MOISTURE ABSORBING DEVICE
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This invention relates to a moisture absorbing device and more particularly it deals with a device for removing moisture from the atmosphere in a receptacle, such as a carton, box, bag or the like.

It is well known that hydrophilic substances, such as dry edibles as prepared cereals, potato chips, and the like, become stale and unpalatable after prolonged exposure to the water vapor in the atmosphere, and that metallic instruments rust even in their cases.

It is therefore an object of this invention to produce an efficient, simple, effective, economic and disposable device for removing this water vapor from the atmosphere in a receptacle, case or package after it has been sealed, and to thus preserve the contents from deterioration by moisture for a longer period of time.

Another object of this invention is to produce a device which will remove the moisture from any air which might find its way into the package after sealing, either during storage or after opening, as well as to protect weapons, instruments, fishing tackle, and the like from rust while in their boxes or cases, and to prevent such bulk hydrophilic chemicals including water-setting materials as cement or the like from deterioration or hardening before their use is desired.

Another object of this invention is to produce such a small perforated container which will adhere to the interior of a receptacle, case or package, and which contains a desiccating agent.

A further object of this invention is to provide a means for allowing moisture to enter such a container, without allowing the desiccating agent to egress through the perforations.

An additional object of this invention is to provide an indicator for such a device which will show when the desiccating agent is exhausted.

In accordance with this invention, a small hollow perforated relatively rigid shell of metal or plastic is provided with an opening for filling and a locking cover for this opening, a chemical desiccating agent, such as calcium chloride crystals or silica gel, is placed in the shell, and a gas permeable barrier, such as fibrous batting, sponge, plastic foam and/or similar material is placed inside the shell between said agent and said perforations.

This shell may have any shape and may comprise with its cover two complementary cavity forming members, with said perforations in at least one wall of at least one of said members. A vegetable coloring or other harmless dye may be added to the calcium chloride, and when sufficient water has been absorbed, the coloring may be seen through a translucent portion of the shell or cover. A ring of pressure-sensitive adhesive or a magnet may be applied to the cover, in order to attach the device to the interior of a receptacle.

The above mentioned and other features and objects of this invention and the manner of attaining them will become more apparent and the invention itself will best be understood by reference to the following description of embodiments of the invention taken in conjunction with the accompanying drawings, wherein:

FIG. 1 is a sectional elevation on an enlarged scale of one embodiment of this invention, taken along line I—I of FIG. 2;
FIG. 2 is a plan view of the embodiment shown in FIG. 1;
FIG. 3 is a sectional elevation of a modified form of this invention;
FIG. 4 is a bottom plan view of a further modified form of this invention;
FIG. 5 is a sectional elevation taken along line V—V of FIG. 4;
FIG. 6 is a view similar to FIG. 5, but with parts broken away, showing a different closure locking structure;
FIG. 7 is a sectional elevation of a further embodiment of this invention; and
FIG. 8 is an isometric view to a reduced scale of a package with a part broken away to show a device of this invention in place therein.

Referring now in more detail to the drawing, in FIG. 1 one embodiment of the capsule or device 10 of this invention is shown to comprise an outer container 11, which may be a hollow substantially rigid and hemispherical shell made of a plastic material, such as polyethylene, polypropylene, polyethylene, or the like, having a plurality of perforations 12 therethrough. One side or end of this container 11 is shown to be open and a cap or closure 13 is provided therefor, which may be a low open circular cylinder with one open end and made of the same or preferably a translucent material, as also shown in FIG. 4. Filling the upper portion of the capsule 10 adjacent the perforations 12 may be a barrier member 14, which barrier may in this embodiment be made of sponge or resilient rubber, and which may have a plurality of small perforations 15 therein, to allow air or a gas to pass therethrough. Filling the remainder of the enclosure in the capsule 10 is a hygroscopic, deliquescent or desiccant material 16, such as calcium chloride or silica gel. Interposed between the sponge 14 and the desiccant 16 may be a sheet of porous material 17, such as filter paper to aid in retaining the desiccant 16 and/or particles thereof at all times inside the capsule 10. Covering the bottom of the closure 13 may be a thin opaque sheet 18 of wax or latex, having a window or portion 19 cut out to form a character, such as "R," shown in FIG. 4 for a purpose to be hereinafter disclosed.

A means for holding the members 11, 13 in assembled relation is also provided, wherein the container 11 may have a short end portion 21 of reduced outside diameter and a shoulder 22 adjacent thereto, the closure 13 having its cylindrical sides act as a flange 23 made equal in height to the height of the reduced portion 21. The flange 23 slips over the reduced portion 21 with a tight frictional fit, and this junction may later be heat sealed or cemented.

In FIG. 3 is shown a modification of this invention wherein the sponge 14 and filter sheet 17 have been replaced by a layer of a fibrous material 34 such as cotton batting. In this case, the cotton is porous enough to allow air to enter, but will not allow particles of the hydrophilic material 16 to escape. There is also shown a thin spot 39 in the side of the container 11 which may...
be used instead of the window 19 as will be later explained.

In FIGS. 5 and 6 there is shown a modification of the type of fastening or holding means for the container 11 and closure 13. The flange on the container 11 is formed with an outwardly curving lip 43, while the flange on the cap 13 has an inwardly curving lip 44. In FIG. 6 the flange on the container 11 is shown with an inwardly curving lip 43', and the flange on the closure 13 is shown with an outwardly curving lip 44'. In either case the cooperating flanges 41, 43, or 41', 43' are flexible enough to allow snapping together for assembly, and at the same time a positive lock is produced which may eliminate the necessity of later sealing steps. The desiccant 16 may be completely enclosed in a thin porous bag 47, to further guard against loss of the chemicals, as also shown in FIG. 5.

On the outside of the closed circular end of the cylindrical closure 13 there may be provided an annular ring or strip 48 of two-faced pressure sensitive adhesive sheet and there may be a thin covering strip 49 protecting its exposed face or surface. When it is desired to attach the capsule 10 to the interior of a receptacle or a package 10 (see FIG. 8), the backing strip 49 is removed, and the capsule 10 is pressed against an interior wall 71 thereof, where it will then stay. The package 10 may then be filled and sealed, and the contents will remain dry or protected due to the action of the isolated desiccant 16 in the capsule 10. It is to be understood that the ring 48 could also be replaced by a magnet (not shown) to attach the capsule 10 to the interior of a paramagnetic metallic receptacle, such as a coffee can, or it could be replaced by a spring clip, hook or pin (not shown) without departing from the scope of this invention.

In FIG. 7 there is shown a further modification of the device of this invention, comprising a flatter capsule 50 having a shell or container 51, which may be a thin substantially rigid metal or plastic cylinder having a flat or rounded top with perforations 52 therethrough. The cap or closure thereon may comprise a complementary metallic cylinder 53, such as, for instance, of aluminum, which closure may also have perforations 52'. Interposed between this hygroscopic material or desiccant 16 and the perforated walls of this container 51 and closure 52 are thin sheets 57, 57' of gas permeable material, such as filter paper. These sheets 57, 57' serve to allow air to enter the container, but prevent any particles of the desiccating chemicals from escaping. There may also be provided a thin translucent portion or window 59 in the dome top of container 51, similar to the window 39 shown in FIG. 3. The shell 51 herein is shown to have a short cylindrical flange 61 at the open end thereof, and a shoulder 62 at one portion of this flange. The cap 53 is provided with a complementary flange 63, and the two flanges may be provided with screw threads for assembly.

A small quantity of water soluble, non-toxic coloring agent, such as vegetable dye or the like may be mixed with the hydrophilic material 16 and/or with or in the covering 47 or insulating layer between the material 16 and the shell or container in the capsule 10 or 50. The mixture or layer thus formed is practically colorless until a certain amount of water has been absorbed by the desiccant 16, whereupon the coloring may be seen. If the dye is added in proper proportions, it is possible for the dye or indicator to be mixed with a sufficient quantity of water to enable the coloring to be seen at the same time as the hygroscopic material or desiccant becomes saturated. In this manner the dye or coloring agent acts as an indicator, for when the color appears the desiccant is no longer useful and the capsule or at least the desiccant therein must be disposed of or reactivated.

In order to apply this indicating principle to this invention, at least a portion of the capsule must be translucent. In FIGS. 1, 4 and 5 the member 11 may be of any color or may be opaque, while the member 13 is translucent. The masking disk 18 is opaque and is positioned between the member 13 and the chemical 16, but the cut out portion 19 allows the color to be seen when the capsule is exhausted. Even if the desiccant material is enclosed in a porous bag, as shown in FIG. 5, the coloring may still be seen, because a porous material such as filtering paper will become wetted by the chemicals as they absorb moisture, and it will also take on the color of the dye.

In FIG. 3, the member 13 may be opaque, while the shell 11 is made translucent, or if both members are desired to be opaque, for reasons of color combinations, etc., a thin spot 39 in the wall may be made, thus rendering the translucent a small portion, and in this case the cotton 34 absorbs the coloring from the mixture 16, allowing it to be seen. In FIG. 7 the same arrangement is provided, but since the metallic closure 53 is opaque, the container 51 is either completely translucent or may have a thin translucent spot or window 59 in one of its walls.

In FIG. 7 there is also shown a temporary non-porous covering sheet 75 and 75' which may be adhesively applied to the outside of the shell 51 and base 53 to cover or seal the holes 52 therein to prevent deterioration of the capsule until it is ready for use. Similarly, such covering sheets may be applied over the holes 12 in the other embodiments of this invention or these holes may be sealed by molding therein blind ends 76 as shown in FIG. 5 which ends may be placed or punched out with a pin just before use.

Thus there is described a moisture absorbing device which may be inserted into a package of dry edibles prior to sealing, which may be used in any sealed enclosure, and which will effectively protect against the deleterious effects of moisture for a prolonged period of time, and which will give a visual indication of when the device is no longer effective.

It is to be understood that many changes or different arrangements may be made without departing from the scope of this invention. For instance, the container need not be circular in cross-section, but may be triangular, square, or any shape whatever. Also the container may be made of any color or combinations of colors as long as a translucent spot is provided somewhere, if a dye is employed as an indication of when the desiccant in the capsule is exhausted. The capsule may be made of metal or plastic, and the embodiment in FIG. 7 may be entirely metallic. It is also possible to mix the desiccating chemicals from escaping. Thus there is described a moisture absorbing device which may be inserted into a package of dry edibles prior to sealing, which may be used in any sealed enclosure, and which will effectively protect against the deleterious effects of moisture for a prolonged period of time, and which will give a visual indication of when the device is no longer effective.

What is claimed is:

1. A capsule for reducing the water vapor content in a closable container, said capsule comprising: a hollow substantially rigid shell member having an opening in one side thereof, a cover member for said opening in said shell member, means for fastening said members together at their adjacent edges, at least one of said members having perforations therethrough, a transparent window 39 therethrough in at least one of said members spaced from said perforations, a hydrophilic material in the hollow portion of said shell member, a layer of fibrous porous material between said perforations and said hydrophilic material to permit passage of water vapor therethrough but pre-
vent the loss of hydrophilic material out through said perforations, a visual exhaustion indicator mixed with said hydrophilic material which indicator is visible through said transparent wall portion of one of said members, and a detachable non-porous sheet over the outside wall of said member having said perforations for sealing said capsule until it is to be used as a desiccant.

2. A capsule according to claim 1 wherein one of said members comprises a transparent plastic material.

3. A capsule according to claim 1 including means for holding said capsule to the inside wall of said closable container.

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