13) which co-act with supports (11) suspended from a ceiling and which are mounting supports engaging slidably at least on one side in a mounting rail (11) suspended from the ceiling.

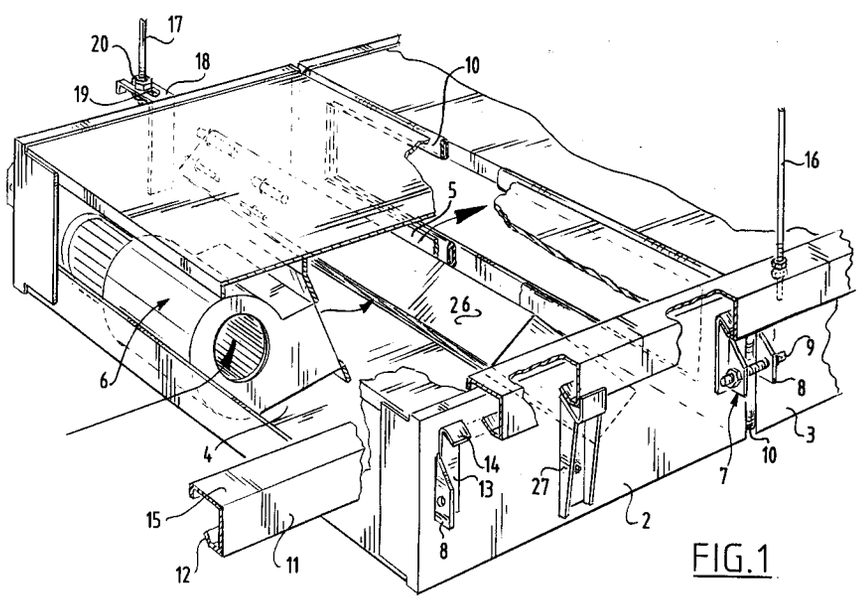


FIG.1

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The invention relates to an air conditioning device for ceiling fitting.

The conditioning devices of this type are usually built into the space between the structure ceiling and a lowered, suspended ceiling.

Air conditioning devices comprise for instance fans, heating and cooling heat exchangers, air filters, connecting elements for air ducts and the like. These air conditioning devices are therefore sizeable and heavy. Fitting such a device to a ceiling requires special lifting equipment for positioning the device for mounting at the correct location. In the case of maintenance or repair the whole device often has to be detached from the ceiling, for which the special lifting equipment is once again required. Carrying out repairs in this manner in a planned office environment is highly inconvenient.

With the air conditioning device according to the invention as characterized in claim 1 a device is provided which does not have these drawbacks. The modules, which per se each have a weight such that they are easy to manipulate, can be suspended one by one in their position on the ceiling. The individual modules are pushed against each other and mutually connected with the connecting means.

In the case that repair or replacement of a module is necessary, the connecting means are released, the adjoining modules shifted slightly sideways and the module for repairing or replacing are simple to remove. The inconvenience for the surrounding area during repair operations is thus limited to a minimum.

Further features and advantages of the invention will become apparent from the following description with reference to the embodiments shown in the figures.

Fig. 1 shows in partly broken away perspective view a part of a device according to the invention.

Fig. 2 shows a module for use in the device according to the invention.

Fig. 3-6 show schematic longitudinal sections of different assemblies of the conditioning device according to the invention.

The air conditioning device 1 according to the invention shown in fig. 1 comprises a first module 2 and a second module 3 connected thereto. Each module is box-shaped and has a front and rear side. An air inlet 4 is defined in the rear side and an air outlet 5 is defined in the opposite front side.

The module 2 is a module in which is mounted a fan 6 and, connecting thereto, a heat exchanger 26. The heat exchanger 26 can cool or heat the air flow generated by fan 6. The air is drawn in by fan 6 through air inlet 4 of module 2 and blown out of module 2 at the front through outlet 5.

The air conditioning device 1 according to the invention is assembled from modules having the same basic dimensions. That is, these modules have a similar height and width. The modules are joined to each other by connecting means, which are generally designated with the reference numeral 7. Because each module has on its front side an outlet and on its rear side an inlet opening, the inlet and outlet of two successive modules are mutually connecting.

As shown in fig. 1, a compressible sealing profile 10 is arranged around air outlet 5. When the modules 2 and 3 are joined together by means of connecting means 7 the sealing profile 10 is somewhat compressed and thus provides a good sealing connection between the modules.

In this embodiment the connecting means 7 are integrated with mounting supports 13 to be described further in more detail. The connecting means are formed by lips 8 which protrude from mounting supports 13 and in which is arranged a bore. A bolt 9 is inserted through the two bores of the lips of mounting supports of modules for mutual connection, on the end of which bolt a nut is screwed in order to tighten the modules against each other.

A blind rivet nut is preferably arranged in a bore of one of the lips 8 so that for assembly only a bolt has to be placed through the bore in the opposite lip and screwed fixedly into the blind rivet nut. Assembly is hereby simplified.

Each module is provided on its opposite sides with mounting supports with which it can be suspended from a ceiling. Arranged at least on one side, the right-hand side as seen in fig. 1, are mounting supports 13 which co-act with a mounting rail 11 which is suspended from the ceiling by means of threaded rods in otherwise per se known manner. Mounting rail 11 is provided on its underside with a flange 12 protruding obliquely upward which co-acts with a hook portion 14 of each mounting support 13.

Arranged on the opposite side is a bracket 18 in which a slot 19 is recessed. Each module is placed in position simply by placing it inclining upward and hooking it with the hooks 14 behind the flange 12 of the mounting rail 11. The module can then be pivoted upward to a height at which the threaded rod 17 can be hooked with a nut screwed onto the bottom end thereof into the slot 19 of bracket 18. A locking nut 20 is subsequently arranged to fix the connection. After the mounting rail 11 has thus been suspended from the ceiling at the correct height and the threaded rods 17 have also been fitted, the different modules of the device can be arranged simply by hooking in and pivoting upward. Depending on the weight of the individual modules, this can be done by one or two persons.

In addition to the upward inclining flange 12 coacting with the hook 14 on the modules, the

mounting rail 11 is also provided with an upper flange 15 which, in the fitted situation shown in fig. 1, lies closely above a top surface of the modules. After the module has been pivoted upward the flange 15 prevents the modules moving upward in relation to mounting profile 11, so that the hooks 14 can no longer come free of the flange 12. In this situation the modules are, however, still slidable relative to the rail 11. The modules are thus hung one by one in the mounting rail, whereafter a mutual airtight connection is made in the above described manner by means of the fastening means 7.

In addition to the mutual airtight connection, which is necessary for a good operation of the device, the devices also have a mutual sound-proof connection. This prevents noise escaping through the connections or sounds from one room area passing into another space via a leakage of sound in the air conditioning device.

When a module must be detached, only the fastening means 7 have to be released and the adjoining module shifted slightly sideways and the relevant module can be removed simply and if necessary replaced by another.

In order to fix the device assembled from the modules retaining elements 27 are arranged which lie on the underside against the upward inclining flange 12 of mounting rail 11, thereby securing it. In this way the device and the modules can no longer come loose from the mounting rail 11.

The second module 3 of the device according to the invention designated in fig. 1 is shown in more detail in fig. 2. This relates to a sound-damping module. As shown, this module also has a box shape and substantially the same width and height as the module 2. The mounting supports 13 are identical to those of module 2 and can be suspended in the mounting rail 11 in a manner corresponding to that described above. Module 3 likewise has an air inlet 21 on its rear side and an air outlet 22 on its front side. A quantity of sound-damping material in the form of glass wool 23 or the like is arranged in module 3. Rockwool or another type of mineral wool can for instance be employed instead of glass wool. Open-cell foam plastic such as polyurethane foam can also be applied as sound-damping material. A per se known product with an open-cell, smooth top layer that is commercially available under the name LINACOUSTIC can be used on the sound-damping material. Sound vibrations are present in the air stream flowing through the module 3 during operation which penetrate into the sound-damping material 23 and are there damped. The departing air flow is thereby markedly quieter than the entering air flow, which for air conditioning devices in for instance office spaces is desirable to prevent as far as possible inconvenience due to noise of fan air.

Fig. 3 shows a schematic longitudinal section of an air conditioning device according to the invention which is likewise assembled from a number of modules. Likewise present in the device of fig. 3 is a module 2 in which are accommodated a fan and heat exchanger. In front of this module 2 is connected a module 30 in which an electric heating element is arranged. This electric heating element can for instance be used when the regular heating installation is switched off or set to a lower temperature out of normal office hours.

Module 31 has an inlet 32 for outside air and a remotely controllable valve 33 with which either the outside air inlet 32 or the normal inlet can be closed. Outside air or recirculation air can thus be drawn as desired into the device.

Module 34 is a connecting module which forms a transition from one or more circular feed tubes to the rectangular inlet of module 31. The module 35 on the opposite end is a similar connecting module enabling connection of one or more round tubes onto the air conditioning device.

Modules 34 and 35 are called plenum modules and consist of a rectangular casing onto which are arranged the spigots for the transition from rectangular to round.

Fig. 4 shows another air conditioning device likewise assembled from a number of modules. Here too the module 2 is the central module which provides the generating and heating or cooling of the air flow. A module 37 is arranged on the inlet side of module 2. This module 37 is an air filter module in which is arranged a number of bag-type filters.

Connecting onto module 2 on the left-hand side is a module 36 which is a sound-damping module with in principle the same operation as module 3 of fig. 2. Fig. 5 shows a simplified embodiment which consists of the basic module 2 and a sound-damping module 36 connected thereto.

Finally, fig. 6 shows that the basic module 2 can also be used separately.

With the invention it is possible to assemble air conditioning devices wholly in accordance with the wishes of a user, wherein the device is assembled from a number of modules which can be held in stock. In addition to the above mentioned advantages relating to installation and maintenance, the invention also provides the advantage that a device can be supplied very rapidly which is adapted to the specific wishes of a user without many different complete devices having to be held in stock. Only a few of each of the modules has to be kept in stock. A defective module can thus also be replaced very quickly in the case of malfunction.

Claims

1. Air conditioning device for ceiling mounting comprising a number of box-shaped modules which each has on either side in longitudinal direction a front side and a rear side and substantially the same breadth and height, wherein each module has on its rear side an air inlet and on its front side an air outlet and is provided with connecting means for mutually connecting modules in lengthwise direction, and wherein mounting supports are arranged on the sides which co-act with supports suspended from a ceiling and which are mounting supports engaging slidably at least on one side in a mounting rail suspended from the ceiling.

2. Air conditioning device as claimed in claim 1, wherein a compressible sealing profile is arranged around the air inlet or outlet.

3. Air conditioning device as claimed in claim 1 or 2, wherein the slidable mounting supports comprise hook portions protruding obliquely downward and the mounting rail has an upwardly inclining flange co-acting therewith and in the fitted situation a locking flange protruding closely above a part of the module defining a horizontal surface.

4. Air conditioning device as claimed in claim 3, comprising a securable retaining element lying in the fitted situation beneath and against the upward inclining flange.

5. Module for an air conditioning device as claimed in any of the foregoing claims.

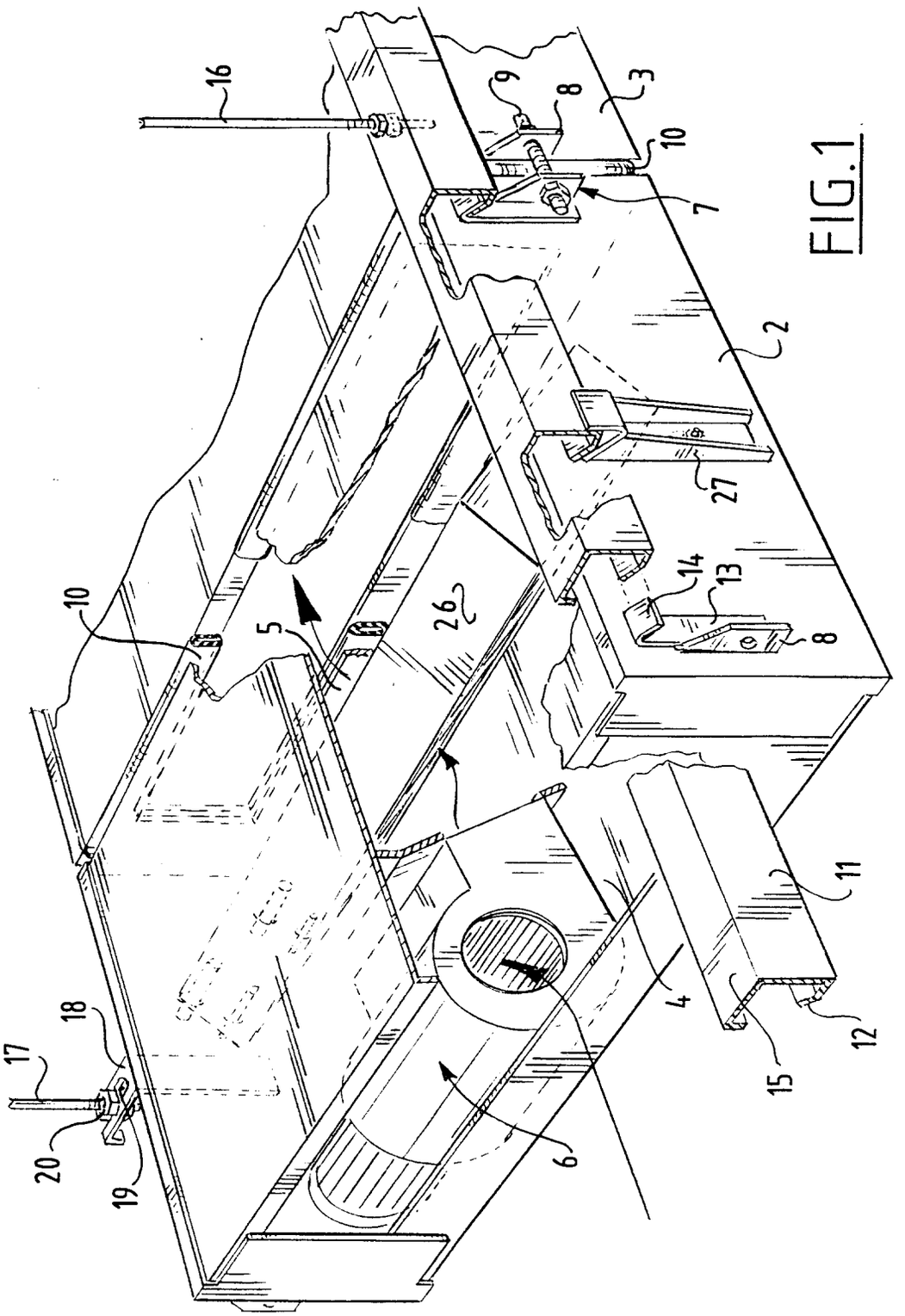


FIG.1

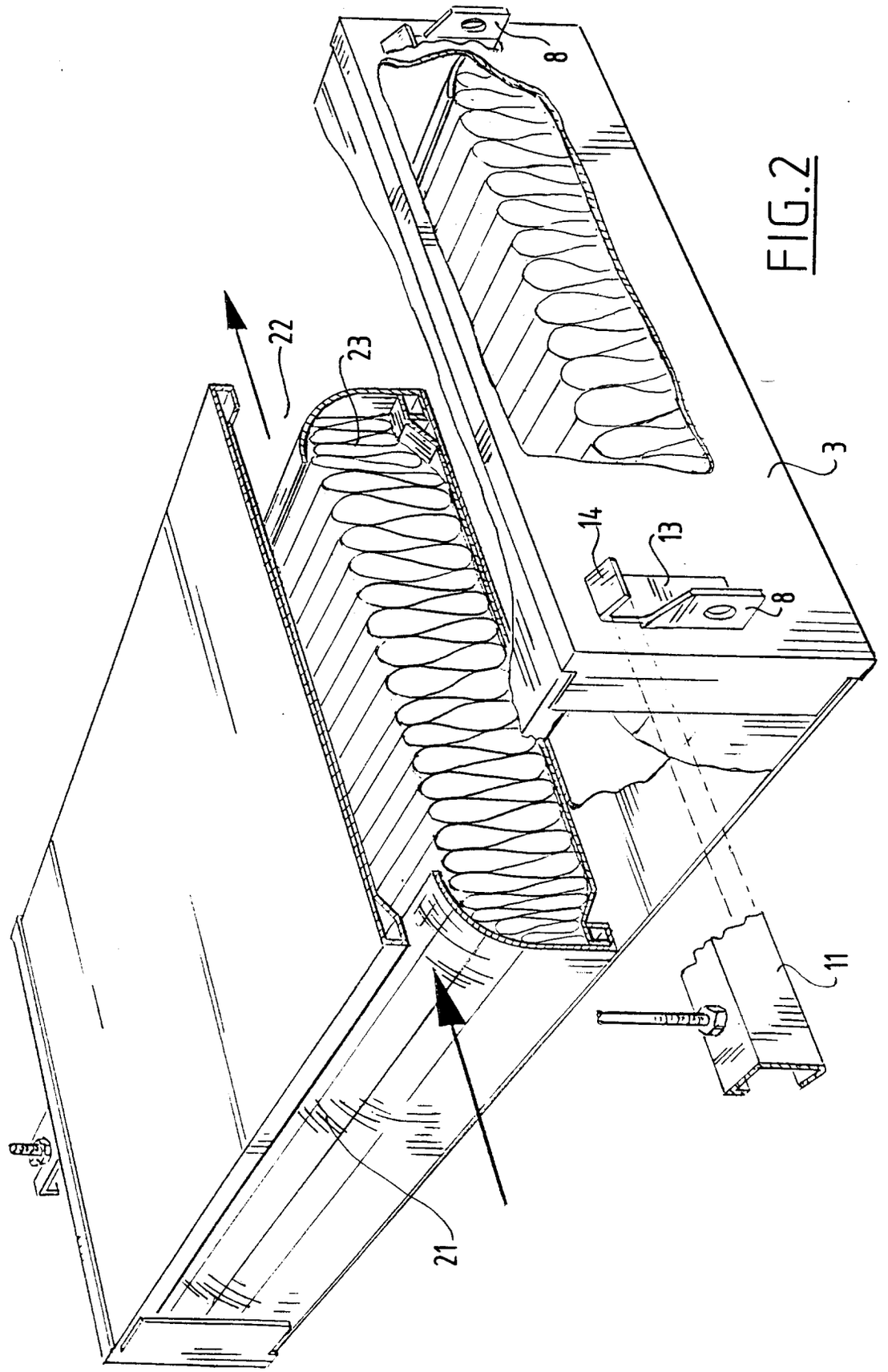


FIG.2

FIG.3

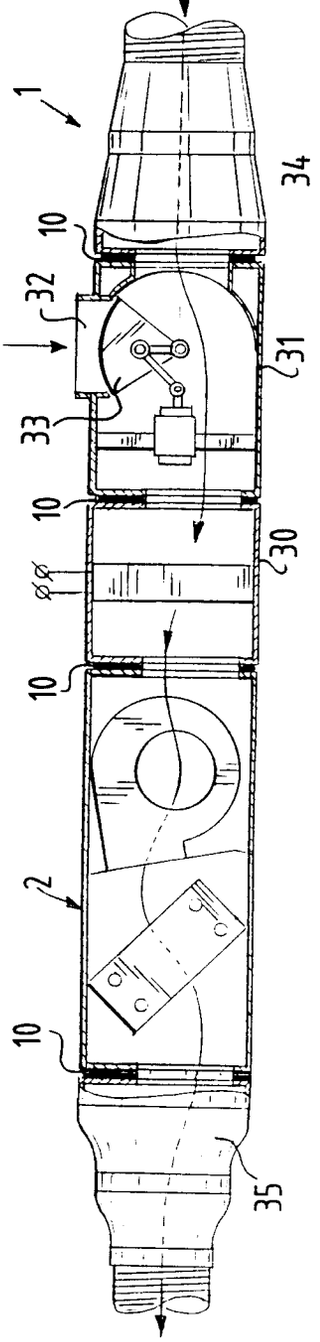


FIG.4

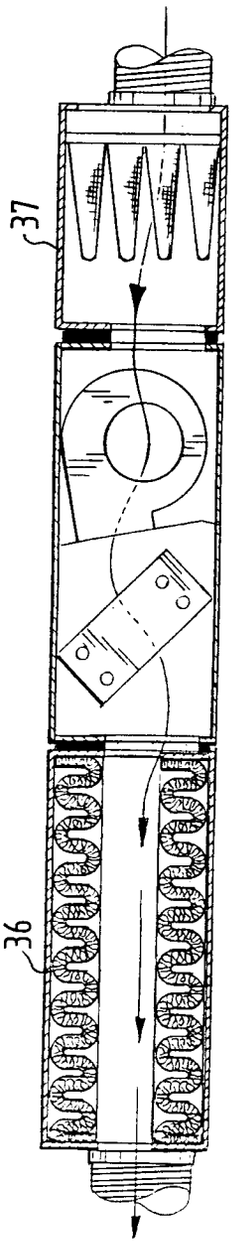


FIG.5

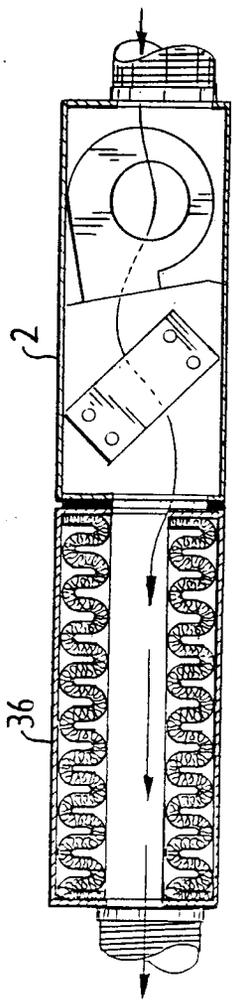
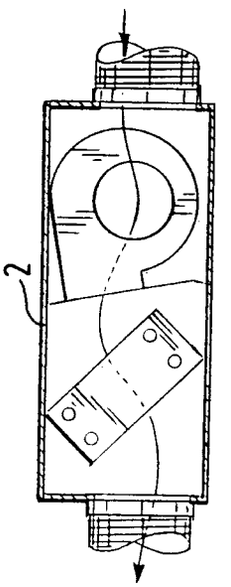


FIG.6



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EUROPEAN SEARCH REPORT

Application Number

EP 93 20 0072

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	GB-A-623 113 (SVENSKA FLAKTFABRIKEN) * page 1, line 67 - page 2, line 75; figures 1,13 *	1,5	F24F13/00 F24F13/20 F24F13/24
A	EP-A-0 038 550 (VEREINIGTE METALLWERKE RANSHOFEN-BERNDORF) * page 2, line 34 - page 3, line 22; figure 1 *	1	

TECHNICAL FIELDS SEARCHED (Int. Cl.5)

F24F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	21 APRIL 1993	PESCHEL G.

CATEGORY OF CITED DOCUMENTS

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