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(54) **System for the recovery of heat for air-conditioning and reduction of the cold passage effect.**

(57) It is a system that uses the air heated during the process of condensation of the refrigerant in condenser units (1) belonging to refrigerating circuits of open refrigerating cabinets (2) of stores where different foods are sold.

The system includes means to adequately channel the heated air, mainly towards the inside of the establishment in winter and towards the outside in summer.

Conventionally, at best, the air heated by the condenser units (1) always flows towards the inside of the store. In other cases, this air is expelled to the outside when the condenser units (1) are located outside the establishment.

In any case, means to adequately channel this stream of heated air for the use thereof as in the case of the invention in question have not been provided for.

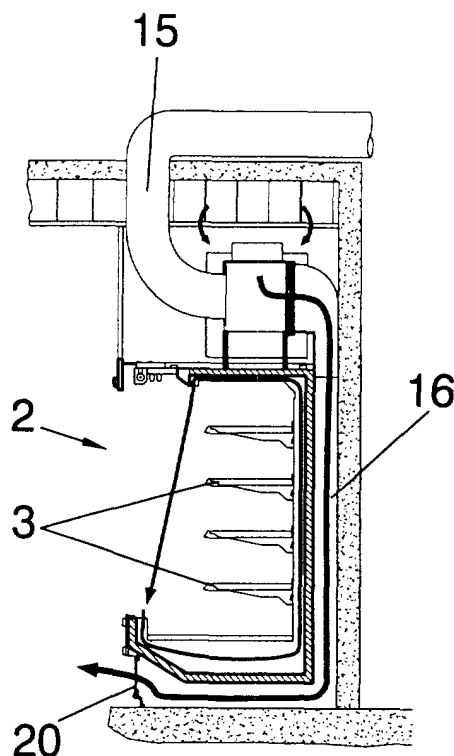


FIG. 1

EP 1 202 008 A2

Description

[0001] The invention refers to a system for the recovery of heat for air-conditioning and reduction of the cold passage effect.

[0002] The system takes advantage of the heat given off during the process of condensation of the refrigerant of the condenser units belonging to the refrigerating circuits of the linear refrigerated display units (open vertical refrigerating cabinets) of stores where perishable food products are sold, in order to use this heat as air-conditioning and to eliminate the effect known as "cold passage", that occurs in the front of said linear refrigerated display units of vertical refrigerating cabinets.

[0003] Therefore, the object of the invention is to use the heat produced and given off by the condenser units of refrigerating elements for air-conditioning and for the elimination of the so-called cold passage effect, as it has been stated above.

BACKGROUND OF THE INVENTION

[0004] Establishments dedicated to the distribution of perishable food products are provided with different types of refrigerating cabinets designed exclusively for the selling of different products. One of these types of refrigerating cabinets is the so-called open vertical refrigerating cabinets. They are refrigerators provided with racks and open in the front so that the buyer can have easy access to the merchandize. Due to their design and in order to be able to keep the enclosure of the racks of said cabinets at the desired refrigerating temperature, they are provided with an air curtain that delimits the environment of the store from the inside environment of said refrigerating cabinets.

[0005] This curtain, at its outside surface is in contact with the air belonging to the store, for which reason the air curtain upon having a temperature colder than the temperature of the store absorbs part of the heat of the store, producing close to these linear refrigerated display units a local reduction of the environmental temperature of around five to ten degrees Kelvin, depending on the amount of refrigerating cabinets that form the corresponding linear refrigerated display units. This absorbed heat will be greater the larger the linear refrigerated display unit is, since this cooling is proportional to the cold density installed. The ratio is expressed between the refrigerating power removed from the refrigerating cabinets and the selling surface. This local reduction of the environmental temperature close to this type of refrigerating cabinets produces environmental discomfort to the buyer, since this passage is too cold and therefore customers tend to walk away from these passages and this produces a reduction of sales.

[0006] Nowadays there are some methods in order to reduce this inconvenience, one of them is the use of grilles in the bottom part of the cabinets which by means of fans collect the cold air of the passage and channel

it for removal thereof.

[0007] There are also cabinets where the condenser of the refrigerating system is installed in the top part of the cabinets (if they are small cabinets the condenser unit is located in the bottom part), but the only thing that the condenser does is absorb air belonging to the store and return it thereto with all the heat given off during condensation, with the subsequent increase of the temperature of the store in hot seasons and the subsequent economic detriment, since this heat has to be removed by means of increasing the power of the air-conditioning system.

[0008] In large retail stores, the condenser units are centralized in a machine room so that the heat of the condensers is removed to the outside of the store by means of conduits or else the condensers are located outside the store. In some cases this heat is used by channeling it again to the store by means of the air-conditioning system.

DESCRIPTION OF THE INVENTION

[0009] In order to achieve the aims and to avoid the above-cited inconveniences, the invention proposes a system for the recovery of heat for air-conditioning and reduction of the cold passage effect.

[0010] The system of the invention is applicable to refrigerating cabinets designed to sell food products.

[0011] These cabinets are located in stores.

[0012] Starting from this premise, the system of the invention comprises in principle a condenser unit for each refrigerating cabinet that is installed in the top part thereof.

[0013] The condenser unit is located inside an immobilized box that comprises three different areas.

[0014] A first area where there is the air inlet in order to cool the condenser, which is provided with an interchangeable filter in order to facilitate the cleaning and maintenance thereof. Besides in this first area there is a low sound level compressor, aside from a liquid vessel or drum, as well as the remaining automatic devices for the adjustment of the refrigerating installation.

[0015] A second area connected with the preceding one by means of an intermediate opening in order to facilitate the passage of the air where the condenser itself is located.

[0016] A third area also connected with the preceding area where an exhaust element is located, such as a low pressure axial fan that is the one that facilitates the circulation of air, in such a way that in the end part of this third area there is an air outlet that is provided with a slat shutter that prevents the undesired return of any air stream.

[0017] The assembly of the condenser unit is fastened to the top part of the refrigerating cabinet by means of a bed assembled on some dampers in order to eliminate the possible vibrations that this unit transmits to the cabinet.

[0018] Next and connected by means of a rubber tube that damps the possible vibrations of the condenser unit there is an air distributor, whose purpose is to channel the air to the inside of the store or to the outside of the store depending on what is convenient and what is desired.

[0019] For this purpose, this distributor has an inlet for the air coming from the condenser unit and two outlets, one of them that connects with the inside of the store by means of an appropriate conduit and a second outlet that connects with the outside by means of a corresponding duct.

[0020] Hence, in the summer position the distributor directs the hot air coming from the condenser unit towards the outside of the establishment whereas in the winter position the distributor directs the hot air coming from the condenser unit towards the inside of the store.

[0021] The operation of the distributor can be carried out manually and also by means of a motor with insertion of a switch that selects the summer position or the winter position at the user's will. The operation of the distributor can be carried out automatically by including a thermostat, in such a way that depending on the temperature desired in the passage, the motor is actuated so that the distributor is automatically positioned in the summer or winter position.

[0022] This system also has the advantage that since the condenser unit is located in the top part of the cabinet, the tubing up to the condenser unit is very short, with the subsequent reduction of the load of refrigerant in the installation.

[0023] Hereinafter to provide a better understanding of this specification and forming an integral part thereof, some figures in which the object of the invention has been represented in an illustrative and non-restrictive manner are attached.

BRIEF DESCRIPTION OF THE DRAWINGS

[0024]

Figure 1 shows a sectioned profile view of a refrigerating cabinet that includes the system for the recovery of heat for air-conditioning and reduction of the cold passage effect, object of the invention. In this case a refrigerating air curtain and a hot air stream produced by the refrigerating system of the cabinet are shown. This hot air stream is used and directed towards the inside of the store. Furthermore, the system of the invention is installed in the top part of the corresponding refrigerating cabinet. Figure 2 shows a front view of that which has been represented in the preceding figure. Figure 3 shows a plan view of that which has been represented in the two preceding figures. Figure 4 shows a view similar to the one of figure 1 where the hot air stream produced by the refrigerating cabinet is directed towards the outside since

it is essentially a summer season, in such a way that in all cases this air stream is controlled by means of a distributing device that forms part of the system of the invention.

Figure 5 shows a plan view of that which has been represented in the preceding figure.

Figure 6 shows a schematic view of a condenser unit that forms part of the assembly of the system of the invention.

Figures 7 to 9 show different views of the distributing device that channels the hot air stream produced by the refrigerating cabinet.

DESCRIPTION OF THE PREFERRED EMBODIMENT

[0025] An embodiment of the invention is described hereinafter referring to the numbering used in the figures.

[0026] In principle it comprises a condenser unit (1) that is installed in the top part of some open refrigerating cabinets (2) located in stores or commercial establishments, cabinets that are open in the front and that include on their racks different food products to be sold to the public. These products are thus maintained perfectly preserved, at the same time that they are easily accessible to the public.

[0027] The condenser unit (1) is located inside a duly soundproofed box (4) that comprises in principle a front area, a center area and a rear area, all of them successively connected to each other.

[0028] The front area includes a compressor (5), a liquid vessel or drum (6), as well as the remaining automatic devices needed for the adjustment of the refrigerating installation.

[0029] The center area includes a condenser itself (7).

[0030] The rear area includes a low pressure axial fan (8) that facilitates the circulation of the air that enters through an inlet (9) of the box (4), said inlet being located in the front area and said air comes out through an outlet (10) of the cited box (4), said outlet being located in the area in correspondence with the axial fan (8).

[0031] This air stream goes through each area of the condenser unit (1), in such a way that upon passing through the center area, the air is heated due to the heat given off by the condenser (7), in such a way that the air comes outside the box (4) at a relatively hot temperature.

[0032] It should be pointed out that in the inlet (9) there is an interchangeable filter (11) in order to facilitate the cleaning and maintenance thereof, thus preventing the accumulation of dirt in the flaps of the condenser (7).

[0033] The outlet (10) includes a small slat shutter (12) that prevents the undesired return of air when the condenser unit (1) is not operating, preventing the inappropriate entry of other air streams coming from other condenser units or simply from the outside.

[0034] Following the condenser unit (1), an air distributor (13) is installed. A rubber tube (14) that damps pos-

sible vibrations of the condenser unit (1) is inserted therein.

[0035] This distributor (13) of the air that flows through the outlet (10) of the condenser unit channels the hot air towards the outside of the establishment in the summer or towards the inside in winter, in both cases through some appropriate conduits (15) and (16) that originate in the distributor (13).

[0036] For this purpose, this distributor (13) includes an inlet (17) for the air coming from the condenser unit (1) and two outlets: a side one (18) connected to the conduit (15) that directs the air to the outside and a bottom outlet (19) connected to the conduit (16) that directs the air to the inside of the store with the insertion of some grilles (20). Said conduit (16) is located in the rear part of the refrigerating cabinet (2) and ends in the cited grilles (20) located in the bottom part of the refrigerating cabinet (2).

[0037] The distributor (13) also includes a damper (21) that can take on two stable positions: one where it directs hot air essentially towards the inside of the store during the winter and the other one that directs this air essentially towards the outside of the store during the summer.

[0038] The damper (21) can be operated manually and also by a motor (22) connected thereto. Said motor can be actuated by means of using a switch that selects the summer or winter position at the user's will. This actuation can also be carried out automatically by means of installing a thermostat, which depending on the temperature desired in the passage, actuates the motor so that the distributor is automatically positioned in the summer or winter position.

Claims

1. System for the recovery of heat for air-conditioning and reduction of the cold passage effect, that comprises a condenser unit essentially installed in the top part of an open refrigerating cabinet located inside an establishment, a condenser unit that gives off heat increasing the temperature of the air that passes through said condenser unit, **characterized in that** it includes means to direct the air heated by the condenser unit, either towards the inside of the establishment where the refrigerating cabinet (2) is located or towards the outside of said establishment, as well as to any other place.
2. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to the preceding claim, **characterized in that** the means to direct the hot air of the condenser unit consist of a distributing device (13) that has at least one inlet receiving the air coming from the condenser unit (1) and two outlets: a side one (18) that directs the air stream towards the outside of the es-

tablishment through a conduit (15) and an outside outlet (19) that directs the air stream towards the inside of the establishment through a conduit (16).

3. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to the preceding claim, **characterized in that** the conduit (16) that directs the air towards the inside of the establishment is essentially arranged behind the refrigerating cabinet (2).
4. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to claim 2, **characterized in that** the conduit (16) that directs the air towards the inside of the establishment ends in some air outlet grilles (20) located in the bottom part of the refrigerating cabinet (2).
5. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to claim 2, **characterized in that** the distributing device (13) includes a damper (21) that can take on at least two stable positions: one where it connects the inlet (17) with the side outlet (18) and the other position where it connects the inlet (17) with the bottom outlet (19).
6. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to the preceding claim, **characterized in that** the damper (21) of the distributor (13) is actuated and positioned by means of a motor (22) with insertion of a switch.
7. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to claim 5, **characterized in that** the actuation of the motor (22) is carried out automatically by means of installing a thermostat, which depending on the temperature desired in the passage the motor (22) is actuated so that the distributor (13) is positioned automatically in the summer or winter position.
8. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to claims 1 and 2, **characterized in that** the condenser unit (1) is located in a closed box (4) that has an air inlet (9) and an air outlet (10) that connects with the inlet (17) of the distributor (13) by means of a rubber tube (14).
9. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to the preceding claim, **characterized in that** the closed box (4) includes an exhaust element (8) of the air heated in the condenser unit (1), exhaust element (8) that ends in the outlet (10) of the closed box (4).

10. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to claim 8, **characterized in that** it includes an interchangeable filter (11), located in the inlet (9), all so that the accumulation of dirt in the condenser itself (7) that forms part of the assembly of the condenser unit (1) is prevented. 5

11. System for the recovery of heat for air-conditioning and reduction of the cold passage effect according to claim 8, **characterized in that** it includes a slat shutter (12) that prevents the undesired return of any air stream towards the inside of the box (4) where the condenser unit (1) is located. 10

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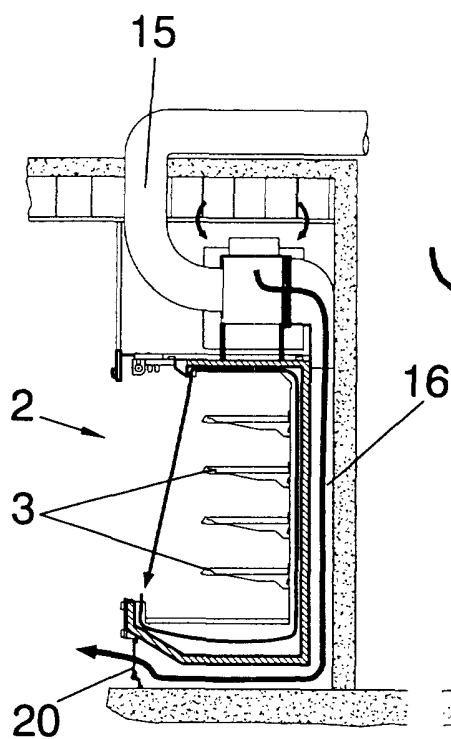


FIG. 1

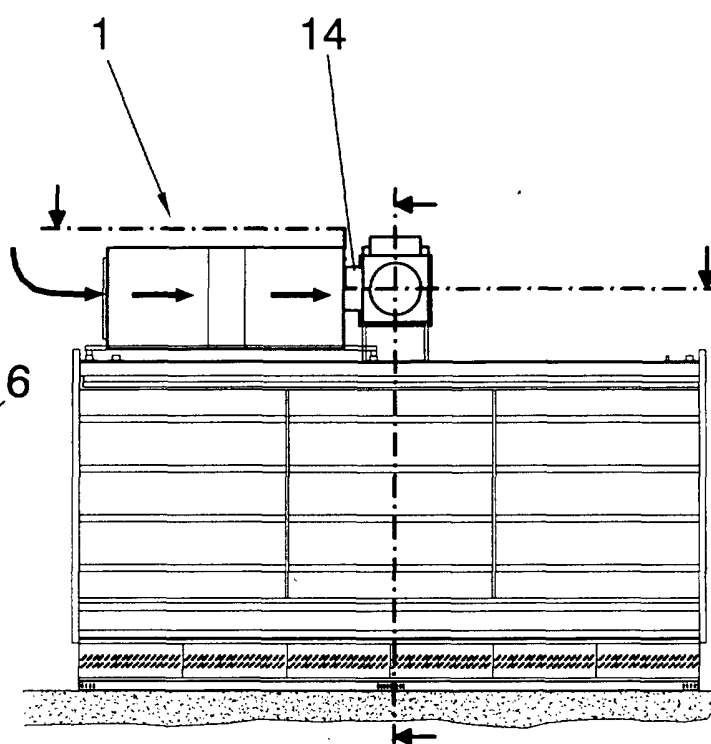


FIG. 2

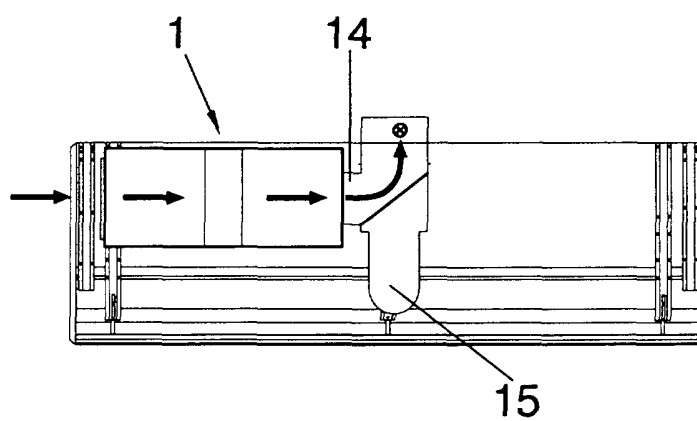


FIG. 3

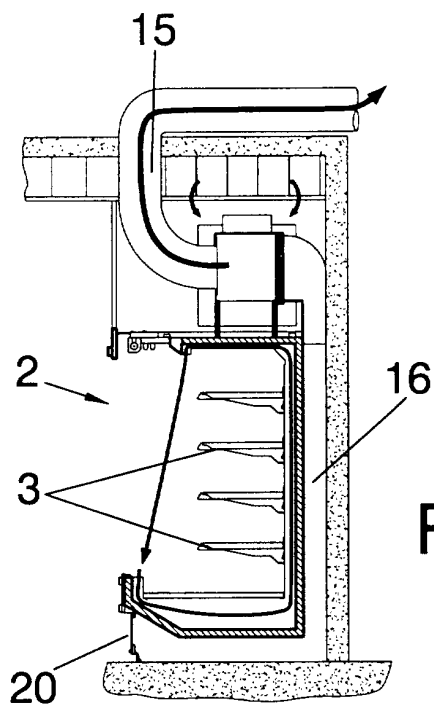


FIG. 4

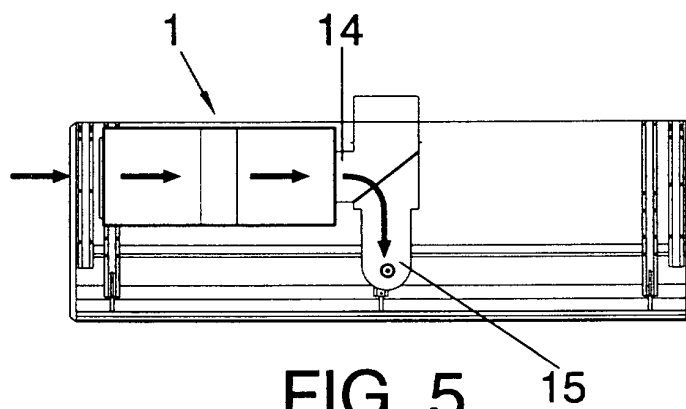


FIG. 5

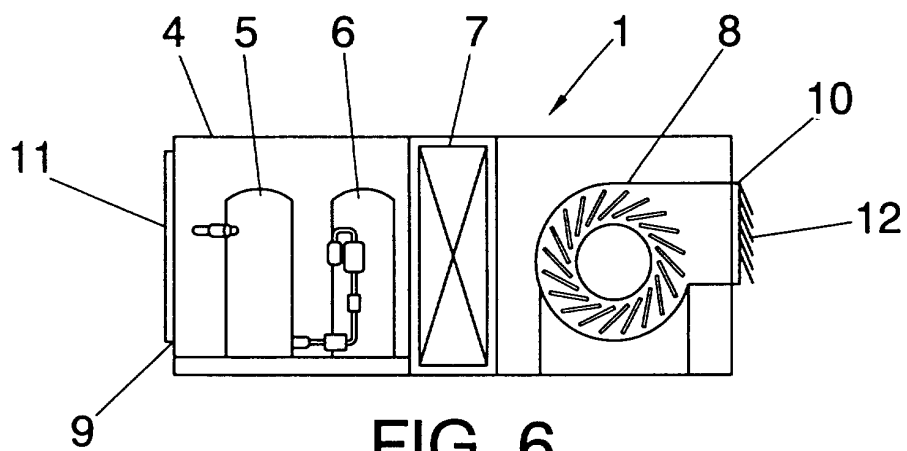


FIG. 6

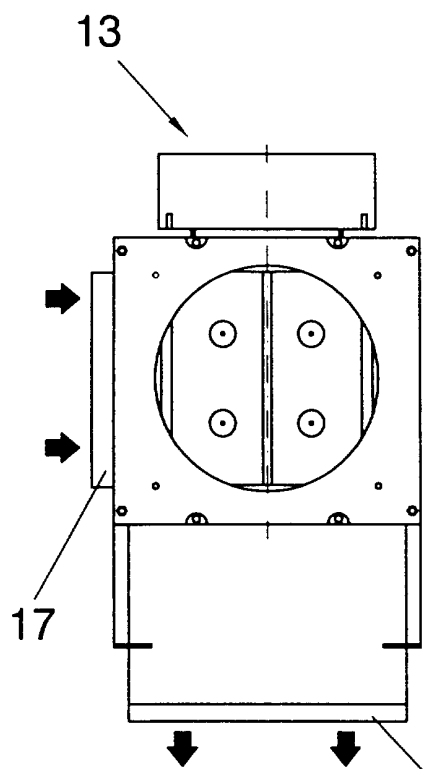


FIG. 7

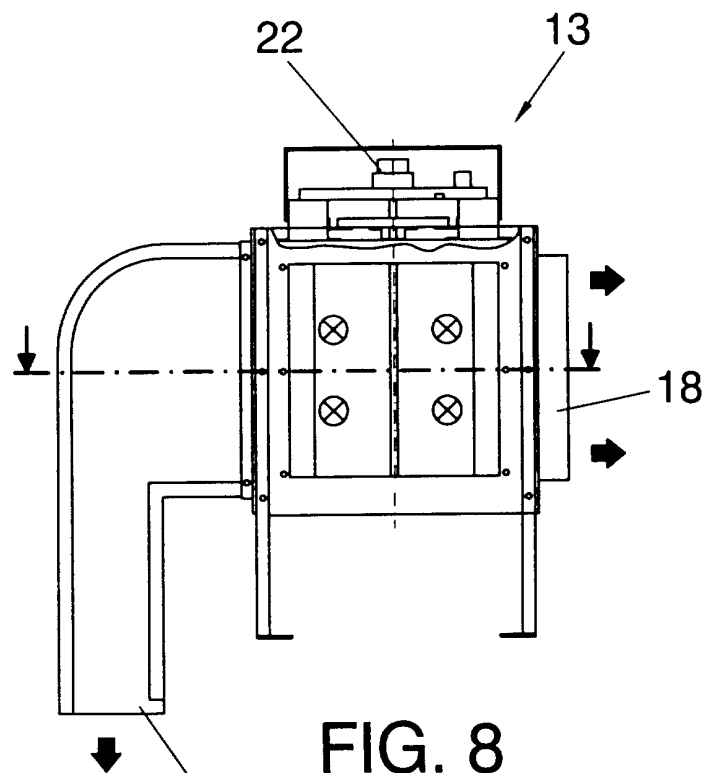


FIG. 8

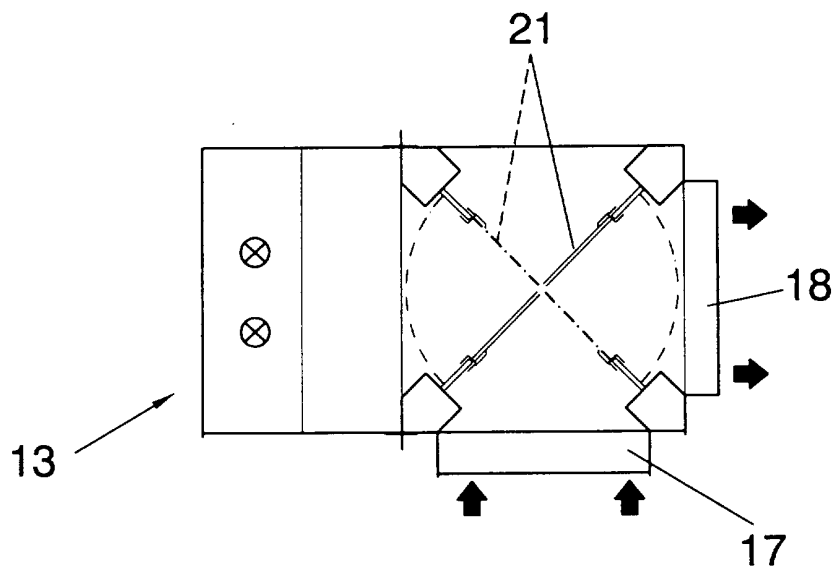


FIG. 9