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(54) Improved insulating glazing unit with heating elements.

(57) An insulating glazing unit with heating elements, characterized in that at least one of the glass sheets (11) is a low-emissive (LE) type glass sheet which has two collectors (13) for electric power supply, even at a very low safety voltage.

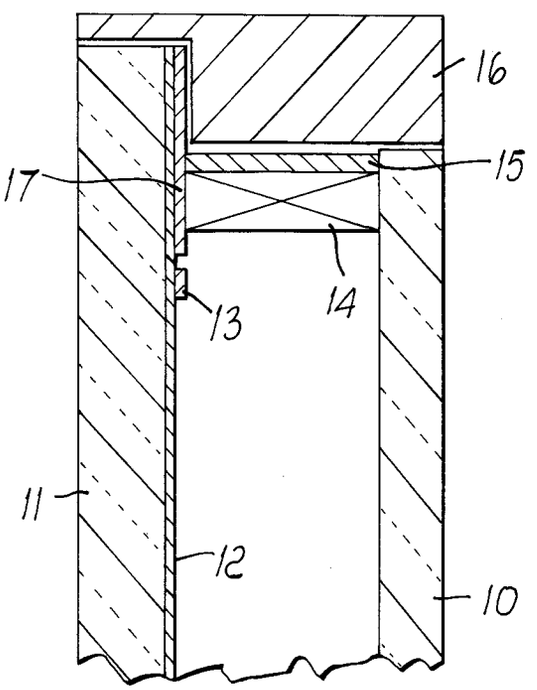

Fig. 1

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The present invention relates to an improved insulating glazing unit with heating elements.

It is known that insulating glazing units that have one or more air spaces and occasionally heating elements, are used in industrial sectors in which it is necessary to reduce the heat transmission rate (U) of the glazing (i.e., to reduce the flow of heat between the outside and the inside) and to demist the outer surface.

A particular field in which insulating glass panes with heating elements are in widespread use is the field of refrigeration, which uses cold-storage units inside which the operating temperature is as low as -25° Celsius.

In order to reduce the value of the heat transmission rate U, one of the glass sheets is a "low-emissive" (LE) type glass, that is to say, it is a sheet that has been treated on its surface by depositing metals and/or metal oxides and has the known function of "reflecting" the long-wavelength radiant component of the heat emitted by the heating elements that are present inside enclosed spaces (radiators, people, walls, etcetera).

The position of the low-emissive glass sheet with respect to the orientation of the glazing unit is not particularly relevant, so long as the treated side is directed towards the inside of the chamber.

Glass sheets on which electrically conducting material (coating) is deposited are instead used for demisting.

The power levels required for demisting (outside temperature of the glass sheet equal to +20° Celsius) vary according to the structure of the glazing unit (normally between 1 and 2.5 W/dm^2) and according to the operating temperatures.

The coating is discontinued in the vicinity of the peripheral region of the glass sheet to avoid possibly short-circuiting it by means of the perimetrically located spacer profiles and by means of the metal frame and to fully insulate the region, which is normally subjected to an electric voltage of 220 volts, taken directly from the electric mains.

An aim of the present invention is to provide an insulating glazing unit with heating elements which despite ensuring optimum heating uniformity allows low supply voltages so as to increase safety.

Within the scope of this aim, a consequent important object is to provide an insulating glazing unit with heating elements that is satisfactory both optically and aesthetically.

Another important object is to provide an insulating glass pane that is constructively simpler than current ones.

Another important object is to provide an insulating glazing unit that is composed of elements that are particularly flexible from the operational point of view.

Another important object is to provide an insulating glazing unit that has, with respect to conventional types, a lower heat transmission rate, thickness being equal.

Another object is to provide an insulating glazing unit that is thinner and lighter than current ones.

This aim, these objects, and others which will become apparent hereinafter are achieved by an improved insulating glazing unit with heating elements, characterized in that at least one of the glass sheets is a low-emissive (LE) type glass sheet which has two collectors for electric power supply and consequent heating.

Further characteristics and advantages of the invention will become apparent from the following detailed description of an embodiment thereof, illustrated only by way of non-limitative example in the accompanying drawing, wherein:

figure 1 is a schematic sectional view.

With reference to the above figure, an insulating glazing unit with heating elements according to the invention comprises a first inner glass sheet 10 of the normal float type and a second tempered glass sheet 11 of the low-emissive type with a conducting deposit 12 on the surface directed towards the first glass sheet 10.

In practice, it has been realized that low-emissive glass, now used only for reflecting purposes, can be converted into glass with heating elements by means of appropriate modifications.

A screen print is in fact performed on said conducting deposit 12 so as to form two electric collectors 13 and is vitrified by means of a heat tempering process.

Starting from a LE glass sheet 11 with sufficiently low Rq values, despite the fact that the tempering step can cause an increase in Rq, the final Rq values allow to use power supply voltages that for most geometrical configurations of the glazing units are lower than 50 volts (RMS), thus improving safety.

An appropriate external electronic module, not shown, with double insulation, or a simple transformer to be associated with the glass sheet, in view of the limited total power demand, which is in the range of 30-100 W, are sufficiently compact and do not cause bulk problems even in current installations.

Interchangeability of the electronic module for the various insulating glazing unit sizes can be easily achieved by using an adapted electrical resistor for the appropriate adjustment of the duty cycle of the internal switching.

The two glass sheets 10 and 11 are spaced by a perimetric spacer 14 (spacer profile) which can be constituted by a conventional aluminum profile or by a profile which has thermal insulation func-

tions and is based on flexible silicone foam containing a 3-Angstrom molecular sieve which has the lowest heat conductivity in the field of spacers.

This last spacer is more expensive than the aluminum ones, but this higher cost is partially compensated by a relatively easier installation which does not require special tools.

Its substantial advantages are:

-- significant reductions in overall heat losses through the glazing unit;

-- elimination of condensation along the perimeter of the insulating glazing unit.

By using this spacer made of flexible silicone foam, it is possible to produce insulating glazing units with a single 12-mm air space with a heat transmission rate that is equal to that of a conventional glazing unit with aluminum spacers and two 6-mm air spaces.

In addition to a reduced thickness, this solution achieves reductions in the overall weight of the glazing unit which are of about 30% and better light transmission due to the reduced thickness of the glass sheets and to lower light reflection.

The elements of the glazing unit are kept together by a butyl seal 15.

Figure 1 also illustrates an external frame 16 for supporting a glazing unit with heating elements of the structural type.

In order to electrically insulate the live heating layer 12 from any grounds (frame 16, spacers 14, if made of aluminum), the perimetric part of said portion 12 is covered by means of a layer of paint 17 which has insulating characteristics.

The need to interrupt the conducting layer in the peripheral region, as required in current glazing units with heating elements, is thus eliminated.

In order to conceal the collectors 13 from sight, it is possible to provide an internal layer of paint with electric insulation functions, not shown in figure 1, to form an element that decorates the entire structure.

It should also be noted that the collectors 13 can be placed at the greatest possible distance so as to heat the entire surface of the glass sheet 11.

The above description shows in practice that the glazing unit with heating elements according to the present invention has achieved the intended aim and objects.

Indeed, it has a whole range of important advantages, mentioned above, with respect to conventional types.

Another advantage is that it is possible to transfer the heating layer onto the outer glass sheet, in view of the low voltages involved.

The invention thus conceived is susceptible of numerous modifications and variations, all of which are within the scope of the inventive concept.

All the details may furthermore be replaced with other technically equivalent elements.

In practice, the materials employed, so long as they are compatible with the contingent use, as well as the dimensions, may be any according to the requirements.

Where technical features mentioned in any claim are followed by reference signs, those reference signs have been included for the sole purpose of increasing the intelligibility of the claims and accordingly such reference signs do not have any limiting effect on the interpretation of each element identified by way of example by such reference signs.

Claims

1. Improved insulating glazing unit with heating elements, characterized in that at least one of the glass sheets (11) is a low-emissive (LE) type glass sheet which has two collectors (13) for electric power supply and consequent heating.

2. Insulating glazing unit according to claim 1, characterized in that said low-emissive glass sheet (11) has low quadratic surface resistivity values, allowing to use low supply voltages.

3. Insulating glazing unit according to claim 1, characterized in that said glass sheet (11) of the low-emissive type is the outer glass sheet.

4. Insulating glazing unit according to claim 1, characterized in that said electric collectors (13) are formed by screen printing and vitrified by means of a thermal process.

5. Insulating glazing unit according to claim 1, characterized in that the conducting layer of said low-emissive glass sheet (11) is covered by a layer of insulating material (17) in the regions that may make contact with conductive-type grounds.

6. Insulating glazing unit according to claim 1, characterized in that at least one spacer (14) based on flexible silicone foam is placed between said glass sheets (10,11) and contains a molecular sieve.

7. Insulating glazing unit according to claim 1, characterized in that said two collectors (13) can be concealed by an appropriate layer of electrically insulating paint with decorative functions.

8. Insulating glazing unit according to claim 1, characterized in that said glass sheet (11) of the low-emissive type has, on one surface, a molecular deposit of metals and/or metallic oxides without requiring its interruption.

9. Insulating glazing unit with heating elements according to one or more of the preceding claims, characterized in that it is constituted by a double-glazing unit with a single air space.

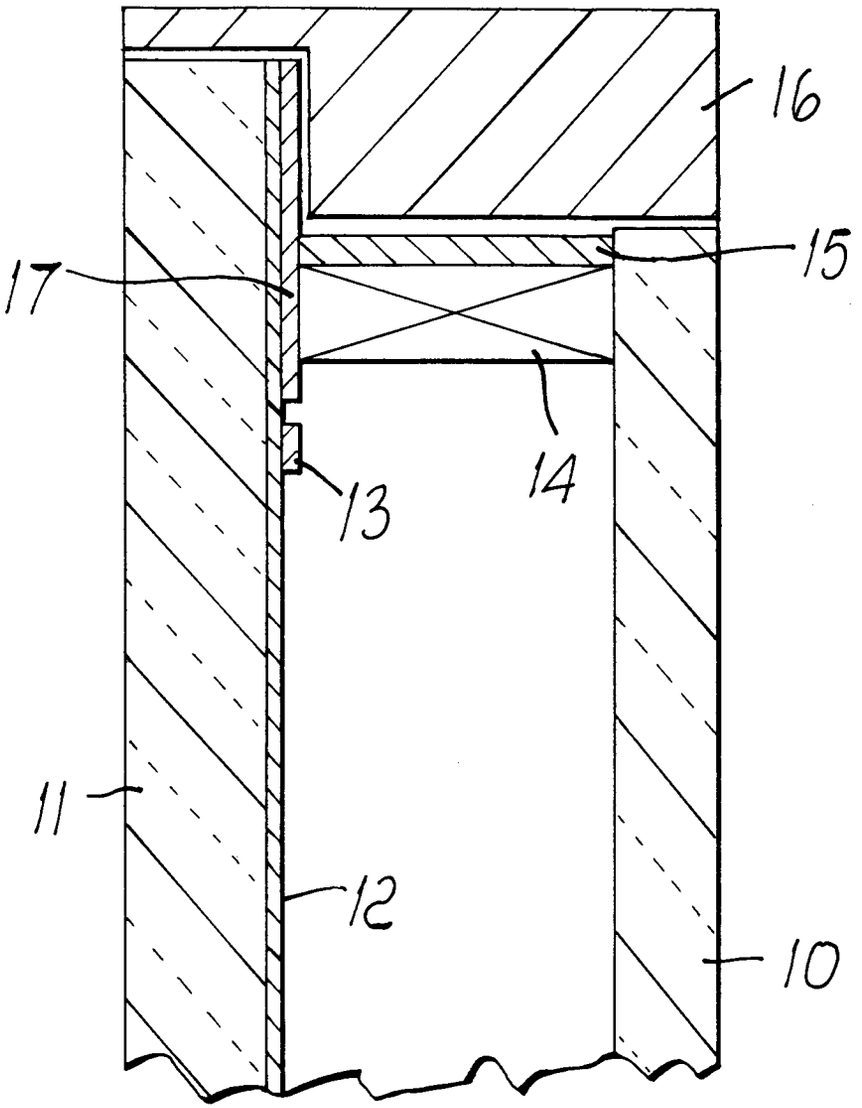

Fig. 1

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EUROPEAN SEARCH REPORT

Application Number
EP 95 10 4073

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.6)
X Y	EP-A-0 406 200 (TERMOFROST AB) * column 3, line 39 - column 4, line 43; figure 1 *	1-3,9 4	A47F3/04
X	FR-A-2 534 007 (TERMOFROST SWEDEN AB) * page 3, line 7 - page 4, line 33; figure 1 *	1-3	
X A	EP-A-0 314 477 (OLO) * column 2, line 55 - column 3, line 41; figure 2 *	1 2,6	
Y	FR-A-2 533 754 (COMPAGNIE GENERALE D'ELECTRICITE SA) * the whole document *	4	
A	EP-A-0 036 657 (ARDCO) * page 9, line 7 - page 10, line 14; figure 1 *	2	
A	FR-A-2 695 789 (TECHMETA SA) * page 4, line 16 - page 8, line 19; figures *	2,8	TECHNICAL FIELDS SEARCHED (Int.Cl.6) A47F H05B A47G E06B
A	PATENT ABSTRACTS OF JAPAN vol. 8, no. 272 (E-284) 13 January 1984 & JP-A-59 141 273 (NICHIDEN ANELVA) 13 August 1984 * abstract *	4	
A	WO-A-93 18266 (ANTHONY'S MANUFACTURING COMPANY) * page 15, line 22 - line 28 * * page 17, line 10 - page 19, line 2; figure 9 *	6	

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	29 June 1995	De Groot, R

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
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