METHOD OF VACUUM-PACKING INSECTICIDAL MATERIALS

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ABSTRACT

Method of packaging a sheet impregnated with an insecticidal product which evaporates slowly and which is contained in a perforated box which serves as a diffuser, by inserting the perforated box containing the impregnated sheet into a bag consisting of a flexible gas impervious material, placing the bag inside a chamber at a partial vacuum, introducing inert gas into said chamber to increase the pressure therewithin to a value still less than atmospheric pressure, sealing the bag, and increasing the pressure in said chamber to atmospheric pressure.

4 Claims, 2 Drawing Figures
METHOD OF VACUUM-PACKING INSECTICIDAL MATERIALS

SUMMARY OF THE INVENTION

Certain insecticidal products, such as dimethyl-dichloro-vinylphosphate, are utilized in a mixture with a liquid product having a high viscosity, such as a chlorinated terpene or castor oil, in order to impregnate sheets of absorbent material. When these sheets are exposed to the open air they release vapors which are capable of killing insects. The evaporation of the active insecticidal compound is slowed by the presence of the liquid having a high viscosity.

It has already been suggested that sheets of absorbent material impregnated with such products be enclosed within perforated boxes which act as diffusers.

In order to prevent the insecticidal product from gradually evaporating during storage the diffusers, with their impregnated sheets, have heretofore been enclosed in small air-tight bags such as bags made of plastic material, and heat sealed.

This type of packaging has certain substantial disadvantages.

In the first place, the quantity of air contained in the sealed bag is by no means negligible, because of the thickness of the diffusing box, and the presence of a relatively large volume of oxygen inside the sealed package results in a slow deterioration of the active insecticidal product. In particular, in the case of dimethyl-dichloro-vinylphosphate, if the air contained in the bag is slightly humid, hydrolysis of the active product may result, followed by an oxidation which yields acid compounds, such as formic acid. The presence of formic acid, which has tear-inducing and irritating properties, becomes immediately apparent when the bag is open. Moreover, the efficacy of diffusers containing a sheet impregnated with insecticide is greatly reduced as a consequence of this deterioration of the active product.

In the second place, the heat sealing step which is used to close the bag may not be perfectly carried out. This disadvantage is not detectable at the time of manufacture and the incompletely sealed bag will admit air. The active product, such as dimethyl-dichloro-vinylphosphate, is then oxidized, not only by the oxygen originally contained inside the bag, but also by oxygen which thereafter penetrates into the bag, and the decrease in the efficacy of the insecticidal sheet which results therefrom is very substantial.

It is the object of the present invention to eliminate this disadvantage by providing a simple process which, on the one hand, prevents the deterioration of the active product and, on the other hand, makes it possible to detect at the time of manufacture any inadequate sealing of the air-tight bag which contains the diffuser holding the impregnated sheet.

The present invention is accordingly directed to a method of packaging an insecticidal product, and in particular a sheet impregnated with an insecticide which is to slowly evaporate within a perforated box which acts as a diffuser. This process is essentially characterized by the fact that the perforated box holding the impregnated sheet is positioned inside a bag made of a flexible gas-tight material. This bag is placed in a chamber in which a partial vacuum is induced. An inert gas is then introduced into this chamber to increase the pressure to a value which is still less than atmospheric pressure. The bag containing the diffuser is then sealed and the chamber returned to atmospheric pressure.

In a preferred method of carrying out the invention the bag containing the diffuser with its impregnated sheet is made of a sheet made of plastic material. This sheet of plastic material may be formed of several superposed layers of different plastic materials, the innermost of which is heat-sealable. The sheet from which the bag is made may be from 0.05 mm to 0.5 mm thick. The bag is heat sealed. The pressure inside the chamber is reduced to from 1 to 10 cm of mercury. The inert gas introduced into the chamber is nitrogen. The pressure at which the inert gas is introduced is between 30 and 60 cm of mercury.

In another method of carrying out the process according to the invention the inert gas is introduced in such a way as to sweep the chamber and thereby still further reduce the residual quantity of oxygen.

It is obvious that by producing a partial vacuum inside the chamber holding the bag containing the diffuser with its impregnated sheet the quantity of oxygen which will remain inside the bag after it has been sealed is substantially reduced. The creation of this partial vacuum accordingly in itself makes it possible to considerably reduce the deterioration of the active insecticidal product due to hydrolysis and oxidation. However, the step of the process according to the invention in which the pressure is returned to a value greater than the original partial vacuum but less than atmospheric pressure by injecting an inert gas is essential and constitutes an important feature of the invention. In effect, if one merely established a partial vacuum inside the bag before sealing it, the bag would be crushed when removed from the chamber and subjected to atmospheric pressure, with the resultant crushing of the diffuser contained therein since, in general, the diffuser is made of a plastic material. This compression would deform the diffuser and this deformation when the bag was opened, would make it appear that the article had been damaged and have an adverse effect on the ventilating properties of the diffuser. On the contrary, the fact that an inert gas is injected into the chamber to raise it to a pressure between 30 and 60 cm of mercury makes it possible to decrease the difference between the pressures inside and outside the bag and avoid the deformation of the diffuser.

Moreover, it should be noted that it is preferable to limit the introduction of the inert gas to a pressure below atmospheric pressure. In effect, when the bag is returned to atmospheric pressure after having been sealed, the pressure difference results in forcing the walls of the bag against the walls of the diffuser. If there is a leak in the bag, an inflow of air results, so that in a very short time the walls of the bag are no longer pressed against the walls of the diffuser. This makes it very easy to detect from the external appearance of the package those bags in which the seal is defective.

Finally, it should be noted that the pressure during the packaging operation is, in general, sufficient to prevent condensation of the active insecticidal product on the internal surfaces of the walls of the bag, because the saturating vapor tension of the insecticidal product used is generally substantially less than the pressure within the bag.
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By way of example, in the case of dimethyl-dichloro-vinylphosphate saturating vapor tension at 20°C is 0.15 mm of mercury whereas the pressure inside the chamber during the packaging operation always remains substantially above that value.

It is a further object of the present invention to provide a new article of manufacture which consists of a bag holding an insecticidal product in the form of an impregnated sheet inside a perforated box which acts as a diffuser, which bag is essentially characterized by the fact that it is made of flexible gas impervious material. The bag is sealed fluid-tight, and contains a very small quantity of oxygen. The pressure of the gas inside the bag is less than atmospheric pressure.

In a preferred embodiment of the invention, the pressure inside the bag is between 30 and 60 cm of mercury. The residual quantity of oxygen is that which remains in the bag after the pressure therewithin has been reduced to between 1 and 10 cm of mercury. The bag is heat sealed and is made of a sheet of plastic material which may comprise several superposed layers of different plastic materials. The sheet of which the bag is made may be from 0.05 mm to 0.5 mm thick.

In order that the invention may be better understood three methods of carrying it out will now be described, purely by way of illustration and example, with reference to the accompanying drawing, in which:

FIG. 1 is a sectional view taken through a diffuser enclosed in a bag in accordance with the invention; and

FIG. 2 is a sectional view taken along the line II-II of FIG. 1.

EXAMPLE 1

An insecticidal sheet 2 consisting of a substantially rectangular sheet of cotton and asbestos felt is positioned inside a diffuser 1 such as the one described in French Pat. application Ser. No. 6902574, filed Feb. 5, 1969. This sheet weighs 9 g and has a surface area of 150 cm². It is impregnated with 35 g of a mixture consisting of:

50 percent by weight of chlorinated terepene sold under the trademark "STROBANE;"
50 percent by weight of dimethyl-dichloro-vinylphosphate.

This diffuser is placed inside a bag 3 formed from a sheet consisting of three superposed layers laminated to each other. The first layer 4 comprises a thin film 5 of aluminum foil, a film 6 of cellophane and a film 7 of a plastic material sold under the trademark "SARAN." The second layer 8 consists of a film 9 of "SARAN," and a film 10 of plastic material sold under the trademark "MYLAR," and the third is a layer 11 of polyethylene. The total thickness of the sheet is about 0.1 mm. The polyethylene forms the inner surface of the bag.

The foregoing bag 3, holding its diffuser 1, is positioned while open, inside a chamber at atmospheric pressure. A partial vacuum of 4 cm of mercury is produced. Nitrogen is then introduced into this chamber to raise the pressure to 46 cm of mercury. Inside the chamber the bag is then heat sealed by a heating bar, which welds together the polyethylene layers 11 which form the inner surfaces of the bag. The chamber is then brought up to atmospheric pressure. It will be found that the walls of the bag 3 are pressed against the walls of the diffuser and that, after long storage, the efficacy of the sheet 2 which has been impregnated with the insecticidal product is in no way decreased. It will also be noted that, if the heat sealing is defective, the walls of the bag 3 will separate from the walls of the diffuser 1 within a few minutes. This makes it possible to visually detect any bag which has been defectively sealed.

EXAMPLE 2

The said diffuser and the same bag are used as in Example 1. The sheet inside the diffuser is made of the same material having the same area and is impregnated with 35 g of the following mixture:

50 percent by weight of castor oil; 
50 percent by weight of dimethyl-dichloro-vinylphosphate.

The bag containing the diffuser with its impregnated sheet is subjected to the same packaging process as described in Example 1 and the bag is heat sealed.

The product has the same advantages as the one described in Example 1. The efficacy of the insecticidal product does not decrease after long storage.

EXAMPLE 3

The said diffuser and bag are used as in Example 1. The sheet inside the diffuser is made of the same material as in Example 1 and is of the same size. It is impregnated with 35 g of the following mixture:

33 percent by weight of castor oil; 
17 percent by weight of the chlorinated terepene sold under the trademark "STROBANE;" 
50 percent by weight of dimethyl-dichloro-vinylphosphate.

The bag containing the diffuser with its impregnated sheet is treated in the same way as in Example 1, and the bag is heat sealed.

This process results in the same advantages as in Example 1. The efficacy of the insecticidal product does not decrease after long storage.

What is claimed is:

1. A gas-impervious flexible bag housing a sheet impregnated with an insecticidal material therein, said bag having an inert gas therein of between 30 and 60 cm of mercury, said bag being heat-sealed to contain said inert gas therein, the difference in the pressure within the bag and the ambient pressures surrounding the same causing said bag to engage with the walls of the perforated box and to remain in contact with the walls of said perforated box until such time as the pressure within said bag is at least equal to the surrounding atmosphere, whereupon said bag will no longer contact said walls.

2. Bag as claimed in claim 1 in which the quantity of oxygen therein is that which remains in the bag after the pressure therein has been reduced to from 1 to 10 cm of mercury.

3. Bag as claimed in claim 1 which consists of a sheet of plastic material comprising several superposed layers of different plastic materials.

4. Bag as claimed in claim 1 in which the thickness of the sheet material from which the bag is made is between 0.5 and 0.05 mm.

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