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(54) **Refrigerated display-case and method to prevent the transparent elements thereof from fogging**

(57) Refrigerated display-case for the preservation and display of food products, comprising at least a transparent element (20) of the type through which an electric current is able to flow; said transparent element (20) is divided, at least in its part nearest the products to be

refrigerated, into a plurality of zones (19) partly separated electrically by areas (18) of electric discontinuity, the zones (19) being able to be fed independently by means of respective conductor elements (23) associated with at least a source (25) of electric feed.

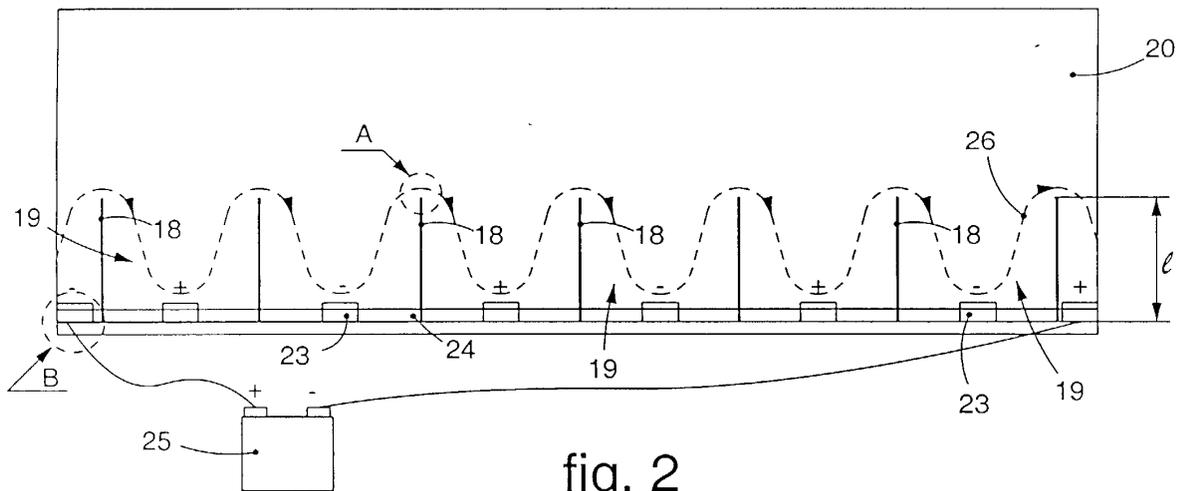


fig. 2

Description

FIELD OF THE INVENTION

[0001] The invention concerns a refrigerated display-case employed to display, preserve and sell refrigerated food products.

[0002] In order to combat the phenomenon of fogging and the formation of condensation on the relative glass and transparent elements, the refrigerated display-case according to the invention is equipped with transparent elements of the type through which, when fed from a suitable source, an electric current is able to pass.

[0003] The refrigerated display-case according to the invention has at least a relative transparent element divided, at least in the part nearest the products to be refrigerated, into sections which are partly separated electrically from each other, in order to limit the area of the transparent element affected by the circulation of electric current. This allows to diminish the consumption of electric energy and to reduce to a minimum the influence of the anti-fogging operation on the preservation parameters of the food products.

BACKGROUND OF THE INVENTION

[0004] When the damp air contained in a partly closed environment comes into contact with a surface which has a lower temperature than dew temperature, condensation forms on said surface. If the surface is transparent, for example, a piece of glass, the phenomenon is called fogging.

[0005] In refrigerated display-cases for the preservation, display and sale of food products, such as ice-cream, cakes, ice-cream cakes, or similar, the phenomenon of fogging is due in particular to the high humidity and the low temperature of the inner environment.

[0006] Apart from diminishing the visibility for the consumer by hiding the products on display, fogging causes water droplets which can damage the products displayed or their packaging. Moreover, in the long run, the droplets can damage the metal parts of the refrigerated display-cases, or reach the electric parts with dangerous consequences for both workers and customers.

[0007] To overcome these problems, the state of the art uses anti-fogging electric devices. Among these, there are the heat strips of the type used in the rear windows of cars, which are made by depositing in a desired geometric pattern a conductor paste, for example made of silver, to which metal elements with a high electric resistivity are added.

[0008] The state of the art also uses pyrolitic glass, at least the inner surfaces of which are lined with layers of metal oxides which can be fed electrically so as to heat, according to cycles of programmed activation, the entire surface of the glass. Pyrolitic glass is particularly appreciated by businessmen working in this field because it achieves the anti-fogging function without substantially

entailing any visible aesthetic modification to the transparent surface.

[0009] Pyrolitic glass is normally fed electrically by means of two serigraph strips, arranged in correspondence with the upper edge and the lower edge of the glass; the strips are usually hidden by frames or finishings near the supporting shelves inside the display-case.

[0010] However, using such pyrolitic glass has the disadvantage that the requirement of electric energy is oversized with respect to real needs. In fact, in a normal refrigerated display-case, for example for the preservation and display of ice-cream, condensation forms mainly if not exclusively in the lower part of the transparent element, that is to say, in the part affected by the recirculation of cold air near the products to be refrigerated.

[0011] On the contrary, since it is necessary to position the electric feed zones in extreme positions where they can be well covered or invisible, at present the whole transparent element is affected by the passage of electric current. This entails a greater consumption due to the greater need for electric energy, and also a greater incidence on the thermostat parameters, with negative consequences on the quality and preservation of the products to be refrigerated.

[0012] Moreover, since the tension required to feed the whole surface of the transparent element is in the order of 50V, it is necessary to use a double glass in order to meet the safety regulations regarding electricity, which entails further costs for the producers.

[0013] Another problem of conventional pyrolitic glass is that it is difficult for producers to guarantee a reliable electric behavior thereof, that is to say, a resistivity which will maintain sufficiently safe values in the range of the declared nominal value.

[0014] The greater the transparent surface defined by the pyrolitic glass, and the higher the tension of feed, the greater this problem is; it can even make it impossible to use such pyrolitic glass due to the lack of guarantees on the resistivity values, and hence on the electric behavior, which the glass assumes when it is fed.

[0015] The present Applicant has devised and embodied this invention to overcome the shortcomings of the state of the art and to obtain further advantages as shown hereafter.

SUMMARY OF THE INVENTION

[0016] The invention is set forth and characterized in the main claims, while the dependent claims describe other innovative characteristics of the idea of the main embodiment.

[0017] The purpose of the invention is to achieve a refrigerated display-case for the preservation, display and sale of food products, and an anti-fogging method for the display-case, wherein it is possible to obtain a significant saving in electric energy required, thus solving a problem of consumption and also a problem of in-

vidence on the thermostat parameters of the products.

[0018] Another purpose is to reduce the values of feed tension, avoiding the need to use a double glass to meet the safety requirements concerning electricity.

[0019] A further purpose is to reduce the problems deriving from an electric behavior, in terms of resistivity of the transparent element, which is not coherent with the nominal values declared by the producer.

[0020] The invention provides to use glass of a pyrolitic type, that is, with at least the inner face lined or embedded with electric conductor metal oxides.

[0021] According to one characteristic of the invention, the pyrolitic glass is divided, at least in the zone nearest the products to be refrigerated, that is, where condensation is most likely to form and hence fogging is most likely to occur, into a plurality of zones which are partly separated electrically, and which can be fed separately and independently.

[0022] To be more exact, each of said zones is partly separated from the adjacent zone by means of at least an area of electric discontinuity, so that, by suitably feeding the individual zones, for example by arranging alternately electric poles of opposite sign, the electric current is propagated from one zone to another, substantially flowing around the areas of discontinuity.

[0023] By suitably planning the areas of discontinuity, it is possible in this way to make the current assume a desired development, limiting the passage of the current to one or more desired portions of the entire pyrolitic glass.

[0024] In a preferential embodiment of the invention, the electric feed to the pyrolitic glass is supplied by means of a serigraph strip in correspondence with the lower edge of the glass, which can be suitably covered by frames or finishings. The areas of electric discontinuity consist, for example, of thin notches made on the inner face of the glass and extending, with respect to the lower edge, for a height correlated to the extension of the zone of the glass which is to be heated.

[0025] If every zone of the glass is equipped with a conductor element having a pole of the opposite sign with respect to the pole with which the adjacent zone or zones are equipped, the current flows from one zone to another around the areas of discontinuity, thus causing only the lower zone of the glass to be heated.

[0026] The result is that the heating of the pyrolitic glass is limited only to the zone or zones where said heating is necessary; this allows to reduce the feed tension to limited values, for example around 24V, which does not necessarily require the use of a double glass. Moreover, the elements of electric feed can be suitably arranged in covered or at least non-visible zones.

[0027] The lesser amplitude of the zones through which electric current flows, together with the reduction in the values of feed tension, makes the electric behavior of the pyrolitic glass much less critical, and reduces the problems deriving if the values of resistivity are not completely congruous with those declared by the pro-

ducers.

[0028] According to a variant, the areas of discontinuity are defined by polished segments wherein the pyrolitic lining of the glass is removed. In another variant, the areas of discontinuity are defined by segments of non-conductor material applied to separate two or more adjacent zones.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029] These characteristics and advantages of the invention will be clear from the following description of the preferential embodiment of the invention, given as a non-restrictive example with reference to the attached Figures wherein:

- Fig. 1 is an embodiment of a refrigerated display-case to which the invention is applied;
- Fig. 2 is a front view of the inner side of a transparent element according to the invention which can be associated with a display-case of the type shown in Fig. 1;
- Figs. 3a and 3b show respectively the details A and B of Fig. 2;
- Fig. 4 is a side view of the transparent element in Fig. 2.

DETAILED DESCRIPTION OF PREFERENTIAL EMBODIMENT

[0030] With reference to the attached Figures the number 10 denotes generally an example of refrigerated display-case of the type used to display and sell refrigerated products, for example ice-cream, cakes, ice-cream cakes, sweets and similar.

[0031] This example is not to be considered restrictive and the invention can be extended to any display-case, counter, compartment, cupboard or other refrigerated container, which has the requirement of preventing the formation of condensation on a covering transparent element.

[0032] In this case, the display-case 10 comprises a base 11 defining a motor compartment 12 housing the technological equipment, indicated in their entirety by the number 13, needed for the display-case to function. Above the base 11 there is a container 14 which supports the loading plane 17 and the serving plane or work plane 29 located on the operator's side.

[0033] The loading plane 17, together with a front glass 20 located on the customer's side and a rear glass 21 located on the operator's side, defines a substantially closed refrigerated compartment 15. The numbers 20 and 21 also refer to transparent elements made of different material other than glass.

[0034] Between the bottom of the container 14 and the loading plane 17 there is a technical compartment 16, one zone of which houses the ventilation assembly 22, which determines the circulation of cold air in the

display-case 10, and the refrigeration assembly 30.

[0035] The front glass 20 is normally closed and allows the customers to see the products, to make their selection and order.

[0036] The front glass 20 according to the invention, shown in a front view from its inner side in Fig. 2, is of the pyrolitic type and an electric current is able to flow through it, if fed by an appropriate source.

[0037] In this case, in its lower part, it has a plurality of notches 18, a few millimetres or a few tenths of a micron thick, which constitute areas of electric discontinuity able to define zones 19 of the glass 20 which are partly separated electrically. In each of said zones 19 a conductor element 23 is arranged able to be connected, by means of a suitable conductor strip 24, for example serigraphed, to a source of electric feed 25. The conductor elements 23 and the conductor strip 24 are substantially in correspondence with the lower edge of the glass 20, in a zone which is normally covered from sight by means of frames or finishings.

[0038] If, for every adjacent zone 19, the conductor elements 23 define electric poles of opposite sign, then the electric current fed on one side of the glass 20 will flow from one zone 19 to the other as far as the opposite side of the glass 20, following a path indicated by the line of dashes 26 which passes over the notches 18 while remaining substantially near them.

[0039] Therefore, when the source 25 is activated, the electric current affects and heats only a lower portion of height "1" of the whole glass 20, that is, that portion in which, due to the proximity to the products and hence to the zone where the cold air circulates, it is more likely that condensation will form and hence fogging occur.

[0040] It is obvious that, according to the type of display-case 10, the arrangement of the refrigerated products inside, the way in which the cold air circulates, the position of the air intakes and outlets, etc., the arrangement of the areas of discontinuity defined by the notches 18 can be different, allowing to selectively heat desired portions of the glass 20, for example upper, lateral, longitudinal or transverse portions, etc.

[0041] Instead of the notches 18, the areas of discontinuity can be defined, in substantially analogous and equivalent fashion, by polished segments, with the conductor metal oxides being at least partly removed, or by non-conductor segments applied in suitable zones of separation between adjacent zones 19.

[0042] With the invention we thus have the advantage of selective and focalized heating in the areas most affected by the formation of condensation and fogging, without the glass 20 having any anti-aesthetic element visible which could compromise a complete view of the products on display for the customers.

[0043] By means of this selective heating, it is possible to considerably reduce the consumption of electric energy, and reduce the tension of feed to values which do not require double glasses to be installed for safety reasons. The reduction in the amplitude of the zones

through which electric current flows and the reduction in the value of tension of feed makes the variation in the electric behavior of the pyrolitic glass much less critical and hence allows a much safer and more reliable use thereof.

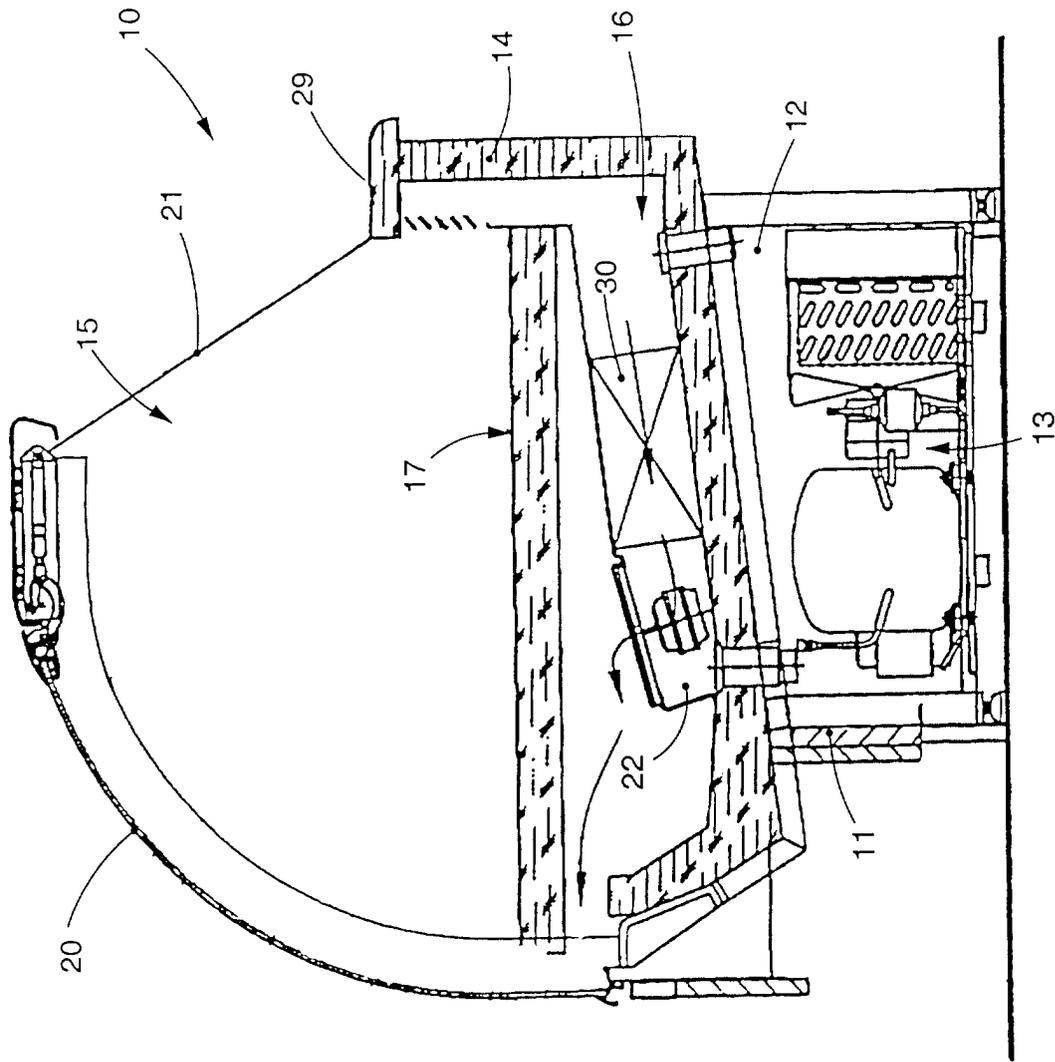
[0044] To electrically connect the zones closely adjacent to the conductor elements 23, which might not be affected by the passage of the current, it is possible to install further strips of conductor material connected to a source of feed, to prevent the risk of localized formation of condensation.

[0045] Modifications and variants may be made to the invention without departing from the spirit and scope thereof.

Claims

1. Refrigerated display-case for the preservation and display of food products, comprising at least a transparent element (20) of the type through which an electric current is able to flow, the display-case being **characterized in that** said transparent element (20) is divided, at least in its part nearest the products to be refrigerated, into a plurality of zones (19) partly separated electrically by areas (18) of electric discontinuity, said zones (19) being able to be fed independently by means of respective conductor elements (23) associated with at least a source (25) of electric feed.
2. Refrigerated display-case as in Claim 1, **characterized in that** said areas (18) of electric discontinuity are arranged and sized in a manner correlated to the portion of glass (20) wherein the electric current is desired to circulate.
3. Refrigerated display-case as in Claim 1 or 2, wherein said transparent element (20) is a glass having at least the inner surface lined with metal oxides, **characterized in that** said areas of electric discontinuity consist of notches (18) able to locally remove said metal oxides.
4. Refrigerated display-case as in Claim 1 or 2, wherein said transparent element (20) is a glass having at least the inner surface lined with metal oxides, **characterized in that** said areas of electric discontinuity consist of polished segments with at least partial removal of said metal oxides.
5. Refrigerated display-case as in Claim 1 or 2, wherein said transparent element (20) is a glass having at least the inner surface lined with metal oxides, **characterized in that** said areas of electric discontinuity consist of non-conductor segments applied in correspondence with zones of separation between adjacent zones (19).

6. Refrigerated display-case as in any claim hereinbefore, **characterized in that** the conductor element (23) associated with one zone (19) is able to define an electric pole of opposite sign with respect to the sign of the conductor element (23) of the adjacent zone (19), so that the electric current flows from one zone (19) to the adjacent zone following a path substantially around said areas of discontinuity (18). 5
7. Refrigerated display-case as in Claim 6, **characterized in that** said conductor elements (23) are arranged in correspondence with a zone of the glass (20) which can be covered. 10
8. Refrigerated display-case as in Claim 7, **characterized in that** said conductor elements (23) are electrically associated to each other by means of at least a strip-type conductor element (24) arranged in correspondence with a zone of the glass (20) which can be covered. 15
20
9. Anti-fogging method for refrigerated display-cases (10) for the preservation and display of food products, wherein said display-cases (10) have at least a transparent element (20) through which an electric current is able to flow, the method being **characterized in that** it provides to arrange on said transparent element (20) a plurality of areas (18) of electric discontinuity able to define a plurality of zones (19), adjacent to each other and partly separated electrically, and to feed said zones (19) independently so as to obtain a flow (26) of current which moves from one of said zones (19) to another following a path which substantially flows around said areas (18) of electric discontinuity. 25
30
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10. Method as in Claim 9, **characterized in that** it provides to associate to each of said zones (19) a conductor element (23) defining an electric pole of the opposite sign to that of the conductor element (23) of the adjacent zone (19), so that the flow (26) of current moves from one zone (19) to the adjacent zone following a path which passes over said areas of discontinuity (18) remaining substantially in proximity therewith. 40
45
11. Method as in Claim 9 or 10, **characterized in that** it provides to electrically connect said conductor elements (23) by means of at least a conductor element (24) connected to a source (25) of electric feed, and to locate the conductor elements (23) and the at least one conductor element (24) in a zone of said transparent element (20) which can be covered. 50
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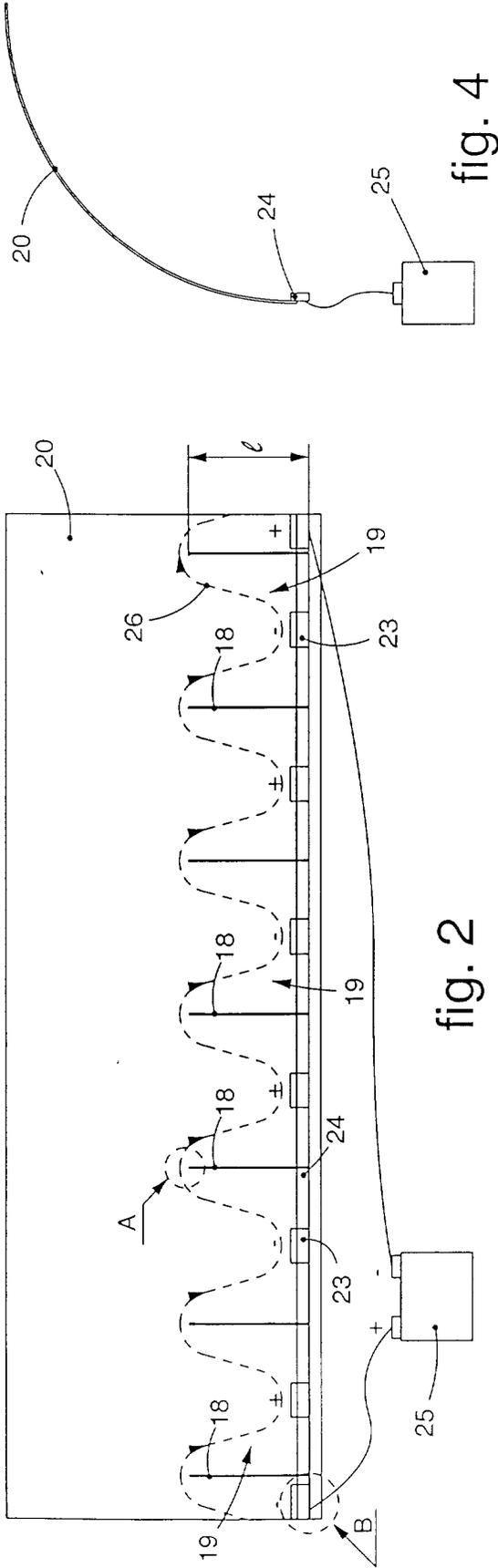


fig. 2

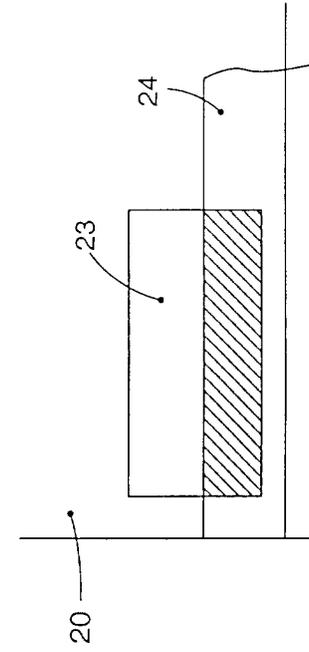


fig. 3a

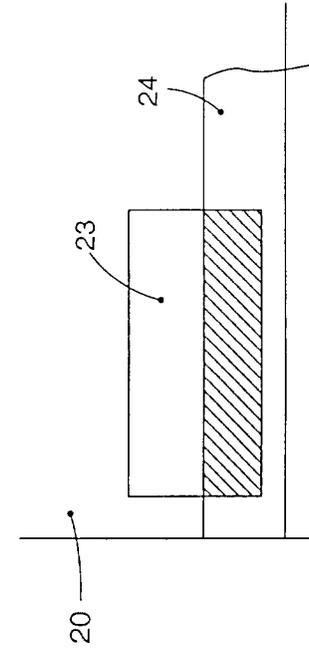


fig. 3b

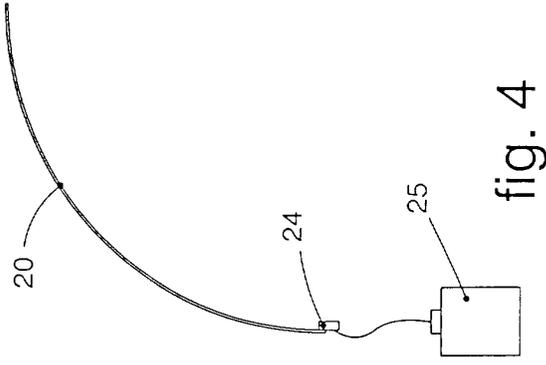


fig. 4



European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 01 12 6207

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.7)
A	PATENT ABSTRACTS OF JAPAN vol. 2000, no. 02, 29 February 2000 (2000-02-29) & JP 11 314943 A (TATSUGUCHI KOGYO GLASS KK), 16 November 1999 (1999-11-16) * abstract *	1	A47F3/04
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			TECHNICAL FIELDS SEARCHED (Int.Cl.7)
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The present search report has been drawn up for all claims			
Place of search		Date of completion of the search	Examiner
THE HAGUE		5 February 2002	Pineau, A
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background O : non-written disclosure P : intermediate document			

EPC FORM 1503 03 82 (P04001)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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EP 01 12 6207

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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05-02-2002

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