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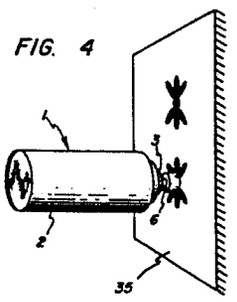
(54) **Device for forming patterns from aerosol container.**

(57) A marking device for mounting on the valve stem of a pressurized dispenser having a valve actuated by said valve stem, said container having a marking material and a propellant medium therein, said marking device comprising a mark-forming member, provided with an axial bore, said mark-forming member being adapted to be connected with the valve stem so that there is provided communication between the axial bore and a dispensing passage in the valve stem when the valve stem is actuated so as to dispense the marking material from the mark-forming member, said mark-forming member having a surface for contacting an object to be marked, said surface having disposed therein one or a plurality of open grooves extending radially from the axial bore to the outer periphery of the surface, characterized by the fact that said grooves (19; 19') have facing side walls (21, 22; 21', 22') angularly disposed with respect to each other so as to diverge in the direction of the surface (20; 20') in which the grooves (19, 19') are disposed.

FIG. 4



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The invention relates to a marking device comprising a mark-forming member to be disposed at the end of discharge means of an aerosol dispensing container containing therein aerosol propellant and a marking material, the mark-forming member being adapted to deposit the marking material in a predetermined pattern on a surface to which the mark-forming member is applied during discharge of the propellant and marking material from the aerosol container. The mark-forming member has a flat surface in which are disposed one or more discharge grooves having facing side walls the surfaces of which diverge toward the said flat surface of the mark-forming member.

Discharge nozzles adapted to discharge water or liquids and having orifices which are associated at the discharge end thereof with grooves and slots having diverging walls are known in the art, see for example U.S. Patents 2,665,946 to A. E. Broughton, 2,701,412 to F. W. Wahlin and 3,403,862 to L. O. Dworjanyn. The devices in the Broughton and Wahlin references are adapted to provide fan-shaped sprays and the device of Dworjanyn is adapted to provide a plurality of jet streams. None of the disclosed devices are intended for, or would be suitable for, use in conjunction with discharge means of an aerosol dispensing device as mark-forming members such as the mark-forming member of the present invention.

U.S. Patent 3,572,591 to R. J. Brown describes mark-forming members adapted to be associated with the valve stem of a pressurized dispenser charged with a marking material and propellant. Disposed in a flat surface of

each of the mark-forming members are one or more grooves which communicate with the dispensing valve passage and extend to a venting zone thereby providing one or more passageways for discharging propellant and marking material to the surface to be marked. In the mark-forming members disclosed, each groove is rectangular, i.e., each groove is defined by a planar bottom wall and facing planar side walls, the surface of the bottom wall being parallel to, and the surfaces of the facing side walls being perpendicular to, the flat surface in which the groove is disposed. In one embodiment of the marking member a plurality of grooves extend radially to the outer periphery thereof and when the grooved surface, which is generally transverse to the direction of the valve actuation motion, is pressed against a surface to be marked with sufficient force to activate the valve of the pressurized dispenser, the propellant and marking material are discharged through the valve stem to the grooves and outwardly from the ends of the grooves to form a "featherlike" pattern.

Although the mark-forming member of U.S. Patent 3,572,591 in which the rectangular grooves extend to the outer periphery thereof performs satisfactorily when employed with aerosol marking formulations of low solids content such as those described in that patent, it produces deformed patterns due to partial clogging as a result of product build-up in the grooves and on the periphery of the mark-forming member upon repeated actuations of the aerosol marking device when employed with aerosol marking formulations of relatively high solids content.

It will be understood that as used herein, the term "solids content" when used with reference to an aerosol marking formulation, means the total content of all those ingredients of such formulation which are deposited in solid form on a surface onto which the aerosol marking formulation is discharged from an aerosol marking device, and that the solids content can but need not comprise the entire content of the aerosol marking formulation exclusive of the propellant. It will be further understood that the solids

content may be either entirely in solution or entirely or partly in suspension in the aerosol marking formulation.

It has now been discovered that when a mark-forming member of the type described in U.S. Patent 3,572,591 is provided with grooves having facing side walls the surfaces of which diverge from each other toward the surface in which the grooves are formed, the problem of clogging of the grooves due to product build-up when aerosol marking formulations of relatively high solids content are used is surprisingly overcome.

The present invention provides a marking device for use with a pressurized dispenser having a valve, a valve stem having a dispensing passage adapted to be associated with said valve, and a marking material and a propellant medium within the dispenser, said marking device comprising a mark-forming member provided with an axial bore, said mark-forming member being adapted to be associated with the valve stem such that the axial bore communicates with the valve stem dispensing passage, or with means mounted on the valve stem for providing communication between the axial bore and the valve stem dispensing passage, said mark-forming member having a surface for contacting an object to be marked, said surface being provided with one or a plurality of open grooves extending from the axial bore to the periphery of the surface and having facing side walls which diverge from each other in the direction of the surface in which the grooves are disposed.

The aerosol dispensers employed in the marking device of the present invention utilize valve units which are of the vertical reciprocating type or of the "tilt" or "toggle" type or a combination of these types and which may be fitted with the usual dip tube. Such aerosol dispensers and valve units are conventional and well known and are described, e.g., in U.S. Patents Nos. 2,631,814 and 3,326,469 in the case of the vertical reciprocating valve type, No. 3,506,241 in the case of the "tilt" or "toggle" valve type, and No. 2,881,808 in the case of a combination of these

valve types. Vertical reciprocating valve units of the so-called "stemless" or "female" type (such as are available from Newman-Green, Inc., Addison, Illinois) wherein the stem is part of the actuator, the two being molded as one piece, also can be utilized.

The mark-forming member can be molded as a single piece of plastic, e.g., high density polyethylene, or made from rubber, foam, etc., and when employed in conjunction with a so-called "stemless" valve, is manufactured as one piece with the stem. The mark-forming member preferably is of circular or elliptical cross-section and has a substantially flat surface in which are formed open grooves having facing side walls the surfaces of which diverge from each other in the direction of the flat surface. The mark-forming member is provided with an axial bore or passage to provide communication between the interior of the aerosol dispenser with its content and the flat grooved surface of the mark-forming member.

The mark-forming member is adapted to receive therein the discharge means of an aerosol dispenser such that communication is provided between the dispensing passage of the discharge means and the axial bore or passage of the mark-forming member, and thence to the grooves in the grooved surface.

In accordance with one arrangement of the invention, the mark-forming member is mounted on the valve stem of an aerosol dispensing container fitted with a vertical reciprocating valve unit in a manner which provides direct communication between the valve stem dispensing passage and the axial bore of the mark-forming member and such that the longitudinal axis of the valve stem is parallel to or coaxial with the axis of the axial bore and generally perpendicular to the plane of the grooved surface. In this arrangement of the invention, when the grooved surface of the mark-forming member is placed flush against a target surface, the longitudinal axis of the aerosol dispenser is substantially perpendicular to the plane of the target sur-

face and when the aerosol dispenser is pressed toward the target surface, the valve stem is displaced inwardly of the aerosol dispenser resulting in opening of the valve and discharge of the marking material and propellant from the dispensing container via the valve stem dispensing passage and the axial bore of the mark-forming member through and outwardly from the grooves onto the target surface in a pattern defined by the grooves.

In accordance with another arrangement of the invention, the mark-forming member is disposed at the end of an extension tube which is associated with an actuator button mounted on the valve stem of an aerosol dispenser fitted with either a tilt valve unit or a vertical reciprocating valve unit. The longitudinal axis of the extension tube is generally transverse, preferably at right angles, to the longitudinal axis of the valve stem and to the plane of the grooved surface of the mark-forming member. A dispensing bore extends completely through the extension tube and provides communication between the axial bore of the mark-forming member and the valve stem dispensing passage via a dispensing bore or passage provided in the actuator button. The actuator button and extension tube can be manufactured from materials such as plastics and can be formed as a single piece, e.g., by conventional molding techniques, or as separate units adapted to be interengaged, e.g., by frictional engagement of an end of the extension tube in a socket provided in the actuator button. The extension tube can be formed either of rigid or semi-rigid materials and can be of any desired length which permits efficient functioning of the aerosol marking device for its intended purpose. In this arrangement of the invention, when the grooved surface of the mark-forming member is placed flush against a target surface, the longitudinal axes of the valve stem and the aerosol dispenser are parallel to or inclined at a small angle relative to the plane of the target surface, and actuation of the valve then is effected in one of two ways depending on the type of valve unit employed. Thus in the case of

a vertical reciprocating valve unit, actuation is effected by depressing the actuator button by finger pressure so as to cause the valve stem to move inwardly of the aerosol dispenser and open the valve. In the case of a tilt valve unit, the aerosol dispenser, or at least the valved end thereof, is pressed laterally toward the target surface causing lateral pressure to be transmitted through the mark-forming member, the extension tube and the actuator button to the valve stem thus causing the valve stem to move laterally and open the valve.

The above-described arrangement of the invention in which an extension tube-actuator button is employed has the advantage that when used to apply a marking material to a vertical or inclined surface, the aerosol dispenser need not be inverted during the dispensing action and therefore the problem of premature propellant depletion attendant upon use in the inverted position of aerosol dispensers incorporating a conventional dip tube is avoided, and the need for a special dip tube designed for inverted use, such as described in U.S. Patent 2,932,433 is obviated. Another advantage of this arrangement is that, by virtue of the extension tube, normally difficult to reach surfaces can be readily marked. A further advantage of this arrangement when a vertical reciprocating valve unit is employed is that soft or yielding target surfaces can be readily marked because actuation is effected by finger pressure rather than by applying pressure to the target surface.

With reference to the accompanying drawings,

Fig. 1 is a partial elevated view, in section of one embodiment of the aerosol marking device of this invention;

Fig. 2 is a perspective view of a mark-forming member of the type shown in Fig. 1;

Fig. 3 is a perspective view of another embodiment of the mark-forming member;

Fig. 4 is a perspective view of a mark-forming device incorporating the mark-forming member of the type

shown in Fig. 2 disposed in operating relation to a surface to be marked; and the form of a pattern resulting from actuating the device; and

Fig. 5 is a partial elevated view, partially in cross-section, of another embodiment of the aerosol marking device of this invention.

Referring to Fig. 1, one embodiment of the marking device of the present invention comprises a conventional aerosol dispenser generally designated 1 including a container 2, a mounting cup 3, a valve unit generally designated 5, and a mark-forming member 6. The valve unit 5 may be of the type wherein a housing 7, a resilient sealing gasket 9, a stem 10 and a stem biasing spring 11 are secured in the pedestal portion 4 of the cup 3. A conventional dip tube 12 is frictionally attached to a depending neck portion 8 of housing 7 and the entire assembly is sealed to container 2 which contains a mixture of propellant and marking material. The valve unit and the manner of attaching it to the mounting cup and the latter in turn to the container are entirely conventional and are more fully described in U.S. Patent 2,631,814. In order that the dispenser may be used in either upright or inverted position, a dip tube of the type shown in U.S. Patent 2,932,433 may be attached to the depending neck portion 8 of housing 7. However, if the dispenser is to be used solely in inverted position, a dip tube is not required.

Referring to Figs. 1 and 2, the mark-forming member 6 has an axial dispensing bore 13 having counterbores 14 and 14a at opposite ends. Counterbore 14a functions as a valve stem receiving socket which frictionally engages the upstanding projection 15 of stem 10. Projection 15 has an axial dispensing passage 16 in communication at its upper end with axial dispensing bore 13 of mark-forming member 6 and at its lower end with valve orifice 18 which is sealed by gasket 9 when valve 5 is in its normally closed condition as shown in Fig. 1.

Referring to Fig. 2, a series of radially disposed

V-shaped grooves 19 are formed in the surface 20 of one end of mark-forming member 6. The grooves 19 extend from the open counterbore 14 of axial dispensing bore 13 through the periphery of mark-forming member 6. Each of the grooves 19 is defined by facing side walls 21 and 22 the surfaces of which diverge from each other in the direction of surface 20 and intersect inwardly of surface 20 to form a juncture 23 which defines the bottom of groove 19.

Fig. 3 shows another embodiment of a mark-forming member of this invention. This embodiment is similar to the embodiment shown in Figs. 1 and 2 except that the grooves include a bottom wall. Thus, mark-forming member 6' is provided with a valve stem receiving socket (not shown), a dispensing bore (not shown) and a counterbore 14', the arrangement of which is the same as valve stem receiving socket 14a, dispensing bore 13 and counterbore 14 respectively of mark-forming member 6 of Fig. 1. A series of radially disposed grooves 19' are formed in the surface 20' of mark-forming member 6' and extend from the open counterbore 14' to the periphery of mark-forming member 6'. Each of the grooves 19' is defined by facing side walls 21' and 22', the surfaces of which diverge from each other in the direction of surface 20', and a bottom wall 23'. The surface of bottom wall 23' in the embodiment shown in Fig. 3 is parallel to surface 20'. However, the surface of bottom wall 23' need not be parallel to surface 20'.

Fig. 5 shows another embodiment of a marking device of the present invention. In this embodiment a conventional aerosol dispenser generally designated 24 is fitted with a valve unit (not shown) of the vertical reciprocating type, such as described above with reference to Fig. 1, or the tilt type, such as described in U.S. Patent 3,506,241, or a combination of the vertical reciprocating and tilt types, such as described in U.S. Patent 2,881,808. The valve stem projection 26 of the valve unit has an axial dispensing passage 25 which communicates with the interior of the aerosol dispenser when the valve is in the open position. Mounted on

valve stem projection 26 is an extension actuator generally designated 28 which comprises an actuator button 29 having integrally formed therewith an extension tube 32, the longitudinal axis of which is at right angles to the longitudinal axis of valve stem projection 26 and which has attached at the terminal end 34 thereof a mark-forming member 6 of the type shown in Figs. 1 and 2. Actuator button 29 is provided with a dispensing passage comprising interconnecting axial bore 30 and lateral bore 31. The outer end of axial bore 30 is counterbored to provide a valve stem socket 27 which frictionally engages valve stem projection 26 so as to provide communication between valve stem dispensing passage 25 and axial bore 30 of actuator button 29. Extension tube 32 is circular in cross-section and has a central dispensing bore 33 which extends completely therethrough and is an extension of lateral bore 31 of actuator button 29. The terminal end 34 of extension tube 32 is frictionally engaged in socket 14a of mark-forming member 6 so as to provide communication between extension tube bore 33 and dispensing bore 13, and hence counterbore 14 and grooves 19, of mark-forming member 6. Although in the embodiment shown in Fig. 5 the extension actuator 28 is formed as one-piece, the actuator button 29 and extension tube 32 can be formed separately and interengaged by conventional means, e.g., by frictional engagement of an end of the extension tube in a socket provided in the actuator button so as to provide communication between the central bore of the extension tube and the actuator button dispensing passage.

An essential feature of the invention is that the facing side walls of the grooves in the mark-forming member have surfaces which diverge from each other in the direction of the surface in which the grooves are disposed. It is as a result of this feature that the problem of deformed patterns and excessive product build-up in the grooves which occurs when mark-forming members having grooves with non-diverging side walls, i.e., rectangular grooves, are used in conjunction with aerosol marking formulations of relatively high

solids content is overcome. Although it is not understood why excessive product build-up does not occur in the grooves of the mark-forming member of this invention, it is believed that it may be due to a Venturi effect. Thus, by analogy to a Venturi tube, each groove has a constricted area, i.e., the area at the bottom of the groove, and a gradual widening path, i.e., the path defined by the diverging facing walls of the grooves. The effect of the constriction in combination with a widened area in a Venturi tube is to increase the velocity and reduce the pressure of a fluid flowing through the tube. It is believed that there is a similar effect when marking material and propellant are expelled through the grooves of the mark-forming member of this invention and that the increased velocity and reduced pressure results in reduced friction between the aerosol marking formulation and the walls of the grooves thus preventing build-up of the marking material in the grooves.

The angle of divergence of the surface of the facing side walls of the grooves, designated "α" in Figs. 2 and 3, can be varied over a wide range between 0° and 180°. The angles of divergence which will be effective for any particular formulation will be dependent upon, inter alia, such factors as the nature of the ingredients comprising the marking material and particularly the solids content of the aerosol marking formulation, and can be readily determined without the need for undue experimentation. Thus, for example, for aerosol marking formulations having a relatively high solids content, i.e., a solids content greater than about 5 percent by weight based on the total weight of the marking material (concentrate) and propellant system, generally an angle of divergence of about or greater than 10° is desirable, and for a solids content of 15 percent by weight, an angle of divergence of about or greater than 110° generally is desirable.

With reference to Figs. 2 and 3, "W" represents the widths of grooves 19 and 19' at surfaces 20 and 20' respectively. The particular width "W" which can be employ-

ed will vary depending on such factors as the nature of the aerosol marking formulation and the form of pattern desired. However, it will of course be apparent that the maximum possible width "W" which can be employed necessarily will be limited by the number of grooves desired and the area of the surface in which the grooves are to be formed. It will be further apparent that for any particular angle of divergence "α", the depth of the groove will be dictated by the width "W" and, in the case of groove 19' of Fig. 3, also by the width of bottom wall 23. The depth of the grooves employed should not exceed that which would permit discharge of any substantial amount of the marking material other than onto the target surface in the intended pattern. The maximum depth which can be employed for any particular angle of divergence and width "W" will depend on the nature of the aerosol marking formulation and can be readily determined by one skilled in the art to which this invention pertains.

Although in the mark-forming members illustrated in Figs. 2 and 3, the grooves in each case have identical dimensions and are arranged such that all are not equally spaced, it will be understood that other arrangements, e.g., equal spacing, of the grooves are possible, that the dimensions of the grooves of any particular mark-forming member need not be identical, and that combinations of grooves 19 and 19' can be employed. Furthermore, it will be understood that although in the embodiments illustrated in Figs. 2 and 3, an imaginary line, which bisects the angles of divergence of each of the grooves into equal parts, intersects the plane of the grooved surface at right angles, the grooves can be disposed in the surface in a manner such that the line bisecting the angle of divergence of one or more of the grooves into equal parts, may intersect the plane of the grooved surface at angles other than a right angle.

The operation of the marking device of the present invention will now be described with reference to Figs. 1, 2, 4 and 5. The grooved surface 20 of the mark-forming

member 6 of the marking device shown in Figs. 1 and 5 is placed flush against a target surface to be marked. In the embodiment shown in Figs. 1 and 4, the valve unit 5 is urged to the open position by pressing dispenser 1 toward the target surface 35 thus permitting discharge of the propellant and marking material through passage 16 of valve stem projection 15 and bores 13 and 14 and the passages formed by grooves 19 of the mark-forming member 6 outwardly from the ends of said passages onto the target surface 35 resulting in deposition of the marking material on the target surface 35 in a pattern determined by the number, arrangement and design of grooves 19. In the embodiment shown in Fig. 5, the procedure for actuating the dispenser will depend on whether a vertical reciprocating valve or a tilt valve is employed. In the case of a vertical reciprocating valve, the valve is urged to the open position by depressing valve stem 26 by applying finger pressure to actuator button 29 in the direction of arrow "A". In the case of a tilt valve, the valve is urged to the open position by lateral displacement of valve stem 26 by pressing dispenser 24 toward the target surface, i.e., in the direction of arrow "B". In either case, once the valve is in the open condition, the propellant and marking material will be discharged through passage 25 of valve stem projection 26, bores 30 and 31 of actuator button 29, bore 33 of extension tube 32, and bores 13 and 14 and the passages formed by grooves 19 in mark-forming member 6 and outwardly from the ends of said passage onto the target surface in a pattern determined by the number, arrangement and design of grooves 19.

A wide variety of formulations can be used with the marking device of the present invention, including formulations both of low and relatively high solids content. Formulations can be used which are intended to produce mark patterns either for the purpose of identification, whereby identification is established by visual or other means, such as disclosed in U.S. Patent 3,572,591, or for the purpose of providing an aesthetically pleasing visual effect while

at the same time functioning in some other capacity such as a room air freshener or an insecticide.

A formulation suited to provide an aesthetically pleasing visual effect as well as to function as a room air freshener when dispensed from the marking device of this invention is as follows:

Room Air Freshener Formulation

Ingredient	Percent by weight
Sunsubly B[a]	15.0
Perfume Oil	1.0
A-46[b]	84.0
	100.0

a) Triisopropyl-s-trioxane supplied by Norda Inc., East Hanover, New Jersey.

b) Propellant(isubutane, 83%; propane, 15%; n-butane, 2%) supplied by Phillips Petroleum Co., Bartlesville, Oklahoma.

The above air freshener formulation was prepared and filled into aerosol containers as follows:

The Subsubly B (15.0 g.) and the perfume oil (1.0 g.) were charged into an aerosol can. The air in the vapor phase of the aerosol can was then removed by evacuation and an aerosol valve was placed on and crimped to the aerosol can, all in the same operation. Alternatively, the air in the vapor phase of the aerosol can can be removed prior to applying the valve by purging with propellant. The propellant A-46 (84.0 g.) then was pressure filled into the aerosol container through the valve stem in a conventional manner.

An alternative method which can be used for preparing large quantities of the above air freshener formulation and filling the formulation into aerosol containers is as follows:

a) The required amounts of Sunsubly B, perfume oil and propellant A-46 are charged into a pressure vessel and mild agitation is provided, if necessary, to ensure that a homogeneous solution is obtained.

b) The aerosol cans to be filled are evacuated to eliminate air therefrom and valves then are placed on and crimped to the aerosol cans, all in the same operation.

c) The required amount of solution (concentrate) from step (a) then is pressure filled into each aerosol container from step (b) through the valve stem in a conventional manner.

The triisopropyl-s-trioxane employed in the above air freshener formulation is a solid white powdery material which sublimes at ambient room temperature when exposed to room atmosphere. The triisopropyl-s-trioxane has several functions. Thus it is the predominant visible component of the mark pattern, it is the carrier for the perfume which functions as the air freshener, and, since the pattern eventually disappears as a result of sublimation, it alerts the consumer to the need for dispensing a fresh supply of the air freshener formulation onto the target surface. The relatively high solids content, i.e., 15% by weight of triisopropyl-s-trioxane, of the air freshener formulation is desirable in order that an adequate quantity of the triisopropyl-s-trioxane and perfume oil will be deposited by the marking device onto the target surface to ensure acceptable efficacy and use life levels.

The above air freshener formulation can be dispensed onto various nonporous surfaces such as windows, mirrors, walls, desk tops, counter tops, wastebaskets and plastic and ceramic surfaces. By appropriate selection of the number, arrangement and design of the grooves of the mark-forming member of the invention, the air freshener formulation can be deposited in a mark pattern having an aesthetically pleasing visual effect. As the triisopropyl-s-trioxane carrier slowly sublimes, the perfume is gradually released into the surrounding atmosphere.

The superiority of the mark-forming member of this invention to the mark-forming member having rectangular grooves in forming undeformed mark patterns when used with marking formulations having relatively high solids content

was demonstrated in a comparative test using the room air freshener formulation described above. A total of six marking devices, the mark-forming member of which in each case was attached to the valve stem in the manner shown in Fig. 1, were tested. The marking devices tested, all utilized identical containers, identical vertical reciprocating valve units, identical dip tubes and substantially the same amount of formulation fill. Except for the design and dimensions of the grooves, and in one case the number of grooves, all the mark-forming members of the six marking devices tested were identical in all other respects, i.e., in general dimensions and shape and the arrangement and dimensions of the dispensing bore and counterbore. The general shape and the arrangement of the dispensing bore and counterbores of the mark-forming members tested conformed substantially to the embodiments of mark forming member 6 shown in Figs. 1 and 2. The grooves of each of the six mark-forming members tested were equally spaced in the grooved surface. Two of the mark-forming members tested, identified hereinafter by Roman numerals I and II, were provided with rectangular grooves and form no part of the present invention. The other four mark-forming members tested, identified hereinafter by Roman numerals III to VI, were provided, in accordance with the present invention, with V-shaped grooves of the type illustrated in Fig. 2. Each of the test marking devices were actuated twenty consecutive times by placing the flat grooved surface of the mark-forming member flush against a target surface consisting in each case of plastic tiles laminated on masonite and then momentarily pressing the device toward the target surface with sufficient force to open the valve to permit discharge of air freshener formulation followed immediately by removal of the device from the target surface, the operation being the same as that described hereinabove with reference to Figs. 1 and 4. Each of the mark patterns so formed were then visually evaluated and the number of consecutive mark patterns formed before mark pattern distortion occurred was noted. The results of the tests are

tabulated in the following table wherein "MFM" indicates "mark-forming member", "G" represents the number of grooves in the surface of the mark-forming member, "α" is the angle of divergence as defined hereinabove, "W" is the width of the grooves, "D" represents the depth of the grooves, and "MP" represents the number of consecutive undeformed mark patterns deposited on the target surfaces before mark pattern distortion was noted. The value "0°" for "α" indicates a rectangular groove, i.e., with parallel, or non-diverging, side walls.

MFM	G	α	W	D	MP
I	8	0°	0.055 in.	0.055 and 0.100 in.*	0
II	6	0°	0.022 in.	0.009 in.	0
III	6	10°	0.008 in.	0.035 in.	0
IV	6	60°	0.050 in.	0.040 in.	5
V	6	110°	0.120 in.	0.040 in.	7
VI	6	160°	0.140 in.	0.012 in.	20

*Four grooves of each depth arranged in alternate pattern.

The results in the above table demonstrate the superiority of those mark-forming members having grooves with facing side walls which diverge at an angle greater than 10° over the mark-forming members wherein the grooves are rectangular or have facing side walls diverging at 10°. Although mark-pattern distortion occurred with mark-forming members IV and V after 5 and 7 consecutive actuations, respectively, nonetheless the performance of these members is considered satisfactory since a consumer is unlikely to make more than 5 or 6 consecutive applications of the room air freshener formulation in any one day and any marking material accumulated in the grooves will clear due to sublimation. The results further indicate that for the particular formulation tested, an angle of divergence of about or greater than 110° is preferred and an angle of 160° is the most efficient.

In another comparative test, two marking devices, one equipped with mark-forming member I and the other with mark-forming member VI, identical in all respects to the

corresponding devices employed in the comparative test described above, each were actuated ten consecutive times onto plastic tiles laminated on masonite. The difference in product build-up between mark-forming members I and VI was dramatic, substantially none occurring in the grooves of mark-forming member VI, and significant build-up occurring in the grooves of mark-forming member I.

C L A I M S

1. A marking device for mounting on the valve stem of a pressurized dispenser having a valve actuated by said valve stem, said container having a marking material and a propellant medium therein, said marking device comprising a mark-forming member provided with an axial bore, said mark-forming member being adapted to be connected with the valve stem so that there is provided communication between the axial bore and a dispensing passage in the valve stem when the valve stem is actuated so as to dispense the marking material from the mark-forming member, said mark-forming member having a surface for contacting an object to be marked, said surface having disposed therein one or a plurality of open grooves extending radially from the axial bore to the outer periphery of the surface, characterized by the fact that said grooves (19; 19') have facing side walls (21, 22; 21', 22') angularly disposed with respect to each other so as to diverge in the direction of the surface (20; 20') in which the grooves (19, 19') are disposed.

2. A marking device according to claim 1, characterized in that said mark-forming member is provided with an axial bore (13) positioned to be directly mounted in communication with the valve stem dispensing passage (16), said surface (20) lying in a plane generally transverse to the direction of the actuating motion of the valve.

3. A marking device according to claim 1, characterized in that it further comprises a valve actuator button (29) and an extension tube (32), said valve actuator button (29) being adapted to be associated with the valve stem and the extension tube (32) and being provided with a dispensing passage (30,31) in communication with the valve stem dispensing passage (25), said extension tube (32) having its longitudinal axis transverse to the longitudinal axis of the valve stem and being provided with an axial dispensing bore (33) in communication with the actuator button dispensing passage

(31), said mark-forming member (6) being adapted to be associated with the extension tube (32) and being provided with an axial bore (13) in communication with the extension tube dispensing bore (33), said surface (20) lying in a plane generally transverse to the longitudinal axis of the extension tube (32).

4. A marking device of any one of claims 1 to 3, characterized in that said facing side walls (21, 22) intersect at junctures (23) spaced inwardly of said surface (20), said junctures defining the bottoms of said grooves.

5. A marking device of any one of claims 1 to 3, characterized in that said grooves (19') are defined by said facing side (21') and bottom walls (23') spaced inwardly of said surface (20').

6. A marking device of any one of claims 1 to 5, characterized in that said facing side walls (21, 22; 21', 22') diverge from each other at an angle greater than about 10°.

7. A marking device of any one of claims 1 to 5, characterized in that said facing side walls (21, 22; 21', 22') diverge from each other at an angle greater than about 110°, e.g., at an angle of about 160°.

8. A marking device according to any one of the preceding claims in combination with the pressurized dispenser with its valve stem.

9. A marking device according to claim 8, characterized by the fact that the marking material in the pressurized container comprises a solid which sublimes at ambient room temperature and pressure and, if desired, includes a perfume.

10. A marking device according to claim 8 or 9, characterized by the fact that the propellant medium in the pressurized container is a gas which is liquified at the pressure in the dispenser.

FIG. 1

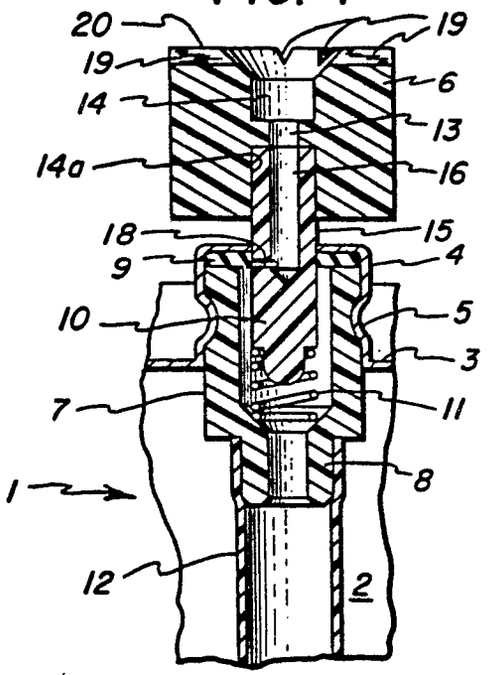

FIG. 2

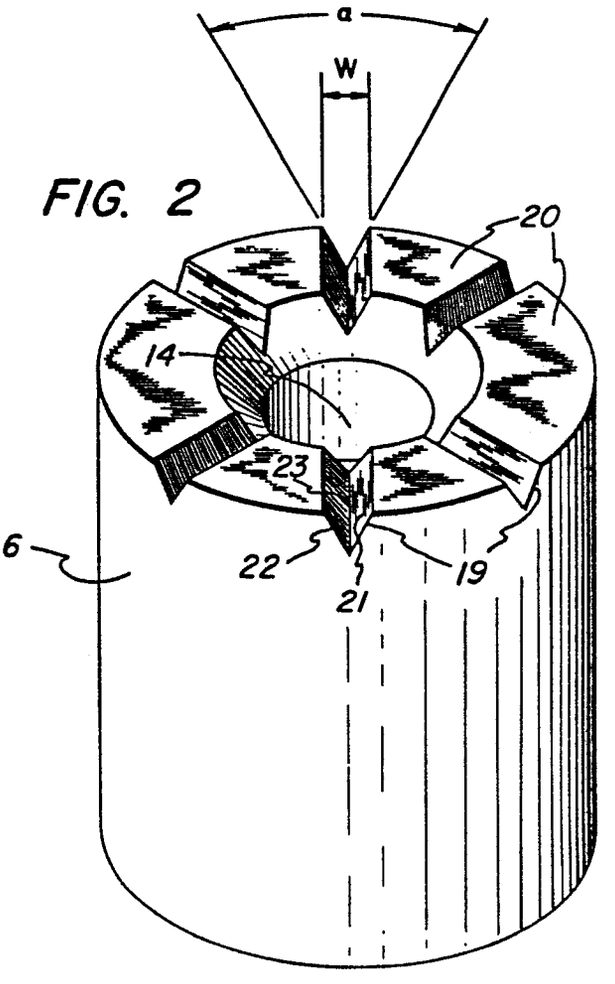

FIG. 3

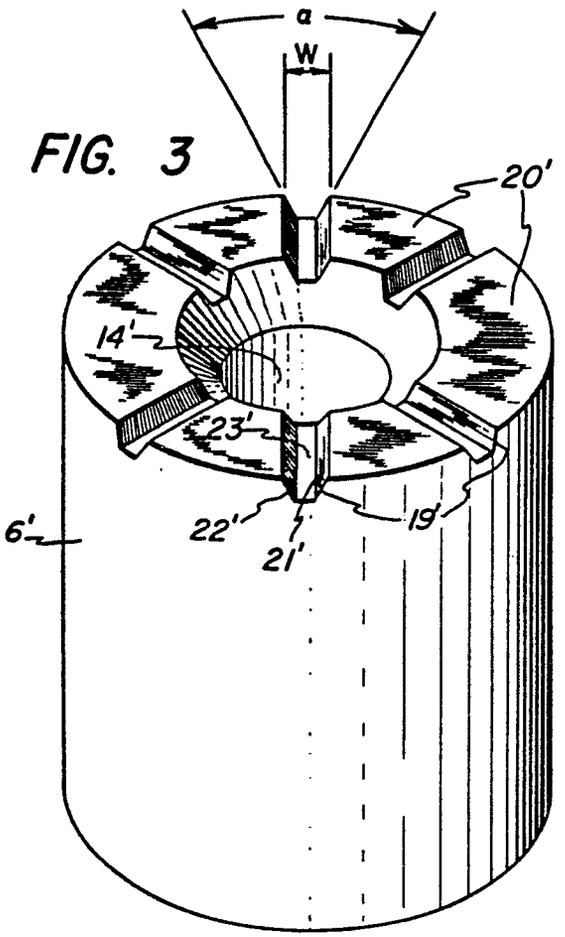

FIG. 4

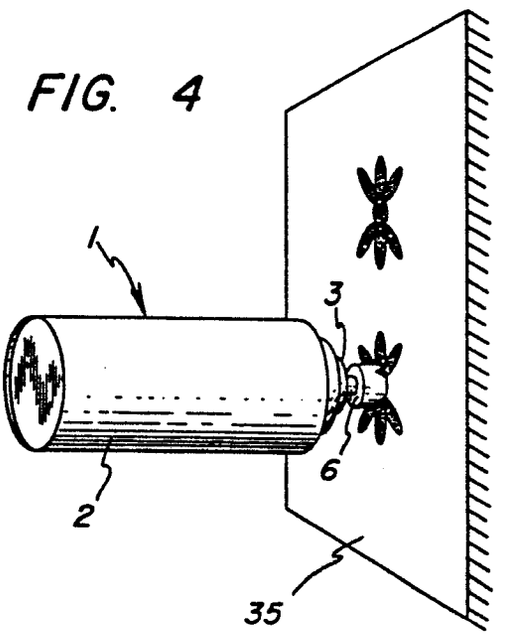

FIG. 5