

DESCRIPTION

Title of Invention: CHEMICAL VOLATILIZING DEVICE

Technical Field

[0001] The present invention relates to chemical volatilizing devices for volatilizing a volatile chemical such as an insect repellent.

Background Art

[0002] Known chemical volatilizing devices include a chemical volatilizing member that volatilizably holds a volatile chemical and a storage container that ventilatably accommodates the chemical volatilizing member. The storage container has, in its circumferential face, a plurality of openings. The chemical volatilized from the chemical volatilizing member is discharged to the outside via the openings (see, e.g., Patent Document 1).

[0003] The known technology, which allows the volatile chemical to be discharged all the time, excels in chemical diffusing performance but leaves room for improvement in terms of lasting chemical volatilizing performance. Even if the volatile chemical itself has no objectionable odor and is safe, consumers may prefer not to leave the chemical to be volatilized all the time in a narrow closed space with a volume of about 2.0 to 33.3 m³ (with or without any system of ventilation such as natural ventilation, 24-hour ventilation, or the like) such as an indoor space (toilet, bathroom, bedroom, living room, or the like), in a vehicle, in a tent, or the like. To cope with that, demand is being felt for a chemical volatilizing device provided with a function of volatilizing a chemical only during its use or only for a prescribed time.

[0004] Here, a preferred design is one that allows easy switching between a volatilizing state (during use) and a non-volatilizing state (during disuse). In particular in a case where the volatilizing and non-volatilizing states are switched frequently (e.g., in a case where they are switched at intervals of 12 hours or less), the easier the switching, the better. Inconveniently, there have thus far been known no chemical volatilizing devices that allow such switching by comparatively simple operation.

Citation List

Patent Literature

[0005] Patent Document 1: Japanese Unexamined Patent Application No. 2023-101180

Summary of Invention

Technical Problem

[0006] An object of the present invention is to provide a chemical volatilizing device that allows easy switching between a volatilizing state (during use) and a non-volatilizing state (during disuse) by comparatively simple operation without diminishing lasting chemical volatilizing performance.

Solution to Problem

[0007] According to a first aspect of the present invention, a chemical volatilizing device includes a chemical volatilizing member that volatilizably holds a volatile chemical and a storage container that has an outer container disposed outside an inner container accommodating the chemical volatilizing member. When the storage container is switched between an upright position and an inverted position turned upside down relative to the upright position, the inner container moves down under its own weight. In one of the upright and inverted positions, outer openings in the circumferential face of the outer container and inner openings in the circumferential face of the inner container overlap with each other and, in the other of those positions, the inner openings are displaced from the outer openings in the vertical direction so that the outer openings are closed by surroundings of the inner openings.

[0008] According to second aspect of the present invention, a chemical volatilizing device includes a chemical volatilizing member that volatilizably holds a volatile chemical and a storage container that has an outer container disposed outside an inner container accommodating the chemical volatilizing member. The inner container, which is a sheet molding of synthetic resin, is disposed to be vertically movable relative to the outer container, which is an injection molding. As the inner container moves vertically, a switch is made between a volatilizing state in which outer openings in the circumferential face of the outer container and inner openings in the circumferential face of the inner container overlap with each other and a non-volatilizing state in which the inner opening is displaced from the outer opening in the vertical direction so that the outer opening is closed by the surroundings of the inner openings.

Advantageous Effects of Invention

[0009] With the chemical volatilizing devices according to the first and second aspects of the present invention, the user can place the storage container selectively in either the upright

position or the inverted position and can thereby easily switch between the volatilizing state where the outer openings are open and the non-volatilizing state where the outer openings are closed. It is thus possible to switch to the non-volatilizing state during disuse to suppress unnecessary volatilization of the volatile chemical, and thus to keep lasting chemical volatilizing performance.

Brief Description of Drawings

[0010] [Fig. 1] is a perspective view of a chemical volatilizing device according to a first embodiment of the present invention.

[Fig. 2] is an exploded perspective view of the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 3] is a front view of an inner container in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 4] is a side sectional view of the inner container in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 5] is a perspective view showing the fitting of the inner container in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 6] is a transverse sectional view of an upper part of an outer container in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 7] is a transverse sectional view of a lower part of the outer container in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 8] is a transverse sectional view of an upper part of a front member, in a stacked state, in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 9] is a transverse sectional view of a lower part of the front member, in a stacked state, in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 10] is a transverse sectional view of an upper part of a rear member, in a stacked state, in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 11] is a transverse sectional view of a lower part of the rear member, in a stacked state, in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 12] is a side sectional view of a storage container, in an upright position, in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 13] is a side sectional view of the storage container, in an inverted position, in the chemical volatilizing device according to the first embodiment of the present invention.

[Fig. 14] is a perspective view of a chemical volatilizing device according to a second embodiment of the present invention.

[Fig. 15] is an exploded perspective view of the chemical volatilizing device according to the second embodiment of the present invention.

[Fig. 16] is a perspective view showing the fitting of an inner container in the chemical volatilizing device according to the second embodiment of the present invention.

[Fig. 17] shows a storage container, in an upright position, in the chemical volatilizing device according to the second embodiment of the present invention.

[Fig. 18] is an enlarged view of part D in Fig. 17.

[Fig. 19] shows the storage container, in an inverted position, in the chemical volatilizing device according to the second embodiment of the present invention.

[Fig. 20] is an enlarged view of part E in Fig. 19.

Description of Embodiments

[0011] < First Embodiment >

Embodiments of the present invention will be described below with reference to the accompanying drawings. Figs. 1 and 2 are a perspective view and an exploded perspective view, respectively, of a chemical volatilizing device 1 according to a first embodiment. The chemical volatilizing device 1 discharges a volatile chemical such as an insecticide or insect repellent for the purpose of removing or repelling flying pest insects such as mosquitoes.

[0012] The chemical volatilizing device 1 includes a chemical volatilizing member 5 and a storage container 6. The storage container 6 includes an inner container 10 that accommodates the chemical volatilizing member 5 and an outer container 20 disposed outside the inner container 10. The outer container 20 encloses the inner container 10. The chemical volatilizing device 1 is placed upright, for example, on a table and, through outer openings 20a formed in the circumferential face of the outer container 20, the chemical volatilized from the chemical volatilizing member 5 is discharged.

[0013] The chemical volatilizing member 5 can be any member configured to volatilizably hold a volatile chemical by being impregnated or blended with it in such a way that the volatile chemical can be volatilized. Examples of the material of the chemical volatilizing member 5 include paper, pulp, natural fiber, synthetic fiber, resin material, resin sheet, inorganic or organic porous material, and gel material.

- [0014] A simple method is to impregnate a resin sheet with a chemical. From the viewpoints of easy control of sustained release of a volatile chemical during the period of use, volatilizing the chemical in a stable amount, and, in the case of outdoor placement and use, suppressing effluence of the chemical with moisture such as rain, it is preferable to use a resin material blended with a volatile chemical. This, however, is not meant as any limitation.
- [0015] Examples of resins for a resin material or resin sheet include polyethylene, polypropylene, polyvinyl alcohol, polyvinyl acetate, polybutadiene, polyisoprene, ethylene-vinyl acetate copolymer, ethylene-methyl methacrylate copolymer, and styrene-butadiene copolymer.
- [0016] The chemical volatilizing member 5 can be configured in the form of a sheet, grains, a three-dimensional body, or the like, with no particular limitation intended. From the viewpoint of improved efficiency of volatilizing the volatile chemical, it is possible to employ, for example, a honeycomb structure, a perforated structure, a two- or three-dimensional mesh structure.
- [0017] As the volatile chemical, it is possible to use an insecticide, repellent, mold inhibitor, antimicrobial substance, aromatic substance, deodorant, or synergist, and these can be used singly or in any combination of two or more of them, with no particular limitation intended. For example, for the purpose of removing or repelling flying pest insects such as mosquitoes, Chironomidae, and Psychodidae, it is preferable to use as the volatile chemical a pyrethroid compound. It is particularly preferable to use a normal-temperature volatile pyrethroid compound with high volatility and a high effect of controlling flying pest insects, such as metofluthrin, profluthrin, empenethrin, or transfluthrin. A volatile chemical can be used in combination with a known hardly volatile chemical.
- [0018] The inner container 10 is a resin molding formed by injection molding and accommodates the chemical volatilizing member 5. The inner container 10, with a front member 11 and a rear member 12 that engage with each other, covers the front and rear sides, respectively, of the chemical volatilizing member 5.
- [0019] Figs. 3 and 4 are a front view and a side sectional view, respectively of the inner container 10. An upper end part of the front member 11 of the inner container 10 is provided with a pair of left and right engaging claws 15a protruding rearward. Likewise, a lower end part of the front member 11 of the inner container 10 is provided with a pair of left and right engaging claws 15b protruding rearward. The rear member 12 of the inner container 10 is provided with engaged portions 16 with which the engaging claws 15a and 15b engage. The engagement between the engaging claws 15a and 15b and the engaged

portions 16 keeps the chemical volatilizing member 5 accommodated inside the inner container 10.

[0020] The interval between the engaging claws 15a in the upper end part of the front member 11 differs from the interval between the engaging claws 15b in its lower end part. This prevents the front and rear members 11 and 12 from being fitted one upside down relative to the other. It is also possible to provide the front member 11 with engaged portions 16 and the rear member 12 with engaging claws 15a and 15b.

[0021] It is also possible to form the front and rear members 11 and 12 unitarily across a hinge portion provided at their one ends along the vertical direction and provide them at their other ends with engaging claws and engaged portions that engage together. It is furthermore possible to cover the front and rear faces of the chemical volatilizing member 5 with the front and rear members 11 and 12 and bond these together as by ultrasonic waves.

[0022] The circumferential face of the inner container 10 has a plurality of inner openings 10a in a rectangular shape delimited by crossbars 10b in the form of a lattice. The volatile chemical that volatilizes from the chemical volatilizing member 5 passes out through the inner openings 10a to be directed to the outer openings 20a in the outer container 20.

[0023] The inner container 10 has, on the outer surface of its opposite side faces, first protrusions 14. The inner container 10 has, in a lower end part of it, a wider portion 13 with a larger width along the left-right direction than an upper part of it. The width of the wider portion 13 along the left-right direction is larger than the width of the inner container 10 at the first protrusions 14 along the left-right direction.

[0024] As shown in Fig. 5, the inner container 10 is inserted, starting with its side opposite from the wider portion 13, into the outer container 20 through an insertion hole 20c provided in a lower end face of it. Thus, the inner container 10 is removably fitted in the outer container 20 so that, with the inner container 10 taken out, the entire inner container 10 or the chemical volatilizing member 5 inside the inner container 10 can be easily replaced. A structure is also possible that keeps the inner container 10 unremovable once it is fitted.

[0025] The outer container 20 has, on its inner surface, a pair of left and right second protrusions 24 (see Fig. 2). The interval between the inner faces of the second protrusions 24 along the left-right direction is slightly smaller than the interval between the outer faces of the first protrusions 14 along the left-right direction. Thus, when the inner container 10 is inserted into the outer container 20, the first protrusions 14 elastically deform while sliding across the second protrusions 24 to move over them.

[0026] In that way, the first protrusions 14 rest above the second protrusions 24, so that the

inner container 10 is fitted. The contact of the first protrusions 14 with the second protrusions 24 restricts the vertical movement (falling) of the inner container 10.

[0027] When the inner container 10 is inserted through the insertion hole 20c starting with the wider portion 13, that is, in the direction opposite to that mentioned above, the wider portion 13 makes contact with the second protrusions 24 to prevent the inner container 10 from moving farther. This prevents improper fitting of the inner container 10.

[0028] In Figs. 1 and 2, the outer container 20 is a resin molding formed by injection molding, and the inner container 10 is inserted into it through the insertion hole 20c provided in its one end face (here, the bottom face) along the vertical direction. Thus, the inner container 10 is removably fitted in the outer container 20. The outer container 20 has in its top face a top opening 20d, and a flange 23 provided around the top opening 20d prevents the coming-out of the inner container 10.

[0029] As shown in Fig. 1, the flange 23 has, as a part of it, a jutting portion 23a that protrudes inward. Thus, the outer container 20 is so structured as to prevent the inner container 10 from being inserted through the top opening 20d by mistake.

[0030] When the inner container 10 is taken out of the outer container 20, the inner container 10 can be pushed out through the top opening 20d of the outer container 20.

[0031] The outer container 20 is formed of, for example, white resin and the inner container 10 is formed of, for example, colorless transparent resin or gray resin. The outer container 20 and the inner container 10 can have any exterior colors; while they can be of the same color, coloring them differently makes it easy to distinguish between a volatilizing and a non-volatilizing state, which will be described later.

[0032] The outer container 20, with a front member 21 and a rear member 22 that engage with each other, covers the front and rear sides, respectively, of the inner container 10. The circumferential face of the outer container 20 has a plurality of outer openings 20a in a rectangular shape delimited by crossbars 20b in the form of a lattice with. The outer openings 20a are formed substantially in the same size as the inner openings 10a.

[0033] Figs. 6 and 7 are transverse sectional views of an upper end part and a lower end part, respectively, of the outer container 20 as seen from below. The front member 21 of the outer container 20 has, in an upper end part of its side face, a pair of left and right engaging claws 25a that protrude rearward and, in a lower end part of the side face, a pair of left and right engaging claws 25b that protrude rearward. The front member 21 also has, on its inner surface, a pair of left and right ribs 26a inward of the engaging claws 25a and a pair of left and right ribs 26b inward of the engaging claws 25b.

[0034] The front member 21 has, on the outer surface of an upper part of it, step portions 28a

and 29a at the same positions, along the left-right and vertical directions, as the engaging claws 25a and the ribs 26a. The front member 21 has, on the outer surface of a lower part of it, step portions 28b and 29b at the same positions, along the left-right and vertical directions, as the engaging claws 25b and the ribs 26b.

[0035] The rear member 22 has, in an upper end part of its side face, a pair of left and right engaged portions 30a with which the engaging claws 25a engage, and has, in a lower end part of the side face, a pair of left and right engaged portions 30b with which the engaging claws 25b engage. The rear member 22 also has, in an upper end part of it, a pair of left and right opposing walls 31a facing the engaged portions 30a and has, in a lower end part of it, a pair of left and right opposing walls 31b facing the engaged portions 30b. The rear member 22 has, on its outer surface, step portions 33a and 33b at the same positions, along the left-right and vertical directions, as the opposing walls 31a and 31b, respectively.

[0036] The engaging claws 25a fit between the engaged portions 30a and the opposing walls 31a to engage with the engaged portions 30a. At that time, the opposing walls 31a fit between the engaging claws 25a and the ribs 26a. The engaging claws 25b fit between the engaged portions 30b and the opposing walls 31b to engage with the engaged portions 30b. At that time, the opposing walls 31b fit between the engaging claws 25b and the ribs 26b.

[0037] The width of the opposing walls 31b along the left-right direction is larger than the width of the opposing walls 31a along the left-right direction. Thus, if the front member 21 is put upside down on the rear member 22, the opposing walls 31b make contact with the ribs 26a and prevent the engagement of the engaging claws 25a. This prevents improper fitting between the front member 21 and the rear member 22.

[0038] The opposing walls 31a have projections 32a facing the engaging claws 25a and disposed frontward of the engaged portions 30a along the insertion direction. Thus, the engaging claws 25a, when they fit between the engaged portions 30a and the opposing walls 31a, deform elastically to be guided along the projections 32a to engage with the engaged portions 30a.

[0039] Likewise, the opposing walls 31b have projections 32b facing the engaging claws 25b and disposed frontward of the engaged portions 30b along the insertion direction. Thus, the engaging claws 25b, when they fit between the engaged portions 30b and the opposing walls 31b, deform elastically to be guided along the projections 32b to engage with the engaged portions 30b. In this way, the inner container 10 is housed inside the outer container 20.

[0040] The gaps between the engaging claws 25a and 25b engaged with the engaged portions 30a and 30b and the opposing walls 31a and 31b are narrowed by the projections 32a and

32b. This prevents disengagement of the front member 21 and the rear member 22 from each other under impact as when the chemical volatilizing device 1 is dropped.

[0041] Figs. 8 and 9 are transverse sectional views of an upper part and a lower part of the front member 21 in a state stacked during the assembly of the outer container 20. On the step portions 28a and 29a of the front member 21 rest the engaging claws 25a' and the ribs 26a' of a front member 21' stacked on top. On the step portions 28b and 29b of the front member 21 rest the engaging claws 25b' and the ribs 26b' of the front member 21' stacked on top. In this way, front members 21 can be stacked on each other stably. This helps improve the ease of assembly of the outer container 20.

[0042] Figs. 10 and 11 are transverse sectional view of an upper part and a lower part of the rear member 22 in a state stacked during the assembly of the outer container 20. On the step portions 33a of the rear member 22 rest the opposing walls 31a' of a rear member 22' stacked on top. On the step portions 33b of the rear member 22 rest the opposing walls 31b' of the rear member 22' stacked on top. In this way, rear members 22 can be stacked on each other stably. This helps improve the ease of assembly of the outer container 20.

[0043] It is also possible to provide the front member 21 with engaged portions 30a and 30b and opposing walls 31a and 31b and the rear member 12 with engaging claws 25a and 25b and ribs 26a and 26b.

[0044] Fig. 12 is a side sectional view of the chemical volatilizing device 1 with the storage container 6 in an upright position. Fig. 13 is a side sectional view of the chemical volatilizing device 1 with the storage container 6 in an inverted position turned upside down relative to the upright position. The inner container 10 is, under its own weight, vertically movable inside the outer container 20. Thus, in the upright position, the inner container 10 that moves down under its own weight has its vertical movement restricted by the contact between the first protrusions 14 (see Fig. 3) and the second protrusions 24 (see Fig. 2).

[0045] At that time, inside the storage container 6, the inner openings 10a are located at positions overlapping with the engaged portions 30a, so that the outer openings 20a are left open. Thus, the volatile chemical that volatilizes from the chemical volatilizing member 5 is discharged through the inner openings 10a and the outer openings 20a into the room where the chemical volatilizing device 1 is placed. That is, the chemical volatilizing device 1 goes into a volatilizing state in which it volatilizes the volatile chemical to the outside.

[0046] In the inverted position where the storage container 6 is turned upside down from the upright position as indicated by arrow A, the inner container 10 that moves down under its own weight has its vertical movement restricted by the contact between its end faces along

the vertical direction and the flange 23. At that time, the inner openings 10a are displaced from the outer openings 20a in the vertical direction so that the outer openings 20a are closed by the crossbars 10b around the inner openings 10a.

[0047] Thus, the volatile chemical that volatilizes from the chemical volatilizing member 5 is shut in by the crossbars 10b around the inner openings 10a and the crossbars 20b around the outer openings 20a, and this suppresses its discharge to the outside. That is, the chemical volatilizing device 1 goes into a non-volatilizing state in which it suspends the volatilizing of the volatile chemical. In this way, it is possible to control the amount of chemical used by selecting the upright position when needed and the inverted position when not needed. It is thus possible to keep lasting chemical volatilizing performance.

[0048] In a case where the outer container 20 and the inner container 10 are given different exterior colors, the crossbars 10b of the inner container 10 with the different color from the outer container 20 are visible through the outer openings 20a and this permits visual recognition of the non-volatilizing state. This makes it easy to distinguish between the volatilizing and non-volatilizing states and is useful.

[0049] While the inner openings 10a and the outer openings 20a are formed in a rectangular shape delimited by the crossbars 10b and the crossbars 20b in the form of a lattice, they may be in any shape other than rectangular so long as the outer openings 20a can be closed by the surroundings of the inner openings 10a. While the storage container 6 is in the volatilizing state in the upright position and in the non-volatilizing state in the inverted position, it may be in the non-volatilizing state in the upright position and in the volatilizing state in the inverted position.

[0050] With this embodiment, the user can place the chemical volatilizing device 1 selectively in either the upright position or the inverted position and can thereby easily switch between the volatilizing state where the outer openings 20a are open and the non-volatilizing state where the outer openings 20a are closed, that is, turn it on during use and off during disuse. It is thus possible to switch to the non-volatilizing state during disuse to suppress unnecessary volatilization of the volatile chemical, and thus to keep lasting chemical volatilizing performance.

[0051] The contact between the first protrusions 14 protruding from the outer surface of the inner container 10 and the second protrusions 24 protruding from the inner surface of the outer container 20 restricts the vertical movement of the inner container 10. This makes it easy to position the inner openings 10a relative to the outer openings 20a to select the volatilizing or non-volatilizing state.

[0052] The inner container 10 is formed so as to be removably fitted by being inserted through

the insertion hole 20c of the outer container 20 and, when it is inserted through the insertion hole 20c, the first protrusions 14 slide across and move over the second protrusions 24. This permits replacement of the chemical volatilizing member 5. The first protrusions 14 having moved over the second protrusions 24 make contact with the second protrusions 24. It is thus easy to restrict the vertical movement of the inner container 10.

[0053] The inner container 10 has, in one end part of it along the vertical direction, the wider portion 13. Thus, inserting it starting with the wider portion 13 through the insertion hole 20c results in the wider portion 13 making contact with the second protrusions 24 and preventing the inner container 10 from moving farther. It is thus possible to prevent improper fitting of the inner container 10.

[0054] The inner container can be configured to be removably fitted in the outer container and the chemical volatilizing member 5 can be replaced. It is also possible, for example, to close the insertion hole 20c so that the inner container 10 is non-removably fitted in the outer container 20.

[0055] The opposing walls 31a and 31b facing the engaged portions 30a and 30b have projections 32a and 32b facing the engaging claws 25a and 25b and disposed frontward of the engaged portions 30a and 30b along the insertion direction. This makes it possible to prevent disengagement of the front member 21 and the rear member 22 from each other under impact as when the chemical volatilizing device 1 is dropped.

[0056] The inner container 10 and the outer container 20 are given different exterior colors. This permits easy distinction between the volatilizing and non-volatilizing states.

[0057] < Second Embodiment >

Next, a second embodiment of the present invention will be described. Fig. 14 is a perspective view of a chemical volatilizing device 1 according to the second embodiment, and Fig. 15 is an exploded perspective view of the chemical volatilizing device 1. Fig. 16 is a perspective view showing the fitting of the inner container 10 of the chemical volatilizing device 1. For the sake of convenience, in the following description, such parts as find their counterparts in the first embodiment shown in Figs. 1 to 13 and described above are identified by the same reference signs. The second embodiment differs from the first embodiment in the structure of the inner container 10 and in part of the internal structure of the outer container 20, and is otherwise similar to the first embodiment and provides the same effects.

[0058] The inner container 10 is a sheet molding of synthetic resin formed by vacuum pressure air molding or the like, and has a front member 11 and a rear member 12 that are folded in two. Configuring the inner container 10 as a sheet molding helps reduce the amount of

resin used compared with an injection molding and this makes the chemical volatilizing device 1 environment-friendly. It is also possible to reduce the thickness and weight of the entire chemical volatilizing device 1, and this is expected to lead to reduced storage space and improved transport efficiency. While in this embodiment, as shown in Fig. 2, the inner container 10 has the front member 11 and the rear member 12 folded in two, these members may be configured as separate members.

[0059] The front member 11 and the rear member 12 have, around a storage portion 17 in which the chemical volatilizing member 5 is accommodated, flanges 18. The front member 11 has, in the four corners of the flange 18, boss holes 15. The rear member 12 has, in the four corners of the flange 18, bosses 16. The bosses 16 fit in the boss holes 15 to close the inner container 10 so that the front member 11 and the rear member 12 cover the front and rear sides, respectively, of the chemical volatilizing member 5.

[0060] In the bottom face of the storage portion 17 forming the circumferential face of the inner container 10, a plurality of inner openings 10a in a rectangular shape are formed by crossbars 10b in the form of a lattice. The volatile chemical that volatilizes from the chemical volatilizing member 5 passes out through the inner openings 10a and is directed to the outer openings 20a in the outer container 20. On the other hand, the storage portion 17 of the inner container 10 has, on the outer surface of its opposite side faces, first protrusions 14 (see Fig. 16).

[0061] As shown in Fig. 16, the inner container 10 is inserted into the outer container 20 through an insertion hole 20c provided in the lower end face of the outer container 20. Thus, the inner container 10 is removably fitted in the outer container 20, and the inner container 10 can be taken out so that the entire chemical volatilizing device 1 or the chemical volatilizing member 5 in the inner container 10 can be easily replaced. A structure is also possible that keeps the inner container 10 unremovable once it is fitted.

[0062] The outer container 20 has, on its inner surface, a pair of left and right second protrusions 24 (see Fig. 15). The interval between the inner faces of the second protrusions 24 along the left-right direction is slightly smaller than the interval between the outer faces of the first protrusions 14 along the left-right direction. Thus, the first protrusions 14 of the inner container 10 inserted into the outer container 20 elastically deform while sliding across the second protrusions 24 to move over them.

[0063] Thus, the first protrusions 14 rest above the second protrusions 24, so that the inner container 10 is fitted. The contact of the first protrusions 14 with the second protrusions 24 restricts the vertical movement (falling) of the inner container 10.

[0064] In Figs. 14 and 15, the outer container 20 is an injection molding of synthetic resin, and

the inner container 10 is inserted into it through the insertion hole 20c provided in one end face (here, the bottom face) of it along the vertical direction. Thus, the inner container 10 is removably fitted in the outer container 20. The outer container 20 has in its top face a top opening 20d surrounded by a flange 23. The outer container 20 has, on the inner surface of an upper part of it, a stopper 35 protruding from it. The contact between the circumferential wall of the storage portion 17 of the inner container 10 and the stopper 35 prevents the inner container 10 from coming out.

[0065] Moreover, as shown in Fig. 14, the flange 23 has, as a part of it, a jutting portion 23a that protrudes inward. Thus, the outer container 20 is so structured that the inner container 10 cannot be inserted through the top opening 20d by mistake.

[0066] So long as the inner container 10 serves a predetermined function, it can be configured to be, regardless of its vertical orientation, insertable through the insertion hole 20c. In a case where the orientation of the inner container 10 when it is inserted is restricted to one orientation along the vertical direction, for example, as shown in Fig. 16, an elevated portion 19 is provided in one end part of the inner container 10. If the inner container 10 is, starting with where it has the elevated portion 19, inserted into the outer container 20, the elevated portion 19 makes contact with the stopper 35 (see Fig. 15) and prevents complete insertion of the inner container 10. This restricts the orientation of the inner container 10 when it is inserted.

[0067] Fig. 17 is a side sectional view of the chemical volatilizing device 1 with the storage container 6 in an upright position, and Fig. 18 is an enlarged view of part D in Fig. 17. Fig. 19 is a side sectional view of the chemical volatilizing device 1 with the storage container 6 in an inverted position turned upside down relative to the upright position. Fig. 20 is an enlarged view of part E in Fig. 19.

[0068] When pushed down through the insertion hole 20c or the top opening 20d, the inner container 10 moves down inside the outer container 20. Thus, in the upright position, the inner container 10 pushed down through the top opening 20d moves down to a stroke end where the first protrusions 14 (see Fig. 16) make contact with the second protrusions 24 (Fig. 15).

[0069] At that time, inside the storage container 6, the inner openings 10a are located at positions overlapping with the engaged portions 30a, so that the outer openings 20a are left open. Thus, the volatile chemical that volatilizes from the chemical volatilizing member 5 is discharged through the inner openings 10a and the outer openings 20a into the room where the chemical volatilizing device 1 is placed. That is, the chemical volatilizing device 1 goes into a volatilizing state in which it volatilizes the volatile chemical to the outside.

[0070] In the inverted position where the storage container 6 is turned upside down from the upright position as indicated by arrow A, the inner container 10 pressed down through the insertion hole 20c moves down to a stroke end where the circumferential wall of the storage portion 17 makes contact with the stopper 35. At that time, the inner openings 10a are displaced from the outer openings 20a in the vertical direction, so that the outer openings 20a are closed by the crossbars 10b around the inner openings 10a.

[0071] Thus, the volatile chemical that volatilizes from the chemical volatilizing member 5 is shut in by the crossbars 10b around the inner openings 10a and the crossbars 20b around the outer openings 20a, and this suppresses its discharge to the outside. That is, the chemical volatilizing device 1 goes into a non-volatilizing state in which it suspends the volatilization of the volatile chemical. In this way, it is possible to control the amount of chemical used by selecting the upright position when needed and the inverted position when not needed. It is thus possible to keep lasting chemical volatilizing performance.

[0072] The inner container 10 can be configured to be, under its own weight, vertically movable inside the outer container 20. While the inner openings 10a and the outer openings 20a are formed in a rectangular shape by the crossbars 10b and the crossbars 20b in the form of a lattice, they can be in any shape other than rectangular so long as the outer openings 20a can be closed by the surroundings of the inner openings 10a. While the storage container 6 is in the volatilizing state in the upright position and in the non-volatilizing state in the inverted position, it may be in the non-volatilizing state in the upright position and in the volatilizing state in the inverted position.

[0073] With this embodiment, the user can vertically move the inner container 10 and can thereby easily switch between the volatilizing state where the outer openings 20a are open and the non-volatilizing state where the outer openings 20a are closed, that is, turn it on during use and off during disuse. It is thus possible to switch to the non-volatilizing state during disuse to suppress unnecessary volatilization of the volatile chemical, and thus to keep lasting chemical volatilizing performance. Configuring the inner container 10 as a sheet molding helps reduce the amount of resin used compared with an injection molding, and this makes the chemical volatilizing device 1 environment-friendly. It is also possible to reduce the thickness and weight of the entire chemical volatilizing device 1, and this is expected to lead to reduced storage space and improved transport efficiency.

[0074] Placing the inner container in one of the upright and inverted positions and moving it down to the stroke end brings about the volatilizing state, and placing it in the other of those positions and moving it down to the stroke end brings about the non-volatilizing state. It is thus possible to switch easily between the volatilizing and non-volatilizing states.

[0075] The contact between the first protrusions 14 protruding from the outer surface of the inner container 10 and the second protrusions 24 protruding from the inner surface of the outer container 20 restricts the vertical movement of the inner container 10. This makes it easy to position the inner openings 10a relative to the outer openings 20a to select the volatilizing state or the non-volatilizing state.

[0076] The inner container 10 can be configured to be removably fitted in the outer container 20 and the chemical volatilizing member 5 can be replaced. For example, the insertion hole 20c may be closed so that the inner container 10 is non-removably fitted in the outer container 20. Or the inner container 10 may be disassembled to replace the chemical volatilizing member 5 so that the chemical volatilizing device 1 can be used repeatedly.

Industrial Applicability

[0077] The present invention finds applications in chemical volatilizing devices that volatilize a volatile chemical such as insecticide, repellent, mold inhibitor, antimicrobial substance, aromatic substance, deodorant, and synergist.

Reference Signs List

[0078]	1	chemical volatilizing device
	5	chemical volatilizing member
	6	storage container
	10	inner container
	10a	inner opening
	10b, 20b	crossbar
	11	front member
	12	rear member
	13	wider portion
	14	first protrusion
	15	boss hole
	15a, 15b	engaging claw
	16	boss
	16	engaged portion
	17	storage portion
	18	flange
	19	elevated portion
	20	outer container

20a outer opening
20c insertion hole
20d top opening
21, 21' front member
22, 22' rear member
23 flange
23a jutting portion
24 second protrusion
25a, 25a', 25b, 25b' engaging claw
26a, 26a', 26b, 26b' rib
28a, 29a, 28b, 29b step portion
30a, 30b engaged portion
31a, 31a', 31b, 31b' opposing wall
32a projection
32a, 32b projection
32b projection
33a, 33b step portion
35 stopper
A arrow

CLAIMS

[Claim 1] A chemical volatilizing device comprising a chemical volatilizing member that volatilizably holds a volatile chemical and a storage container that has an outer container disposed outside an inner container accommodating the chemical volatilizing member,

wherein

when the storage container is switched between an upright position and an inverted position turned upside down relative to the upright position, the inner container moves down under an own weight thereof,

in one of the upright and inverted positions, an outer opening in a circumferential face of the outer container and an inner opening in a circumferential face of the inner container overlap with each other and, in the other of the upright and inverted positions, the inner opening is displaced from the outer opening in a vertical direction so that the outer opening is closed by surroundings of the inner opening.

[Claim 2] The chemical volatilizing device according to claim 1, wherein

the inner container has, in one end part thereof along the vertical direction, a wider portion with a width larger than a width of the inner container above a first protrusion and is inserted, starting at a side opposite from the wider portion, through an insertion hole, and

when the inner container is inserted in an opposite direction, the wider portion makes contact with a second protrusion to prevent the inner container from moving farther.

[Claim 3] A chemical volatilizing device comprising a chemical volatilizing member that volatilizably holds a volatile chemical and a storage container that has an outer container disposed outside an inner container accommodating the chemical volatilizing member,

wherein

the inner container, which is a sheet molding of synthetic resin, is disposed to be vertically movable relative to the outer container, which is an injection molding, and

as the inner container moves vertically, a switch is made between a volatilizing state in which an outer opening in the circumferential face of the outer container and an inner opening in a circumferential face of the inner container overlap with each other and a non-volatilizing state in which the inner opening is displaced from the outer

opening in a vertical direction so that the outer opening is closed by surroundings of the inner opening.

- [Claim 4] The chemical volatilizing device according to claim 3, wherein
 with the outer container arranged in one of an upright position and an inverted position turned upside down relative to the upright position, moving the inner container down to a stroke end brings about the volatilizing state and, with the outer container arranged in the other of the upright and inverted positions, moving the inner container down to the stroke end brings about the non-volatilizing state.
- [Claim 5] The chemical volatilizing device according to claim 1 or 3, wherein
 contact between a first protrusion on an outer surface of the inner container and a second protrusion on an inner surface of the outer container restricts vertical movement of the inner container.
- [Claim 6] The chemical volatilizing device according to claim 5, wherein
 the outer container has, in one end face thereof along the vertical direction, an insertion hole through which the inner container is inserted,
 the inner container is removably fitted in the outer container, and
 when the inner container is inserted through the insertion hole, the first protrusion slides across and moves over the second protrusion.
- [Claim 7] The chemical volatilizing device according to claim 1 or 3, wherein
 the inner container is removably fitted in the outer container.
- [Claim 8] The chemical volatilizing device according to claim 1 or 3, wherein
 the outer container has a front member and a rear member that engage with each other,
 one of the front and rear members has an engaging claw,
 the other of the front and rear members has an engaged portion engaged with the engaging claw and an opposing wall facing the engaged portion, and
 the opposing wall has a jutting portion facing the engaging claw fitted between the engaged portion and the opposite wall, the jutting portion being disposed frontward of the engaged portion along the insertion direction.

[Claim 9] The chemical volatilizing device according to claim 1 or 3, wherein the inner and outer containers are given different external colors.