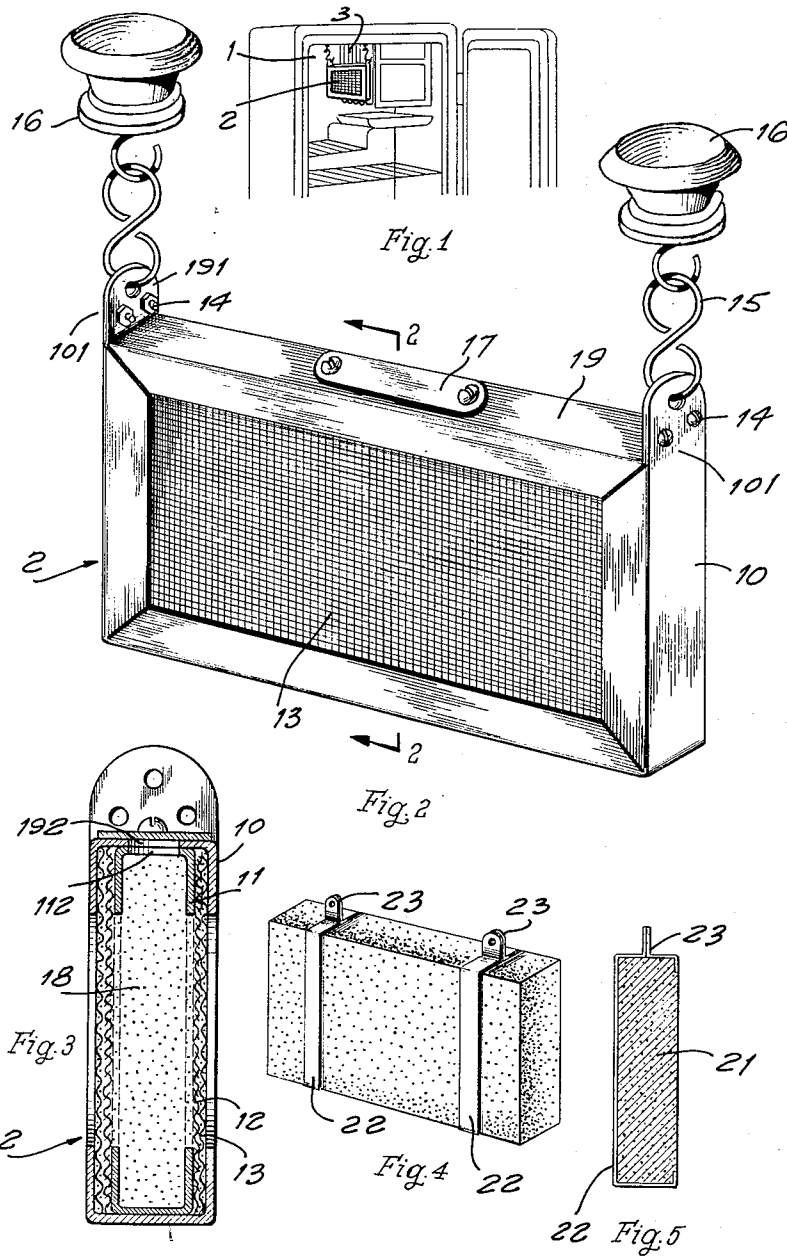


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AIR PURIFYING DEVICE
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AIR PURIFYING DEVICE

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The present invention relates to air purifying devices. More particularly, the present invention relates to a device for purifying the air in the storage space of refrigerators.

In the storage of various kinds of food stuffs together in the storage space of mechanically driven refrigerating devices, it is well known that the odors of the food stuffs are transmitted from one to the other, and that, in addition to this undesirable result, the strong odor of the air usually found in enclosed cooling areas or storage spaces can become exceedingly troublesome. Furthermore, volatile odors from certain food substances, as, for example, volatile acids evolved from cheese, may have an unfavorable effect on the appearance of certain other food substances, as, for example, on meats.

In order to avoid these commonly known disadvantages, some aid can be found in the use of tight containers for the food to be stored in the refrigerator, or in covering the food with odor-tight, air-tight wrapping material, as for example, aluminum or plastic sheets or foils. However, these materials are inconvenient, inadequate, or uneconomical for bulky food stuffs, and it has been found that they have not been able to prevent excessive odor formation in the cooling storage space. Up to the present, there has not been achieved a means for eliminating from refrigerator cooling spaces the odors which are evolved from the food stuffs stored in the refrigerator.

It is an object, therefore, of the present invention to overcome the above disadvantages.

It is another object of the present invention to provide a simple, economical, and effective air purifying device for eliminating odors in refrigerator storage areas.

It is a further object of the present invention to provide a device which simultaneously de-odorizes the refrigerator chamber and removes humidity therein.

With the above objects in view, the present invention relates to a refrigerator device comprising a refrigerator housing providing an enclosed storage space adapted to receive material to be cooled therein, cooling means arranged in the refrigerator housing for cooling the storage space and the material adapted to be stored therein, means for purifying the air in the enclosed cold storage space by sorption of odorous gaseous substances produced by the material adapted to be stored in the enclosed storage space, and means securing the purifying means in the refrigerator housing adjacent the cooling means therein.

Preferably, the air purifying material of the present invention consists of granular adsorbing and absorbing air filtering compounds, the material being held in a container means which is provided with air permeable walls, and which may be easily removably attached to the interior of the refrigerator adjacent to the cooling means, i. e. the evaporator or cooling coil of the refrigeration apparatus. The air filter material, in another embodiment of the present invention, may be held in shaped form without the use of a container, the granular filter material being held together by a binding substance. The latter

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form of the device may also be provided with attaching means for removably securing the filter material in the interior of the refrigerator, in a manner similar to the form which includes a container.

In research on purification of the air in refrigerator storage spaces, it has been found that the area of condensation near or at the evaporator or cooling coil is a favorable location for the collection of odors which are evolved from the substances stored in the refrigerator cooling space. It is in that area that the highest air humidity, strongest odor intensity and lowest vapor tension prevail, due to the influences of the air currents produced by the temperature conditions or by mechanically induced circulation, e. g., by a fan in the closed cooling area. These conditions are favorable for the adsorption of cooling vapors in a localized area around the evaporator. For that reason the most favorable results are assured by providing a chemical or physical air purifier in the region of the greatest condensation. In this connection, the capacity of regeneration of the air purifying material which is used must be considered, since its saturation depends upon the kind and quantity of the materials stored in the cooling space.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

Figure 1 is a view of a refrigerator chamber showing an embodiment of an air purifying filter of the present invention arranged therein;

Figure 2 is a perspective view of the air purifying filter shown in Figure 1 on an enlarged scale;

Figure 3 is a sectional view of the device shown in Figure 2 taken along the lines 2—2;

Figure 4 is a perspective view of another embodiment of an air purifying filter of the present invention; and

Figure 5 is a sectional view of the embodiment shown in Figure 4.

Referring now to the drawings, and particularly to the form of the device shown in Figures 1—3, there is shown a frame member 10 which may be made of aluminum and which has a U-shaped cross section, the open end of the U-shaped frame being directed inwardly, as more clearly shown in Figure 3. Another frame 11 of smaller dimensions and of similar U-shaped cross-section is arranged within the outer frame 10 so that a spacing is left between the two frames in which an inner glass mesh 12 and an outer wire mesh 13 are clamped. The frame 10 is covered on its upper portion by cover member 19. Frame 10 and cover 19 have overlapping flange portions 101 and 191, which are clamped together by screws and bolts 14. The container 2 which is thus formed constitutes an air permeable carrier for holding air filtering material, which is more fully described below.

The container is provided with apertures at the upper ends of the clamped flanges 101 and 191, the hook elements 15 are inserted in these apertures, the hook elements being in turn engaged by suction cup elements 16, by means of which the container 2 carrying the desired air purifying material may be suspended in the refrigerating chamber 1, as shown in Figure 1, with the suction cup elements 16 in engagement with the ceiling of the refrigerating chamber, so that the air purifying container 2 hangs adjacent to the evaporator 3 of the refrigerator.

Cover 19 is formed with an aperture 192, and frame 11 is formed at its top portion with an aperture 112, the apertures being arranged in register with one another.

These apertures provide a means for filling the container 2, formed by the above described frames and mesh members, with air filtering and purifying substances, which are preferably of granular form. Cover 19 is provided with plate 17 for covering apertures 192 and 112 after container 2 has been filled with filtering material 13.

Both the frames 10 and 11 and the wire mesh 13 may be made of aluminum or aluminum alloy, or preferably of an aluminum-magnesium alloy, in order to avoid corrosion of these metallic parts.

The air purifying filter material which may be effectively used in the present invention for purifying refrigerator cooling areas may consist of various adsorption and absorption substances for removing the gaseous odor-producing substances evolved by the food stuffs stored in the refrigerator. Suitable materials of this type are activated carbon, alumina, silica gel, as well as acid combining basic substances, such as burnt lime, magnesia and ion exchange compositions. Examples of the latter compositions are zeolites and synthetic resin ion exchangers. Since a single one of the named compounds is usually not sufficient to overcome all of the odors, a mixture or a plurality of layers of two or more of the above mentioned filtering compounds may be used in suitable quantities.

The adsorbing air filter materials which are described above may be regenerated for repeated use in the manner already known in the art, such regeneration being achieved by washing in solvents, heating, drying and other processes, the process depending on the particular adsorption compound concerned.

It has also been found that particularly desirable results in purifying the air may be provided if the odor-removing substances mentioned above, or mixtures thereof, are provided with a coating of colloidal silver and/or colloidal silver oxide. If, in accordance with the invention, a thin film of the latter materials is applied to the granulated odor-removing substances above mentioned, there results an air disinfecting effect which may be carried out without loss of the colloidal silver or silver oxide, since the latter materials may also be regenerated as described above so as to indefinitely maintain the purifying effects thereof. In the use of the silver materials mentioned, particularly hygienic conditions in the refrigerator chamber can be achieved to supplement and improve the odor-removing action of the other air purifying agents mentioned above.

The following examples are given as illustrative of mixtures of air filtering material which may be used in the present invention for each 100 liters of refrigerator chamber space, it being understood that the invention is not limited to the specific examples set forth:

Example I

100-120 g. activated carbon, 80-100 g. of activated alumina, and 90-100 g. of burnt lime.

Example II

100 g. of activated carbon, 100 g. of activated silica gel, and 100 g. of basic ion exchange synthetic resin.

Example III

110 g. of activated carbon, 90 g. of activated silica gel, and 95 g. of magnesia.

Example IV

100 g. of activated carbon, 80 g. of activated alumina, and 90 g. of zeolite.

In arranging the air purifying material in layers there may also be provided hygroscopic, deliquescent chemical compounds, as for example calcium chloride and magnesium chloride. These chemicals deliquesce in absorbing moisture from the air, and such deliquescence may impair the effectiveness of the adsorbing air purifying materials. Therefore, these chemicals are provided in the air filter device within an absorbent packing material, as

for example, a porous ceramic material, in order to keep them separate from the adsorbing air filter materials.

Figures 4 and 5 illustrate another embodiment of the air purifying filter of the present invention. In these figures, there is shown a filter device which is formed of the materials described above, but which, instead of being contained in an air permeable container, is shaped into a rectangular form, the granular material of which the filter is made being held together by any suitable binding material such as glue, synthetic resin, or other binding media.

In the devices shown in Figures 4 and 5 bracket members 22 and 23 are provided around filter block 21, the bracket members having upwardly extending flange portions with apertures in which hook members and attaching elements similar to those described with respect to Figure 2 may be inserted, so that the filter block 21 may be hung in a refrigerator in the manner described above. Block 21 thus serves as an air permeable filtering diaphragm through which the air in the refrigerator may pass, and which takes up by adsorption or absorption the odor-producing substances in the circulating air.

The filter devices of the present invention may be used in any refrigerator chamber for purifying the air therein, the filter material taking up by sorption, i. e., by adsorption or absorption or both, the undesirable odors from the food stuffs or other materials stored in the refrigerator, the odors reaching the filter device by the air circulation taking place in the enclosed cooling chamber. As a result the stored food stuffs retain their original natural odor and taste, since they are not affected by foreign odors from adjacent food stuffs which are removed by the filter device.

Furthermore, the refrigerator apparatus remains free of odors which may detrimentally influence the taste of the stored materials. The drawing-off of the excess humidity, which acts as a carrying means for the odorous substances, by the filter device of the present invention has a further advantage in that there is less ice formation on the evaporator or cooling coil of the refrigerator apparatus, so that the output of the refrigerator is improved and its operation thereby becomes more economical.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of air purifying devices differing from the types described above.

While the invention has been illustrated and described as embodied in a household refrigerator, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. An air purifying device for a refrigerator having an enclosed storage space and cooling means therein, comprising in combination, air filter material for sorption of odorous gaseous substances produced by material stored in the storage space of the refrigerator, said air filter material being coated with a substance selected from the group consisting of colloidal silver and colloidal silver oxide for disinfecting the air in said storage space, said air filter material and said disinfecting substance being adapted to be regenerated for repeated use; means for retaining the thus coated air filter material in shaped form; and attaching means for securing said filter mate-

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rial in shaped form in the refrigerator storage space adjacent to the cooling means therein.

2. An air purifying device for a refrigerator having an enclosed storage space and cooling means therein, comprising in combination, a mixture of granulated air filter materials for sorption of odorous gaseous substances produced by material stored in the storage space of the refrigerator, each component of said mixture of granulated said air filter materials being coated with a substance selected from the group consisting of colloidal silver and colloidal silver oxide for disinfecting the air in said storage space, said mixture of air filter materials and said disinfecting substance being adapted to be regenerated for repeated use; means for retaining the thus coated mixture of air filter materials in shaped form; and attaching means for securing said mixture of filter materials in shaped form in the refrigerator storage space adjacent to the cooling means therein.

3. In an air purifying device for refrigerators, and the like, an air filter material comprising at least one substance selected from the group consisting of activated carbon, silica gel and activated alumina and being coated

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with a substance selected from the group consisting of colloidal silver and colloidal silver oxide.

4. In an air purifying device for refrigerators, and the like, an air filter comprising a mixture of granulated filter materials of at least one substance selected from the group consisting of activated carbon, silica gel and activated alumina and being coated with a substance selected from the group consisting of colloidal silver and colloidal silver oxide.

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