FUMIGANT APPLICATOR

BACKGROUND OF THE INVENTION AND PRIOR ART

The present invention relates to a novel, fumigant applicator formed from a heat weldable plastic sheet material comprising a spun-bonded, preferably paper-like, polyolefin sheet or fleece composed of heat and pressure bonded minute polyolefin fiber which is vapor- and gas-pervious but impervious to liquid water and dust, naturally water-resistant and of high tensile and tear strength. More particularly, this invention relates to a fumigant applicator formed from this sheet material which contains a gas- or vapor-evolving pest control agent, more particularly comprising a hydrolyzable metal phosphide from which, when exposed to environmental humidity, phosphine gas is released to the environment due to the hydrolysis of the metal phosphide.

A sheet or film material as described above is known. Certain embodiments thereof are marketed under the registered trade mark TYVEK of Du Pont de Nemours. This family of tough, durable products is made from 100% high density polyethylene fibers by an integrated spinning and bonding process. The sheet is formed by spinning very fine polyethylene fibers, which in practice, i.e. in the commercial product, are approximately 0.005 mm in diameter and laying these down as a random network, the fibers then being bonded together with heat and pressure. No binders, sizes or fillers are used in that commercial product. The product is available in various degrees of stiffness or softness and drapeability, most of them being paper-like, i.e., having the appearance of ordinary wood pulp paper, and in various degrees of porosity. The toughness and puncture resistance thereof is outstanding compared to other materials. The combination of tensile strength, elongation, tear strength and flex-life is considered unique. The surface can be made smooth and compact, suitable for printing, coating or laminating. The product is naturally water-resistant, meaning that its physical properties are unaffected when immersed in water. The product has excellent dimensional stability, rot- and mildew-resistance and chemical resistance. Melting occurs at 135° C. Compared with many other plasticsbased materials, this product has favorable nonflammability properties. The product shrinks away from flame but will burn slowly and drip melted polymer. The product does not generally shed lint particles under conditions of ordinary use. Most such products are marketed with effective antistatic treatment. Most of the products, and in particular those of paper-like consistency have good liquid holdout characteristics, i.e., supporting hydrostatic heads of aqueous liquid up to and exceeding 76 cm. These products have been recommended for example for the manufacture of tags and labels, banners and signs, wall covering, book covering, wall maps, charts, packaging and post envelopes.

The above listed properties are highly desirable. However, the present applicants intended to put these properties to commercial use in a particular new manner of application where certain problems were encountered.

The applicants recently developed (see U.S. Pat. No. 4,597,218; Eu-PS 0131 759) what is presently considered to be a new generation of applicator means for holding a gas evolving pest control agent, more particularly comprising a hydrolyzable metal phosphide, from

which, when exposed to environmental humidity, phosphine gas is released to the environment due to the hydrolysis of the metal phosphide. Such applicator means are an the form of sachets, i.e. relatively small bags or envelope-like pockets, made of a non-woven thermoplastic sheet material (by some authors now-a-days referred to as "fleece") comprising more or less randomly orientated fibers of a thermoplastic polymer which are bonded together, usually with heat and pressure to form a felt-like or matted texture. These are usable as individual sachets or in the form of a plurality thereof joined together in a flat composite structure, e.g. flexibly, such as an elongate belt adapted to be rolled up in a or folded up concertina-like manner for storage and transport, packed in airtight and moisture-proof containers such as sealed tins. These applicators are removed from the airtight container immediately prior to use and are then unrolled or unfolded (in the case of such belts) and exposed to the environment where fumigation is to take place (PCT Application WO-A-80/00119). The residue of the hydrolyzed metal phosphide is retained in dust form by the applicator. These applicators are manufactured by thermal welding, the resulting welding seams serving to close the sides of the sachets or the like and to form flexible hinge lines between individual sachets. The flexibility of the seams and their physical strength is of obvious importance in the case of the aforesaid belt-like composite applicators, and is even important in the event that individual sachets are to be manufactured, because the manufacture thereof takes place in substantially the same manner as that of the composite belts (known in the art as "bag blankets") until the final manufacturing stage, when the continuous belts delivered by the machine and filled with pest control agent, are cut along the seam lines into individual sachets.

The teachings of U.S. Pat. No. 4,597,218 introduced substantial improvements into the art. However, the tear-resistance of all those non-woven fabrics ("fleeces"), which could be heat-welded satisfactorily, proved to be somewhat limited. Under severe conditions of use or abuse, these applicators might still tear and burst open. Also, the best materials tested were nevertheless often found to be not entirely dust-proof in the sense that when a sachet filled with very fine dust is beaten against a very clean, polished surface, traces of dust penetration can be observed. These properties can be objectionable if extreme hygienic demands must be met. None of the many prior art non-woven weldable fabrics tested had the property of forming (for practical purposes) a complete barrier against liquid water and yet were pervious to a desired extent to water vapor and the phosphine gas released by the metal phosphide.

Finally, in spite of the many desirable properties of the aforesaid "new generation" applicators, they still suffered from the defect that the non-woven material itself exercised little or no control over the rate of access of water vapor to the pest control agent and over the rate at which the vaporous or gaseous contents of the applicators were released to the environment. One result has been an accumulation of sometimes extremely high concentrations of phosphine gas in the immediate vicinity of the outer surfaces of the applicators, whereas it would have been desirable for these gases to be released more gradually and at a rate closer to that at which the gas is distributed in the environment to be fumigated by diffusion, circulation, convection or other