Oct. 9, 1956 H. H. HOPSON ET AL 2,766,066

DEVICE FOR THE EVAPORATION OF LIQUIDS

Filed Dec. 3, 1953

2 Sheets-Sheet 1

Fig. 1.

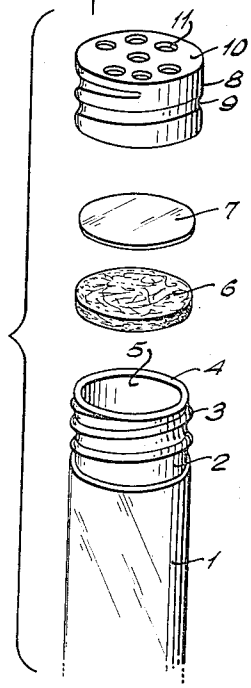


Fig. 2.

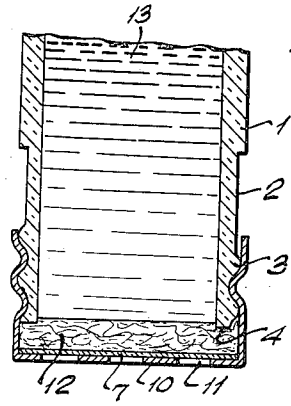


Fig. 3.

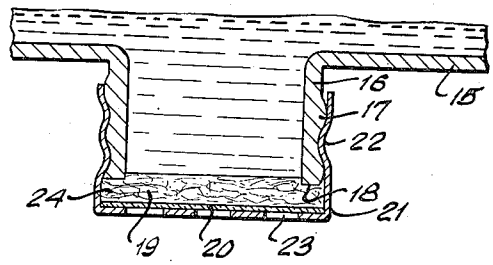
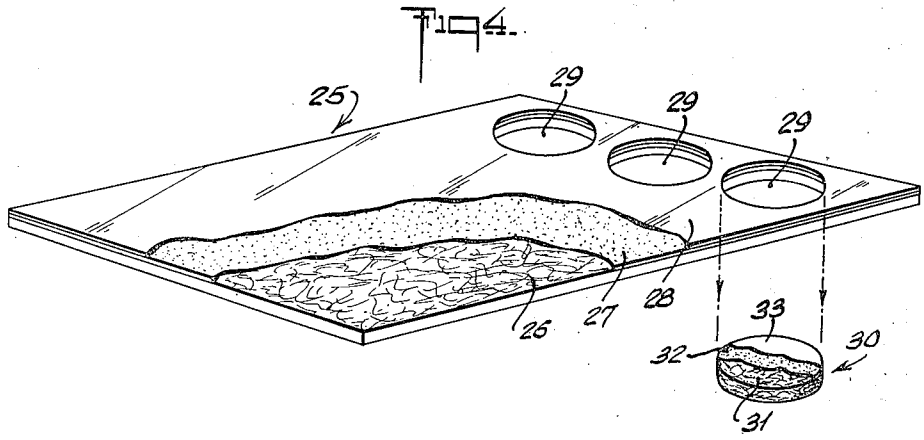


Fig. 4.



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2 Sheets-Sheet 2

Fig. 5.

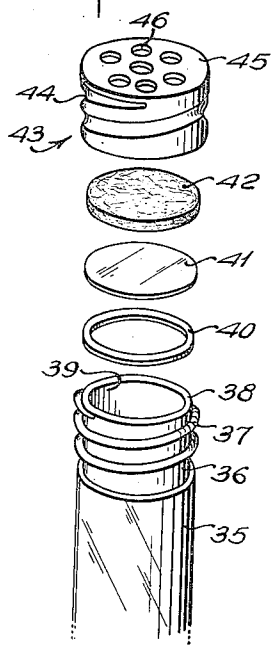
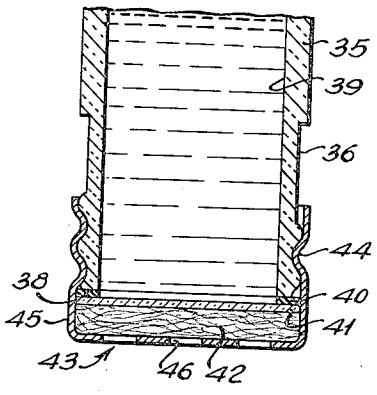


Fig. 6.



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DEVICE FOR THE EVAPORATION OF LIQUIDS

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Application December 3, 1953, Serial No. 396,012

6 Claims. (Cl. 299—20)

This invention relates to improvements in elements for the evaporation of liquids, to methods for making the same, and to combinations incorporating such elements and presenting the same in evaporating position.

In the pending applications of Howel H. Hopson, Serial No. 289,690, entitled Evaporation Units, filed May 23, 1952, now abandoned, and Serial No. 335,299, entitled Containers Providing Vapor Treatment, filed February 5, 1953, now abandoned, various constructions for the evaporation or vaporization of liquids are disclosed and claimed. The constructions disclosed in those applications include porous members for effecting the vaporization of liquids, preferably made of infrangible fibrous material, of which felt of proper texture is the preferred example.

Though the evaporating members as disclosed in those prior applications are most effective for their intended purpose and, in fact, have been found to be superior to prior commercially available evaporating members, there has been found to be room for improvement and that improvement is the subject of the instant invention.

When fibrous materials are used alone as the evaporating or vaporizing element, there are certain extreme conditions when those elements fail to function with full effectiveness. Thus where pressure is exerted on the liquid to be vaporized, in contact with the element, an occasional drop of liquid as such, rather than as vapor, will be given off from the outside of the element. This could cause spoiling of the commodities being humidified, or being subjected to other vapor treatment. Contrariwise, the outer surfaces of such element can sometimes dry out, from exposure to air, to an extent to retard the humidifying action. The construction of the invention eliminates these and other drawbacks in a fully effective, though simple and economical, manner.

The improvement with which the instant invention is concerned involves the application of a vapor permeable liquid impervious film, of which cellophane is an example, against one side of the fibrous evaporator element, such as felt. This assembly of cellophane and felt members is secured in place on the end of a neck by means of a suitable perforated cap, with either the cellophane or the felt exposed to the air through the perforations and the other of the elements, as the case may be, exposed to the liquid within the neck. The vapor permeable film precludes the passage of liquid as such, while assuring and enhancing the normal vaporization provided by the fibrous element. In addition, where the cellophane film is on the outside it protects the fibrous element from contact with the air so as to prevent the drying out of the outer surface of it. The fibrous material, being compressible and being liquid impervious when compressed, provides a tight, leak-proof joint between the cap and the neck when the fibrous material element is on the inside and the cap is applied in a manner to compress that material. When the cellophane disc is on the inside a compressible gasket is employed between that disc and

the end of the neck. Thus all the requirements of a fully effective vaporizing unit are met.

It is, accordingly, a principal object of the invention to improve upon evaporating units.

Another object is to do so in a simple and economical manner.

Another object is to enhance the vaporization of vaporizing units while, at the same time, precluding the passage of liquid therethrough.

Still another object is to assure the uniform effectiveness of vaporizing units, regardless of the drying action of air thereon.

A further object is to provide for vaporizing units which, in and of themselves, will furnish leak-proof joints at the position where they are secured in place.

A still further object is to provide methods for the forming of vaporizing units.

Other and more detailed objects will in part be obvious and in part be pointed out, as the description of the invention taken in conjunction with the accompanying drawing proceeds.

In that drawing:

Figure 1 is an exploded perspective view of the parts making up the vaporizing unit of the invention disposed in their proper relationship.

Figure 2 is a fragmentary vertical section of an assembled vaporizing unit in accordance with the invention, as applied to the tubular member.

Figure 3 is a similar view showing the assembled vaporizing unit applied to a container wall.

Figure 4 is a perspective view of a sheet of material for forming vaporizing elements in accordance with the invention, with one element blanked out therefrom and with portions of the sheet and element broken away to illustrate the construction thereof.

Figure 5 is a view similar to Figure 1 of an alternate form of the invention; and

Figure 6 is a fragmentary vertical section of an assembly thereof.

In Figures 1 and 2, a fragment of a vial-like container for carrying the liquid to be vaporized is indicated at **1**. This may be formed of any suitable material, though it is preferably of a transparent, or translucent, plastic, so that the contents thereof can be readily observed. The upper end of this vial is provided with a neck **2** formed with integral screw threads **3** and terminating in an annular end face **4**. The side wall thickness is such that an opening **5** of substantial cross sectional area is provided for the passage of liquid into contact with the inner surface of the fibrous member **6**.

The fibrous member **6** is here illustrated as being formed of felt, and, as disclosed in the pending application of Howel H. Hopson, Serial No. 335,299, it has been found that a specially textured felt serves most effectively for the vaporizing of liquid. Also, this felt may be treated with a suitable filler, if desired. Other materials capable of soaking up liquid and emitting the same in the form of vapor from the face thereof remote from the liquid, may also be employed. Illustrations of these are sponge rubber, cotton, nylon, and asbestos, though felt is preferred, being the most effective. Thus, where the use of felt is referred to herein, it is, of course, to be understood that this is for illustrative and not limiting purposes.

As will be seen from Figure 2, the felt disc **6** is dimensioned so that a rim around its periphery will seat against the end face **4** when the unit is assembled. The outer surface of the element **6** is covered by a vapor permeable film-like element **7**, having the same diameter as the felt and, accordingly, covering the whole outer surface of it. The element **7** is preferably formed of vapor permeable cellophane, though other films having

the property of vapor permeability may be employed. Examples of these are certain plastic films and films of certain vapor permeable uncured rubbers. The film should be of such a nature, however, that it will be impervious to the passage of liquid as such, while being vapor permeable to transmit the moisture vapor emitted by the felt, and even to enhance the vaporizing action of the felt. Though vapor permeable cellophane is presently preferred for this member, reference thereto herein is for convenience of description, and not by way of limitation.

The elements **6** and **7** in the order shown in Figures 1 and 2 are seecured in place against the end of the vial **1** by a suitable screw threaded cap type member **8**. The threads **9** of this member are formed to interengage with the threads **3** of the neck **2**, while a peripheral border around the end **10** overlies the cellophane disc **7**. The cap **8** may be formed of metal, or suitable plastic. Its disc-like end **10** is perforated at **11** with the desired number of perforations to emit a suitable quantity of vapor. These perforations may be variously sized or shaped and may range in number from one on up, depending on the size of the cap, quantity of vapor to be emitted, etc.

Referring to Figure 2, it will be seen that when the cap **8** is screwed on to the neck **2**, with the felt and cellophane discs in proper position therein, the rim **12** of the felt disc will be substantially compressed. This serves to increase the density of the felt and enable it to act as a gasket against escape of liquid between the skirt of the cap and the neck. Liquid, such as **13**, within the vial will thus engage the inner surface of the disc **6**, be vaporized in passing through it, which vapor readily travels through the cellophane disc **7**. Any liquid as such which finds its way or is forced through the felt **6** will have its passage blocked by and will be vaporized in passage through the cellophane.

The cellophane or comparable membrane, being substantially impervious to the passage of air, helps the felt maintain complete saturation. Thus, it serves to maintain the felt at full effectiveness, regardless of the moisture content of the atmosphere. In fact, the cellophane, by providing uniformity of vaporization throughout its area, causes the felt to perform at full and uniform effectiveness throughout the whole of its body, effecting what might be considered as a drawing of the vapor through and from the felt.

The vaporization here being considered, when of water, is employed for the humidification of various materials. The invention similarly contemplates the vaporization of such liquids as insecticides, deodorants, preservatives and other liquids whose effectiveness in the vapor state is desired.

The application of the construction just described to a neck carried by a container wall is illustrated in Figure 3. There the wall **15** is provided with a neck **16**, screw threaded at **17** and terminating in a finished end **18**. A felt disc **19** overlies this end and, on its outer side, is covered by a cellophone disc **20**. These felt and cellophane discs are secured in tight engagement against the end **18** of the neck by means of a screw threaded cap **21**, threaded at **22** and perforated at **23**, as just described. Again, the felt is compressed at **24** to block the escape of liquid between the skirt of the cap and the neck.

A modified assembly of materials for the forming of discs and a method of forming such discs is illustrated in Figure 4. Here a sheet of material, generally indicated at **25**, is made up of layers of felt **26**, adhesive **27**, and cellophane **28**. The felt **26** and cellophane **28** or the alternatives thereof, are the same as already described, while the adhesive **27** is suitable for the securing of the felt and celophane together, but is of a vapor permeable type, so as to assure the passage of vapor from the felt **26** to and through the cellophone **28**.

When sheets of felt and cellophone are secured together, as here illustrated, vaporizing discs as complete

units may be punched out therefrom, as indicated by the holes **29**. One of these discs, broken away to show the construction thereof, is generally illustrated at **30**. It has a felt base **31**, an adhesive layer **32** thereon and a cellophane facing **33** secured to the felt by the adhesive.

As will be apparent, a disc, such as that illustrated at **30**, can be employed in place of the separate discs **6** and **7** on the ends of necks **2** and **16**, of Figures 2 and 3. Here, again, the particularly materials going to make up the disc may be such as are suitable for the particular purposes, including, but without limitation to, those heretofore listed. Furthermore, any suitable vapor permeable adhesive, capable of securing cellophane to the felt, may be employed at **32**.

In the alternative form of the invention shown in Figures 5 and 6, the positions of the cellophane and fibrous discs are reversed. This calls, in addition, for the use of a resilient gasket which serves several purposes.

The container neck or other member to which the vaporizing element is to be applied is here illustrated as having a body generally indicated at **35**. This body is reduced at **36**, is formed with screw threads **37** and terminates in an annular end face **38**, bordering the opening **39**.

An annular gasket of suitable resilient compressible material, as indicated at **40**, is formed to seat on the face **38** and form a liquid tight joint against the same when compressed thereagainst as illustrated in Figure 6. The cellophane, or other vapor permeable film member is seated on the outer side of the gasket **41** and has the fibrous, vapor transmissive member **42** seated on its outer surface. These are all held in position on the end of the member **35** by means of a screw threaded cap-type member **43** whose neck is threaded at **44** to mate with the threads **37**, and whose disc-like base **45** is perforated at **46** like the perforations **11** in the cap **8**.

From the showing in Figure 6 it will be apparent that the fibrous member **42** is exposed through the openings **46** to the air to be humidified. It receives its moisture in the form of vapor passing through the cellophane disc **41** which latter is in contact with the liquid **47** within the neck. In some instances it has been found that this arrangement is more effective than that of the form just described.

In the first place, the fibrous material, such as felt, protects the cellophone against puncture while enhancing rather than reducing the vaporizing effect thereof. The provision of the fibrous member on one side of the cellophane and the gasket on the other serves to hold the cellophane out flat and straight, when the elements are assembled, thus overcoming the normal tendency of cellophone to shrivel up. The gasket **40**, of course, provides a leakproof joint against the end **38**, and, at the same time, serves as a buffer to prevent fracture of the cellophane around its rim.

As in the Figure 4 illustration, the cellophane and fibrous material may, of course, be laminated together by means of a suitable vapor pervious cement. Also the fibrous material can be replaced by a disc of perforated rubber or perforated vinal material of suitable thickness and permeability. In fact any vapor permeable resilient material may be used here, since the cellophane serves as a block against transmission of liquid as such and provides for the emission of vapor from the outer side thereof.

Inasmuch as many changes could be made in the above assembly and many apparently widely different embodiments of this invention could be made without departing from the scope thereof, it is intended that all matter contained in the foregoing description or illustrated in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

Having described our invention, what we claim as new and desire to secure by Letters Patent is:

1. In vaporizing construction, a vaporizing member in-

cluding a body portion, a facing portion and a compressible annular gasket, said body portion being formed of compressible vapor permeable material of substantial thickness and said facing portion being formed of a thin membrane of vapor permeable cellophane, said facing portion being assembled in face to face relation with said body portion on one face thereof and being bordered adjacent the periphery of its other face by said compressible gasket.

2. A vaporizing device comprising a neck formed with an annular end face thereon, a section of compressible vapor transmissive fibrous material, having inner and outer faces, seated across the end of said neck with a portion of the inner face thereof in engagement with said annular end face, a vapor transmissive water impervious membrane having an inner surface on the outer face of said section and covering the same, and a cap member having a top portion and a skirt portion, said top portion overlying the outer surface of said membrane, and said skirt portion being secured to said neck, said top portion compressing said compressible member against said annular end face, and said top portion being perforated to expose said membrane to the air.

3. In a vaporizing device, a container for liquid to be vaporized, a neck extending from said container and terminating in a smooth annular end face, a first section of liquid absorptive compressible vaporizing material mounted across the end of said neck in engagement with said end face, a second section of vapor pervious liquid impervious material applied to the outer face of said first section, and a closure cap secured to said neck and having an end overlying said sections, said end of said closure cap being formed with perforations therethrough to expose parts of said second section therethrough, and said closure cap compressing said first section where the same engages the end of said neck.

4. In vaporizing construction, a liquid container having a neck portion extending therefrom, a closure cap engaged with said neck portion, said closure cap having a perforated top overlying the end of said neck portion, a vaporizing member received within said closure cap and having the periphery thereof compressed against the end of said neck, said vaporizing member including a membrane of vapor pervious, liquid impervious, material engaging the inner surface of the perforated top of said closure cap for exposure through the perforations thereof, and an element of compressible fibrous vaporizing material on the inner side of said membrane, the border of said compressible element being compressed against said end of said neck portion.

5. A vaporizing device comprising a neck formed with an annular end face thereon, a compressible annular gasket seated on said annular end face, a thin membrane of vapor permeable material capable of preventing the passage of liquid as such applied across the end of said neck with a portion adjacent the border thereof in engagement with said gasket, a section of compressible vapor transmissive material having inner and outer faces applied, with its inner face in engagement with the outer face of said membrane, and a cap member having a top portion and a skirt portion, said top portion overlying the outer face of said section of vapor transmissive material and said skirt portion being secured to said neck, said top portion compressing said compressible permeable member and said annular gasket against said annular end face, and said top portion being perforated to expose said vapor permeable member to the air.

6. A vaporizing device comprising a neck formed with an annular end face thereon, a vaporizing member seated in place across the eend of said neck and said annular end face, said member including a body portion and a facing portion, said body portion being formed of vapor permeable compressible material of substantial thickness and said facing portion being formed of vapor permeable cellophane, said portions being assembled in face to face relation, and a closure cap secured to said neck and having a top portion securing said member in place across the end of said neck, said top portion being perforated to expose the outer portion of said member to the air.

References Cited in the file of this patent

UNITED STATES PATENTS

1,757,530	Keim	May 6, 1930
1,871,419	McKee	Aug. 9, 1932
2,196,021	Merrill	Apr. 2, 1940
2,243,752	Dunaway	May 27, 1941
2,368,140	Johnson	Jan. 30, 1945
2,452,957	Sabin	Nov. 2, 1948
2,572,669	Sarge et al.	Oct 23, 1951