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(54) **Improvement in the explosion-proof switch for a refrigeration apparatus**

(57) Refrigeration apparatus comprising a circuit containing inflammable gases, at least a sealed electric switch accessible externally by the atmosphere in the storage compartment, and provided with a member (1) adapted to move relatively to the position of the door to supply power to the lamp, and provided externally with a sealed rigid body (4) and an elastic element (2) having a substantially concave shape, preferably a bell-like shape, and applied with its concavity around said moving member (1) so that the edge of said concavity sealingly closes against said sealed rigid body (4) along a perimeter that entirely surrounds the zone in which said moving member passes through into said sealed rigid body.

In a preferred manner, the free rim (6) is elastically engaged around a projection (3) of the body (4) of said switch, while the zone in which said free rim (6) is engaged is pressure-locked in position by an appropriate unremovable locking element (8). At least an electric terminal (23,24) comes out the side of the switch which is substantially opposite to the side in which said moving member (1) is situated, while the switch is adapted to be applied by snap-fitting by means of two elastic engaging elements (11,12) opposing each other.

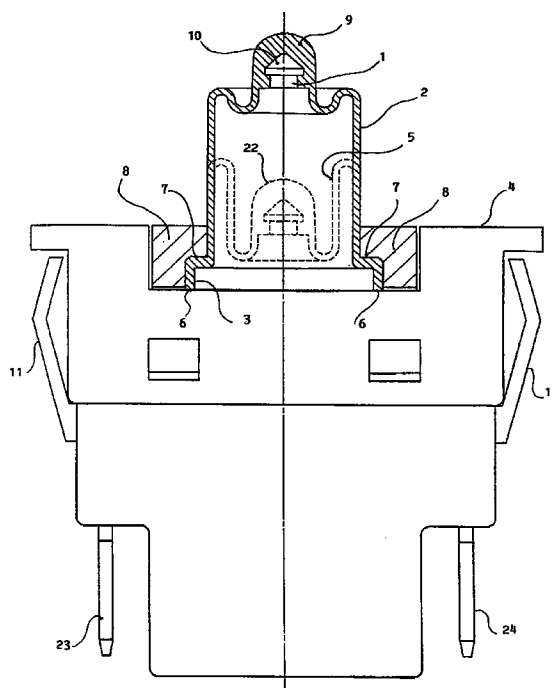


FIG. 1

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Description

The present invention refers to an improved type of refrigeration apparatus, in particular of the household type, provided with at least a compartment for the storage of the foodstuffs, and at least an electric switch accessible by the atmosphere of said food storage compartment and actuated, through appropriate motion transmission members, by the closing and/or opening movement of the door, wherein said switch is appropriately sealed so that possible sparks generated by its contacts are positively prevented from spreading over into the atmosphere of said food storage compartment.

The invention refers in particular to a type of refrigeration apparatus that may operate either statically or by forced ventilation and be provided with one or several food storage compartments and related doors and lamps for interior lighting thereof.

For reasons of greater simplicity, this description will refer to a single-door type of refrigeration apparatus, but it will be appreciated that the invention may of course be freely extended in its meaning and scope to cover also refrigeration apparatuses provided with any greater number of food storage compartments and related doors and lamps.

Refrigerating circuits and equipment for household-type refrigeration apparatuses are known in the art, in which the traditional chlorofluorocarbon-based refrigerant mixture is replaced with working fluids consisting of inflammable gases or gas mixtures.

In order to avoid any risk of explosions in the case of a leakage of such gases or gas mixtures, particular safety devices have been proposed for installation inside the food storage compartment, such as switches, thermostats, lamps and the like.

A number of patent and utility-model applications may be cited in this connection, such as for instance the specifications no. PN93U000024, PN94A000030, PN94A000032, PN94U000018 filed by this applicant in Italy, to which for reasons of brevity reference is made also in connection with all other general considerations commonly applying to products of the above stated type.

In particular, the patent application PN94A000032 refers to a refrigeration apparatus provided with a single food storage compartment, a respective lamp and a respective sealed-type switch (of the reed relay type), whose reeds are adapted to establish a contact with or to separate from each other depending on the relative position taken by a moving member, provided with an appropriate magnetic element arranged so as to act on said reeds, said moving member being capable of being positioned according to the opening or closure state of the door of said food storage compartment.

It should be noticed, however, that such a solution is not so easy or convenient to implement in household-type refrigeration apparatuses owing to the high accuracy required as far as the stroke of the moving member actuated by the door is concerned, being practically

impossible for said accuracy to be in all cases assured by the broad tolerances in the construction and, above all, in the assembly of said moving member.

It would of course be possible to achieve tighter manufacturing and assembly tolerances so as to unfailingly ensure a perfect operation of the switch actuation system, but this would entail much higher costs that are definitely not compatible with such highly competitive products as home appliances in general.

It therefore would be desirable, and it is actually a purpose of the present invention, to provide a household-type refrigeration apparatus provided with such control means for the actuation of the interior lighting in accordance with the opening and/or closing position of the compartment door as to be able to do away with the above cited drawbacks, while avoiding to introduce any further complication in the general construction through the use of new or not widely available techniques and keeping production costs at a reasonably low level.

This and further aims are reached in a refrigeration apparatus as basically described and recited in the appended claims.

The invention itself will anyway be more clearly and readily understood from the description that is given below by way of non-limiting example with reference to the accompanying drawings, in which:

- Figure 1 is a sectional view of the front portion of a switch according to the present invention;
- Figure 2 is a partially front-sectional and partially side view of a respective portion of the switch according to the present invention;
- Figure 3 is a top orthogonal view of the switch according to the present invention;
- Figure 4 is a side view of the same switch as indicated above.

The solution devised in accordance with the present invention essentially consists in the use of a switch of a traditional, non-sealed type, which is converted into a sealed switch through two basic contrivances.

The first one of said contrivances lies in closing the air passage between the switch actuating member 1, which also acts so as to cause the switch contacts to separate, and the body 4 of the same switch.

The second contrivance, of a more traditional nature, consists in hermetically sealing, through a moulding or forming operation for single-piece, integral construction, the whole remaining surface of the body of the switch, so as to shut out any possible way for air or gas to penetrate inside the switch, since also the electric terminals 23 and 24 are sealed by the body 4 of the switch, so that they do not offer any possibility for the gas to pass therethrough.

With particular reference to the above listed Fig-

ures, it can be noticed that the member 1 actuating the switch contacts (not shown since of a generally traditional type) is a small piston which is totally enclosed by a hermetically sealing elastic element 2 that completely covers said small piston and engages about the circular collar 3 of the body 4 of the switch in which said small piston 1 is moving.

Such a small piston can be almost fully inserted in the body 4 and, in this case, its corresponding position is identified by the dashed line generally referred to at 5.

In a preferred manner, said elastic element 2 is formed with a bell-like shape and its free rim 6 is engaged about said circular collar 3 which is larger than the bell-like shape of the the elastic element, so that a step 7 is formed along the upper rim of said circular collar 3.

In order to ensure full stability to such an engagement, there is provided a retaining element 8 which is positioned, pushed and finally at least partially locked against said step 7, so that the air tightness of said switch is definitively and fully ensured.

Such a locking of said retaining element 8 in the desired position against the body 4 can be obtained with means that are generally known in the art.

In an advantageous manner, in order to allow for a regular motion of said piston 1 with respect to said elastic movement 2, the latter is provided on its head portion with such a swelling 9 as to be able to muffle and enclose a corresponding enlargement 10 of the external end portion of said piston 1. This enables the head of the elastic element to undergo a smaller extent of wear and tear and, furthermore, to move symmetrically and regularly, as this is shown by the contours 2 and 22 of said elastic element in the extracted and inserted position, respectively.

A further improvement consists in forming, integrally with said body 4, two elastic retaining elements 11 and 12 adapted to enable said switch to be assembled by snap fitting.

It will of course be appreciated that a refrigeration apparatus may also be made with shapes and forms differing from the ones represented and illustrated here, without departing from the scope of the present invention.

Claims

1. Refrigeration apparatus, in particular for home use, comprising one or several refrigerating circuits containing inflammable gases and including at least a compressor, a condenser, one or several evaporators associated to at least a food storage compartment, at least a lamp providing the interior lighting of said compartment, at least a sealed electric switch which is externally accessible by the atmosphere of said compartment, said switch being provided with a moving member (1) adapted to detect the closure and/or opening state of the door of said compartment and to correspondingly open and/or

close the contacts of said switch so as to correspondingly act on the power supply to the lamp ensuring the interior lighting of said food storage compartment, **characterized in that** it is externally provided with a rigid, hermetically sealed body (4) and an elastic, hermetically sealed, concavely shaped element (2) which is applied with such its concavity around said moving member (1) so that the rim of said concavity of said elastic element is hermetically sealed against said hermetic rigid body (4) along a perimeter that entirely surrounds the insertion zone of said moving member in said hermetic rigid body.

2. Refrigeration apparatus according to claim 1, **characterized in that** said elastic element (2) allows for the actuation and the reversal of said moving member when said elastic element is correspondingly pushed and released from the outside.
3. Refrigeration apparatus according to claim 2, **characterized in that** said elastic element has a bell-like shape, the free rim of which is elastically engaged about a circular collar (3) which is larger of the bell-like shape of said elastic element, so that a step (7) is formed along the upper rim of said circular collar (3), a retaining element (8) being arranged and snap-fitted or similarly locked against said step (7).
4. Refrigeration apparatus according to any of the preceding claims, **characterized in that** said elastic element (2) is provided on the head portion thereof with a swelling (9), that the outer end portion of said piston-like actuation member (1) is provided with an enlargement (10), and that said swelling (9) houses said enlargement (10) in its interior.
5. Refrigeration apparatus according to any of the preceding claims, **characterized in that** it is provided on two opposite sides of said hermetically sealed rigid body (4) with two elastic engagement elements (11, 12) adapted to enable said switch to be assembled by snap fitting.

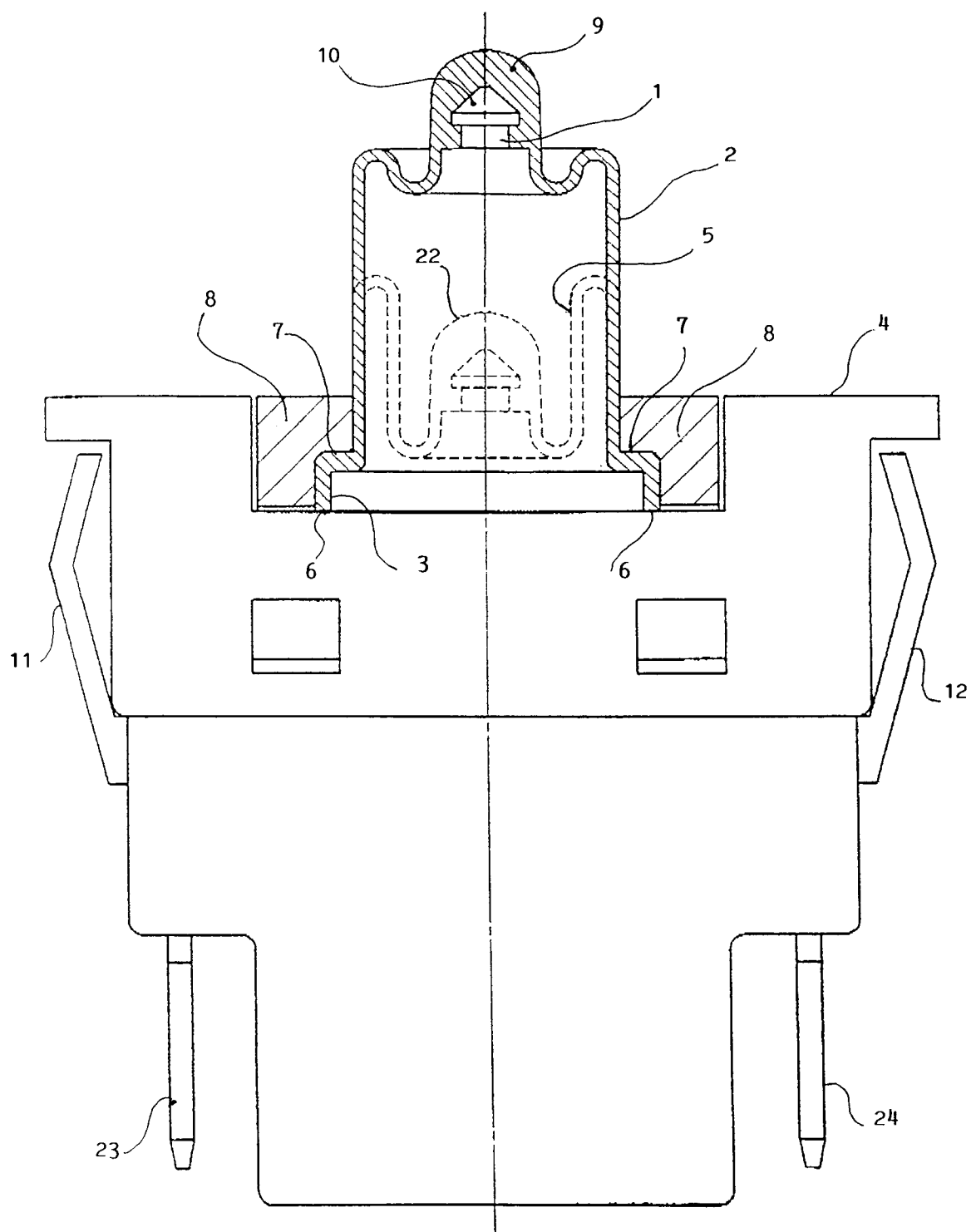


FIG. 1

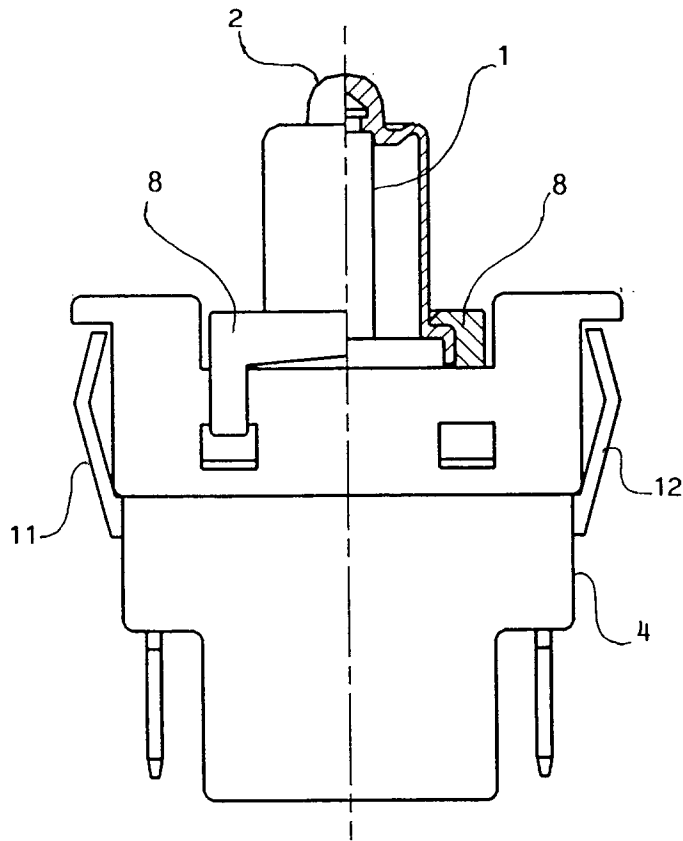


FIG. 2

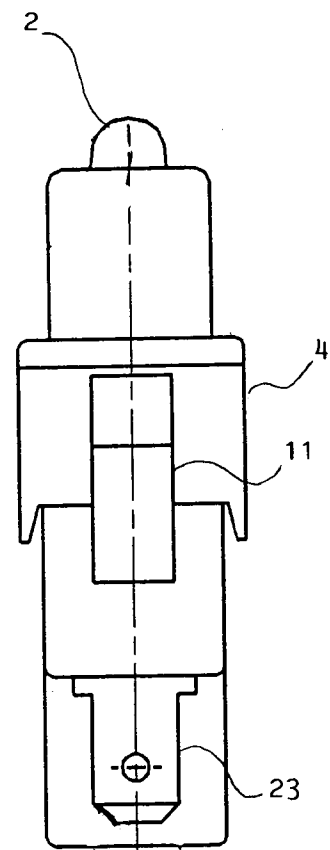


FIG. 4

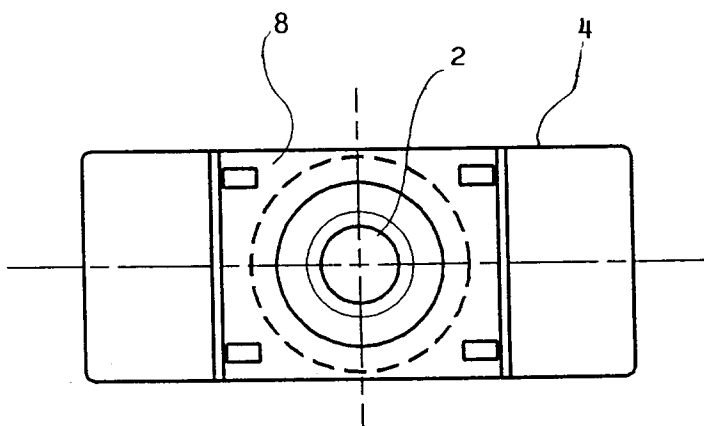


FIG. 3