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CONSTRUCŢII. ARHITECTURĂ

VENTILATION AND HEAT RECOVERING SYSTEM

BY
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Some aspects concerning the heat reducing for ventilation, achieved by using heat recovering components and a combined heating–ventilating system, assuring both comfort and human health are presented. The floor imbedded systems together with air outlets elements could fulfill all the aesthetically desires, as well as comfort and they are ideal for family houses.

1. General Considerations

The prices for primary energy are rising and to save energy and cut costs, and at the same time to enjoy a healthy atmosphere in living space, means to reduce energy consumption for heating ventilation air, as well as a combination between tight – building, good thermal isolation and a control of air flow using integrated recover units.

A ventilation system with heat recover for a family house is efficient when the recovering degree is about 90%. The ventilation must assure a low noise level, the evacuation of pollutants, the intake of fresh air, it must be simply to execute and it will be integrated in the rooms form, so that it fulfills the demands for comfort and health. A complex heating – ventilating system assures the optimum conditions with reduced cost comparative with an air conditioning installation.

The modern ventilation systems provide a regulated fresh air supply and the reliable removal of stale and damp air, so that health and well-being is assured with every breath of air we take.

The nowadays buildings built in accordance with European energy saving regulations must be properly insulated. For good air quality in living space and for the statutory minimum air exchange we have to open opposing windows fully every two hours day and night and that is impossible in everyday life and very expensive during the heating season.

The most savings will be made with a fresh air system with heat recovery because the greatest potential for saving energy is in the area of ventilation heat losses. That is the energy that "blows away" uncontrolled to the outside through open windows.

Ventilation through windows is the largest contributor to the heat loss of a building, comprising almost 40%, followed by outside walls and hot water, each contributing only about 10%.

2. Heating and Ventilating Systems for Buildings with Low Energy Consumption

Outdoor air is inlet through a ventilation duct provided with a protection grid. Air is filltered and preheated in a heat exchanger in cross-current, and then through a duct system it is introduced in rooms. The apparatus has a by-pass flap to avoid the heat exchanger in the summer period.

The air refreshing in the whole volume of the room is assured by a controlled air rate and by a judicious disposed of the inlet elements. A reduced air inlet speed avoids the noise and a draft sensation. The system with flexible air ducts in floor placed, as presented in Fig. 1, is under the screed layer, priority placed regarding the heating pipes, waste-water pipes and canalization, in order to avoid a complicate disposal of the pipes. This allows a better air distribution to the inlet elements, disposed in walls or in the floor, in different zones of the room.

Even the system is extremely technically sophisticated, basically it operate quite simply: the fresh external air is drawn in by the fresh air unit, either directly or *via* a geo-thermal collector.

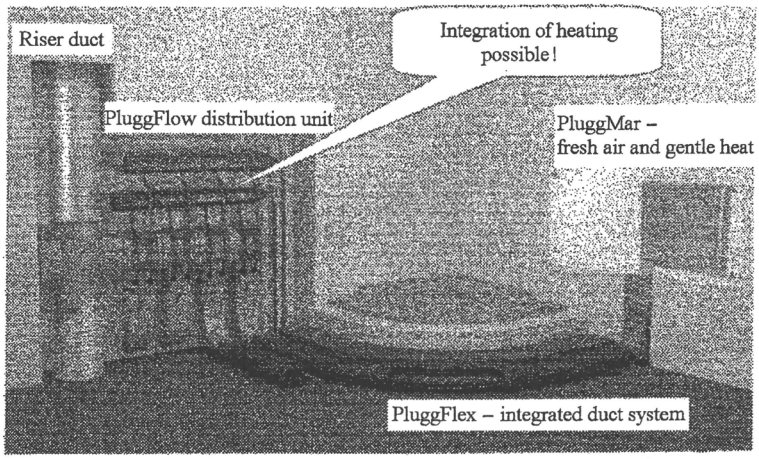

Fig. 1.– Distribution system for air ducts and heating pipes in floor embedded.

After the air has been filtered and heated, it is delivered to the living, sleeping and working areas. Then the air flows to the hallway, corridor and the exhaust air rooms – kitchen, bathroom and toilet. The damp and stale air is then reliably fed outside, *via* the external wall of the house. Through this unique individual connection for each room, the transmission of noise between rooms is also prevented.

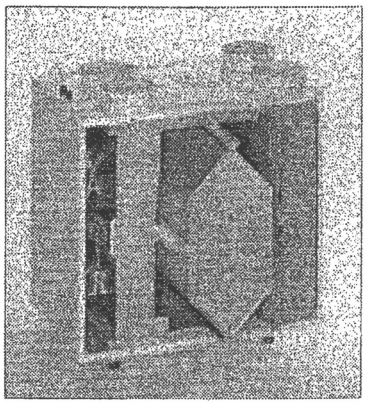

Fig. 3.– Heat recovering unit.

In Fig. 4 is presented the power variation for variable volume. In the following are considered the four functioning manners:

A – reduced, with 80 m^3/h;

B – normal, with 160 m^3/h;

C – as necessary 225 m^3/h;

D – maximum, 260 m^3/h.

The absorbed power variation is a function of the pressure loss in the network and the functioning manner. It can be observed that for a reduced air volume, the absorbed power is about 10...15 W, while in the maximum air volume it reaches 100...120 W.

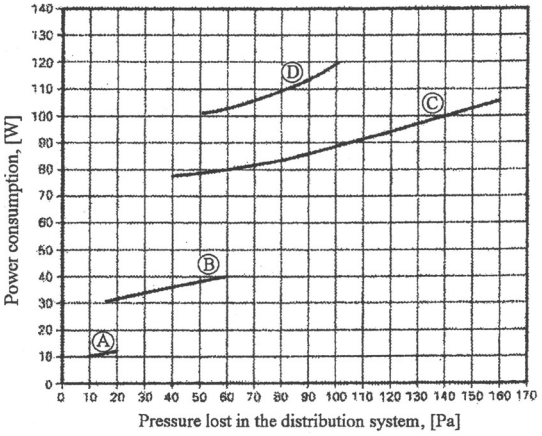

Fig. 4.– Power variation according to the functioning state.

Air ducts are connected similar with those of a heating system, using for each level a distribution unit, as presented in Fig. 2. Because the ducts have a relatively great length, the noise transmission is avoided. Evacuation of air is realized from spaces with high humidity using a direct exhaustion, connected through a flexible duct to the main duct disposed in the basement or in the last level provided with the necessary protection. The ducts for inlet and outlet air must be as short as possible.

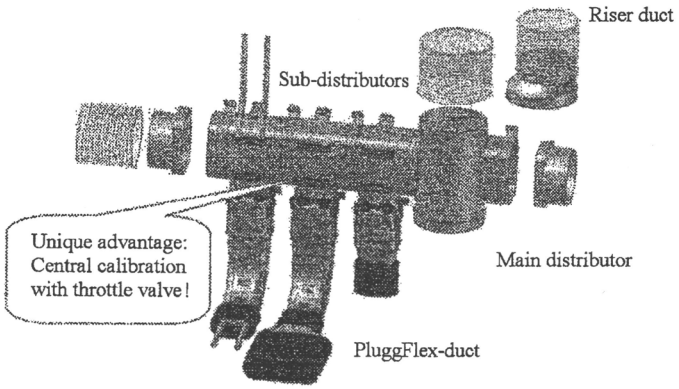

Fig. 2.– Distribution unit.

For heating it is used a centralized system with a boiler for warm water that can function economically in parallel with a solar installation or a heat pump. The heating distribution is integrated in the air ducts and the warm air inlet is realized through special type warm air elements. A combination between heating and ventilation assures an economical installation, the inlet elements are 6.5 cm thick and can be wall integrated, assuring all aesthetically demands. Through the inlet effect of air, realized by these elements, the air distribution assures the necessary recirculation and dilution.

Perfectly aligned cross ventilation is achieved by laying the air ducts in the floor and ideal positioning of the air outlets. Displacement ventilation means that fresh air is fed into the room pre-heated, without the risk of draughts, without any annoying noises and without any pressure.

3. Characteristics of the Heating – Ventilating System

As presented in Fig. 3, the fan of the heat recovering unit has the possibility to function with variable rotations, so that it could assure different conditions and variable energy consumption.

In Fig. 5 is presented the pressure loss variation in the distribution unit *vs.* the flow rate. In this diagram A represents the exhausted air and B – the inlet air.

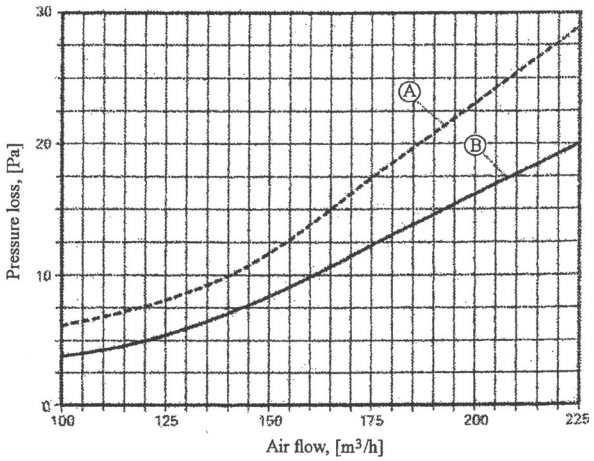

Fig. 5.– Pressure loss according to the flow rate.

Heating is realized with heating medium having a temperature of 50°/40°C or 60°/50°C. The high efficiency, about 90% of the heat recovering unit in cross flow, assures an energy saving till 50%, as presented in Fig. 6.

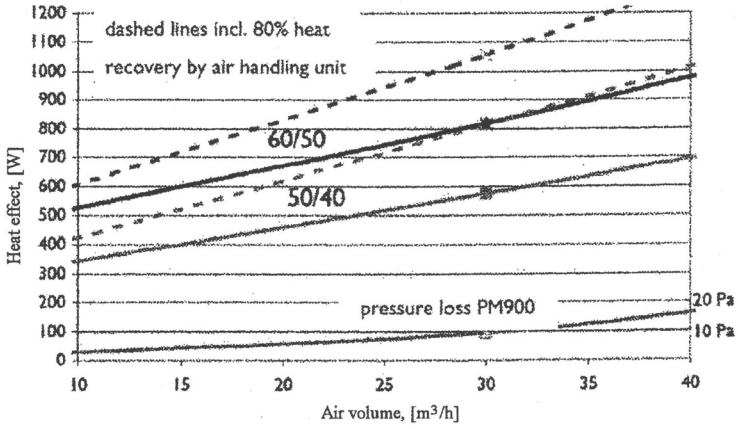

Fig. 6.– Pressure loss and heat effects

Ducts must be disposed right in order to avoid dust sedimentation and supplementary pressure loss. The material of which ducts are made must resist to corrosion, must be fire resistant and not water absorbent. Ducts must be airtight, not allowing air entrance through the tightly band while cold handling. For a better comfort the air handling unit can be equipped with a special filtering for pollen.

The advantages of the system concerns:

a) *Capacity*: fast reaction by minimal heat carrier mass; high heat capacity with all supply temperatures; especially appropriate to low temperature; 100% capacity all the year; optimal use of external heat sources.

b) *Comfort*: gentle heat transfer with < 0.05 m/sec.

c) *Costs*: lower operating costs; lower investment costs in comparison with traditional systems.

d) *Design*: no connections from the floor; saves space by integration in the wall; various designer faceplates.

4. Conclusions

The proposed system assures both heating and cooling with a controlled air rate, functions fully automatically, assures fresh air everywhere in the house, at any time of year or hour of day, around the clock, it is both sensible and effective, save around 50% of the heating costs, depending on the size of the house, insulation and the way of personally use for ventilation. This means cash in terms of the annual heating bill, year after year. In this way the system pays for itself not just with regard to the well-being; it assures the new quality of life that is simply priceless. The proverbial "feeling of well-being" depends much more than we realize on the quality of the air we are constantly breathing in. Thus the living quality achieved through a good atmosphere in living space gives much more: a priceless quality of life, optimum air quality for your living space is achieved.

This intelligent technology, with ideal ducting of air with central control of supply and exhaust air proven cleansing ability, is quick and simple assembly, using the connector system, flexible ducts. A great additional benefit through potential for integratton is fulfilled.

The fresh air systems save heating costs, provide up to 95% heat recovery, save energy and protect the enviromnent, provide healthy air quality in living space, keep noise, dirt and insects "outside the door", protect against the risk of rot and mildew, easy allergy problems.

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SISTEM DE VENTILARE ŞI RECUPERARE A CĂLDURII

(Rezumat)

Se prezintă unele aspecte legate de reducerea necesarului de căldură pentru aerul de ventilare, realizată prin recuperarea căldurii şi un sistem combinat încălzire–ventilare, asigurând concomitent confortul şi sănătatea ocupanţilor. Aceste sisteme, înglobate în pardoseală, împreună cu deschideri de refulare ce pot îndeplini toate cerinţele de estetică, sunt ideale pentru clădiri de locuit unifamiliale.