June 4, 1963 H. E. CHAPMAN 3,092,249

CONTAINERS OR PACKAGES

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FIG. 1.

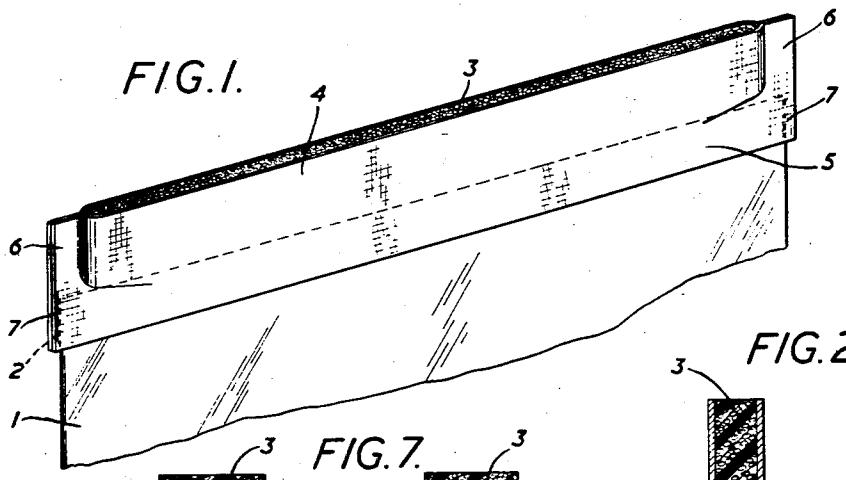


FIG. 2.

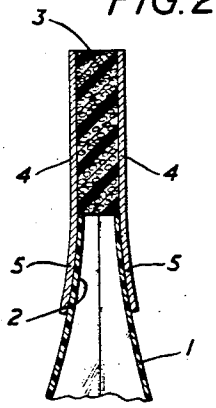


FIG. 5.

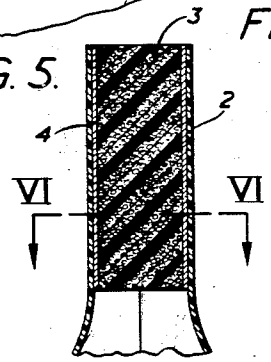


FIG. 7.

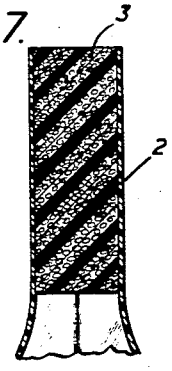


FIG. 3.

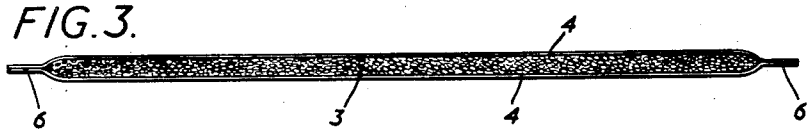
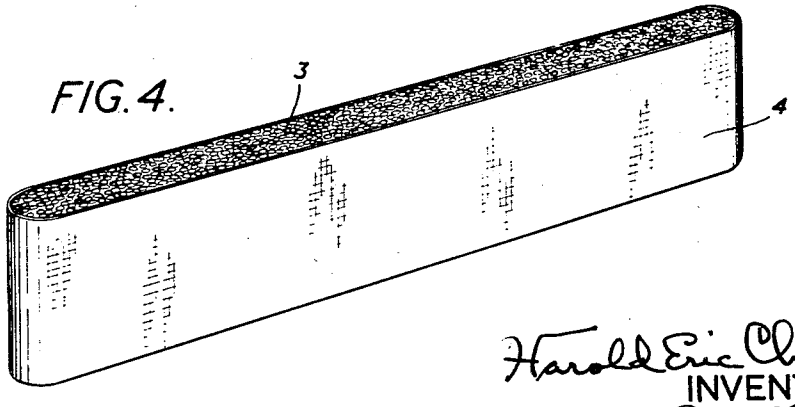


FIG. 4.



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CONTAINERS OR PACKAGES

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FIG.6.

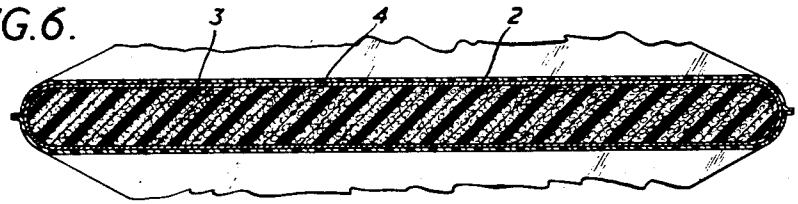

FIG.8.

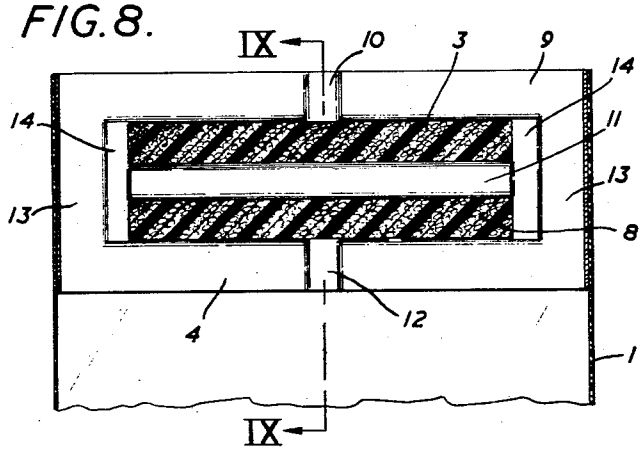

FIG.9.

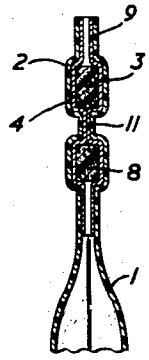

FIG.10.

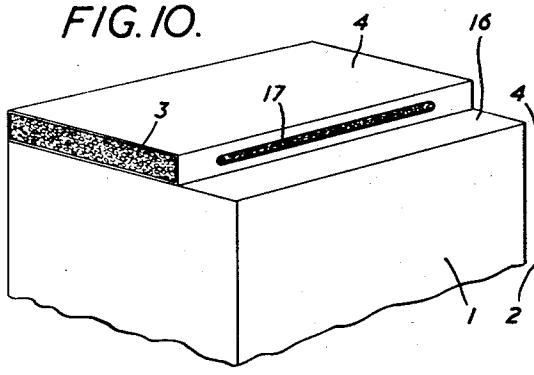

FIG.12.

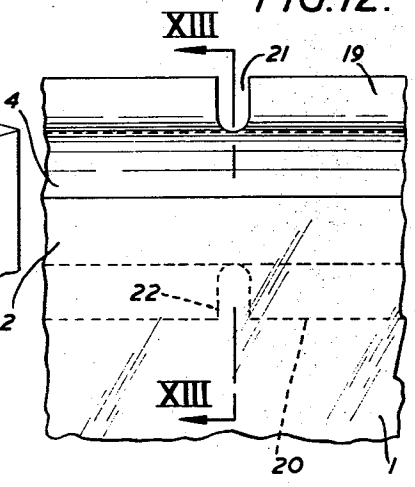

FIG.11.

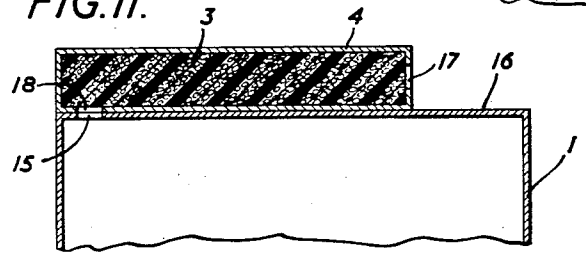

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FIG. 13.

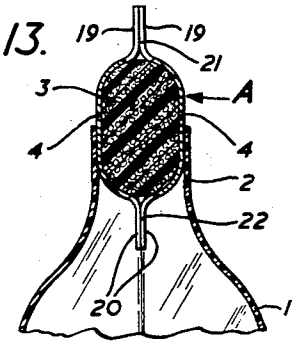

FIG. 14.

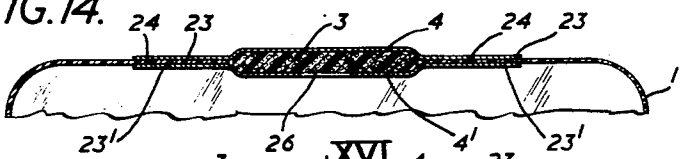

FIG. 15.

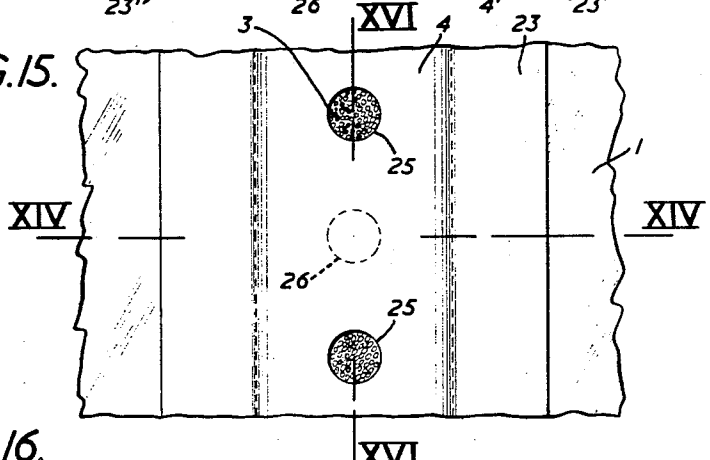

FIG. 16.

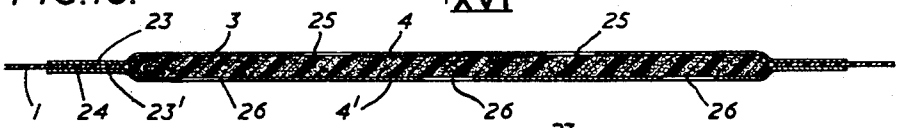

FIG. 17.

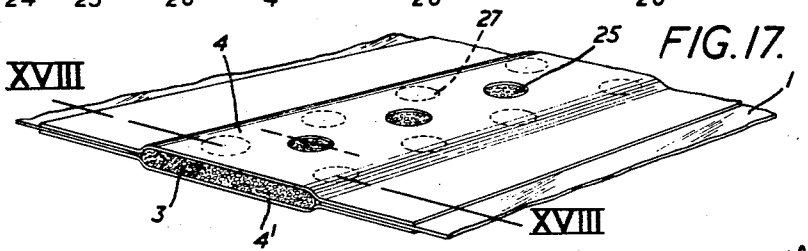

FIG. 18.

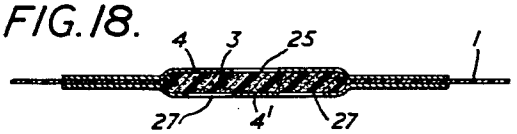

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FIG. 19.

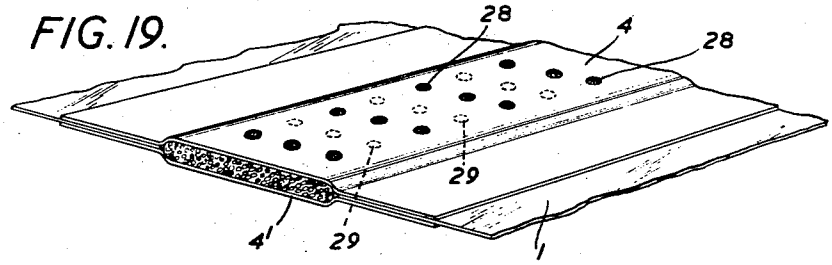


FIG. 20.

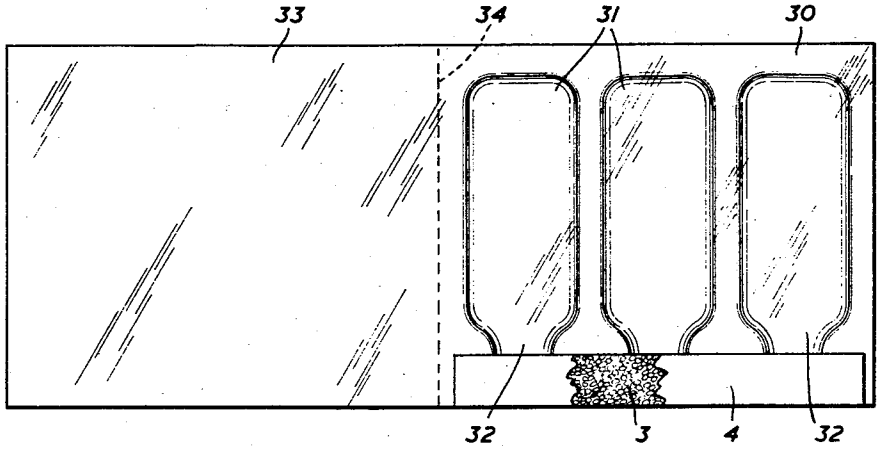


FIG. 21.

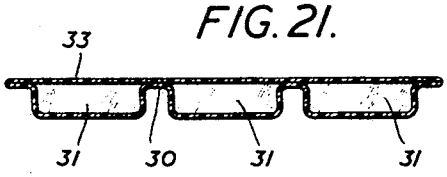
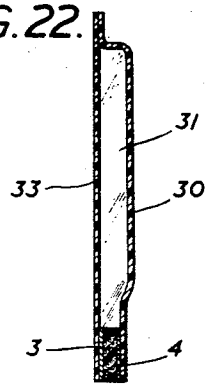


FIG. 22.



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United States Patent Office 3,092,249 Patented June 4, 1963

3,092,249

CONTAINERS OR PACKAGES

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Filed Mar. 30, 1961, Ser. No. 99,422
6 Claims. (Cl. 206—46)

This invention relates to containers or packages intended for enclosing articles or goods which should be maintained in a sterile condition, out of contact with any air or gas liable to cause contamination.

The invention is applicable, for example, to containers or packages intended for enclosing perishable materials, foods either solid or semi-solid, liquids such as milk, and fruit juices, drugs, surgical dressings, surgical gowns and gloves, and other surgical and medical supplies and appliances, including surgical instruments; as well as numerous other goods, such as pillows, mattresses and the like used in hospitals and the like.

An object of the invention is to provide a container or package having simple but effective means whereby air can enter the same only through air filtering means.

Another object is to provide an air filter, for incorporation in a container or package, which is of a form such that it can be readily applied to a container or package, and which is of a form or construction such that air passing through it, when incorporated in a container or package, is constrained to traverse a filtering path of predetermined minimum length.

In this specification and claims the term "air" is intended to include a gas or vapour; and the term "air impervious material" is intended to include any material that is not readily penetrable by air, vapours or gases at temperatures usual in any regions in which the containers or packages are likely to be used.

According to the invention, a container or package is made of air impervious material and has therein an opening or mouth closed by an air sterilizing filter consisting of a strip, tape or length of air filtering material secured and bonded to the container or package at the sides of the said opening or mouth, so that the only ingress for air to enter the container or package is through the filter.

Also, according to the invention, an air sterilizing filter for closing an opening in a container or package comprises a flat tape or strip of air filtering and sterilizing material sandwiched between and bonded to covering material applied to opposite side faces. Apertures may be provided in opposite side portions of the covering material, so that air entering the apertures in one side portion is compelled to pass through the filtering material in order to leave through the apertures in the other side portion. The said apertures in one side portion of the covering material may be staggered in relation to those in the other side portion.

In another form of tape or strip filter, the filtering material is exposed at its two longitudinal edges, but has covering material applied to its flat side faces. The covering material of the tape or strip filter may be extended at opposite sides to form longitudinal margins or flanges for attachment to the body material of the container or package.

The container or package may incorporate a filter consisting of a strip or length of filtering material included between covering material at opposite sides, said filter being attached to portions of the container or package which are adjacent the opening or mouth therein, by said covering material being bonded to said portions. Or, a flat strip of air filtering material may be fitted between the sides of the mouth or opening of the container or package with one edge of said strip exposed to external atmosphere and with the other edge exposed to the interior of the container or package. The said strip of filtering material may be applied and secured directly to the sides of the mouth or opening without any covering material between, or it may have covering material applied and secured to the flat side faces and directly bonded to the sides of the mouth or opening of the container or package.

The container or package may include a filter composed of two flat strips of air filtering material arranged edgewise and in co-planar alignment in a single tape fitted within the mouth or opening of the container or package, so that air entering the latter has to pass through both strips in succession, an edge of the outer strip being exposed to the exterior atmosphere and an edge of the inner strip being in communication with the interior of the container or package.

A package may comprise two superimposed sheets of material joined together along three sides, with a flat strip of air filtering material bonded between the remaining sides of the sheets, and said sheets also being joined together at positions between opposite sides, so as to form a plurality of compartments with respect to which the strip of filtering material is common. At least one of the said sheets may be recessed to form a plurality of hollow compartments or cavities each communicating by a duct with the strip of air filtering material.

In all the various forms of the invention when air enters the container or package it is sterilized by its passage through the filter which may be suitably treated to ensure such sterilization, and in addition, it may be water-repellent and fire resistant.

The body of the container or package may be made of plastic film, film laminate, aluminium laminate, coated paper or other material impervious to water and air; and the filtering material may conveniently consist of an anastomosing synthetic sponge of suitable texture and which is processed to incorporate the sterilizing and other qualities required. Or polyurethane foam or coarse-texture bibulous paper strip or the like may be used.

In the case of the tape form of the filters, where the material is sandwiched between covering material, such covering material would be of a character corresponding to the nature of the material of the body of the container or package, such that it could be secured thereto by a suitable adhesive or by heat welding.

In the case of the dual form of filter, the outer filtering strip could be a sterilizing strip to intercept bacteria, whilst the inner strip could be an untreated chemically-inert strip. This form of the invention would be especially suitable for use in containers for foods and drugs.

The filters will permit the containers or packages being exhausted of their original air or other gaseous content, and then filled with gases suitable for the purpose of sterilizing or fumigating, or for providing a non-oxidising atmosphere within the package. Such packages may be subsequently hermetically sealed, if so desired, if provision is made for the expansion of the contained gas at prevailing ambient temperatures. The filters also permit of the admission of steam or other vapours into the container, and the degree of humidity in the container may thereby be controlled, which is an important factor in some food preservation techniques.

The multiple compartment of multiple cavity form of the invention is particularly useful for the sterilization and storage of surgical instruments, such as hypodermic syringes, hypodermic needles, blood transfusion sets, spinal puncture sets and the like, each item or set of items being housed in a separately sealable compartment connected with a common sterilizing filter.

The containers could be of a disposable nature and could be made of a material suitable for the conditions

imposed when they are intended for use with the ethylene oxide sterilization technique, or other gas sterilization technique, or a dry heat process. The subsequent filling of the containers with nitrogen followed by hermetical sealing would ensure the contents being preserved from changes due to oxidation.

The invention is suitable for the in-package sterilisation of perishable or contaminable material, and for its maintenance in a sterile and unpollutable condition for an indeterminate time.

The invention will enable a great variety of foods to be sterilised subsequent to packaging (without the use of preservatives), and such sterilised products will remain sterile at room temperature for an extended period, the length of which depends upon the shelf life of the packaging materal used.

The invention will enable the inpackage pasteurisation or sterilisation of milk. Drinking water may be sterilised by filtration, and aseptically introduced into presterilised containers for storage. It may also be aseptically extracted for consumption from these containers as required.

The covering material of the tape or strip filter may be paper, plastic material, a textile fabric, metal or other convenient sheet material.

The filter material and the covering material may be made water repellent, bacteria proof, mould proof, insect proof, chemically inert, ferro-magnetic or fire proof, if these qualities are required but are not inherent in the material selected.

Hermetic sealing of the container, after the exhaustion of the air and the introduction of sterilized air or gas, may be effected by air impervious adhesive tape applied over the opening and filter therein, or by heat welding when the nature of the material of the container admits of this.

Where the filter material is enclosed in covering material having longitudinal margins for attachment to the container, these margins may have holes in them, or may embody a magnetic recorder tape, for use with a punched-card or magnetic coding device whereby the identity of the contents of the container may be announced.

FIGURE 1 of the accompanying drawings in a perspective view of the mouth portion of a container having a sterilizing filter device incorporated in it in accordance with one form of the present invention.

FIGURE 2 is a transverse vertical section, on a larger scale, through the mouth portion and filter of the said container.

FIGURE 3 is a longitudinal horizontal section through the said mouth portion and filter.

FIGURE 4 is a perspective view of a modified form of filter unit in accordance with the invention.

FIGURE 5 is a transverse vertical section through this filter unit when fitted in the mouth of a container.

FIGURE 6 is a longitudinal section on line VI—VI, FIGURE 5.

FIGURE 7 is a transverse vertical section through the mouth portion of a container having therein a filter strip in which the filtering material is not enclosed between covering material but is bonded directly to the container.

FIGURE 8 is a vertical longitudinal section through the mouth portion of a container in which a dual filter unit is embodied, in accordance with a modified form of the invention.

FIGURE 9 is a transverse section on line IX—IX, FIGURE 8.

FIGURE 10 is a perspective view and

FIGURE 11 is a sectional view of another modification.

FIGURE 12 represents a fragmentary side elevation of the top portion of a container provided with air filtering means in accordance with a further modification.

FIGURE 13 is a cross-section on line XIII—XIII, FIGURE 12.

FIGURE 14 is a cross-section through the upper portion of a container having another form of filter device in accordance with the invention.

FIGURE 15 is a fragmentary plan view.

FIGURE 16 is a longitudinal section on line XVI—XVI, FIGURE 15.

FIGURE 17 is a perspective view of a modification of the last-named embodiment of the invention.

FIGURE 18 is a cross-section on line XVIII—XVIII, FIGURE 17.

FIGURE 19 is a perspective view of another variation of the embodiment in FIGURES 14 to 16.

FIGURE 20 represents a wrapper in its opened-out condition, embodying air filtering means in accordance with the invention.

FIGURE 21 is a longitudinal section through the package produced by the folding of the wrapper shown in FIGURE 20.

FIGURE 22 is a vertical transverse section thereof.

Referring to FIGURES 1 to 3 of the said drawings, a container for enclosing goods that are required to be maintained in a sterile condition consists of a bag-like body part **1** having at its upper end an open mouth portion **2**, and over the open mouth an air sterilizing filter device is fitted. This filter device consists of a flat strip **3** of an air sterilizing and filtering material, such as an anastomosing synthetic sponge of suitable texture and which is processed or treated to incorporate the necessary sterilizing qualities as well as any other qualities desired, such as water-repellent and fire-resistant characteristics. Instead of the material being an anastomosing synthetic sponge it may consist of polyurethane foam or coarse-texture bibulous strip. The said strip **3** is enclosed or sandwiched between two strips **4**, **4**, of covering material applied to opposite side faces and bonded thereto by adhesive or other means. The covering strips **4** are flush with the top edge of the filter material **3**, so that said edge is exposed, to the atmosphere, but the said covering strips **4** extend downwards below the filter material in the form of margins **5** and also extend beyond the ends of said material at **6**. The filter strip **3** seats upon the top edge of the side walls of the container mouth portion **2** (the mouth is shown open in FIGURE 2) and the margins **5** of the covering strips overlap and are bonded to the outside surfaces of the walls of the container. The end extensions **6** are cemented or bonded together to close the ends of strip **3** and are also bonded to the container body. They extend slightly beyond the side edges of the container, as at **7**, so that said edges and the ends of the mouth are enclosed. The container body may be made of any desired air and water impervious material, such as transparent or other plastic film, film laminate, aluminium laminate, coated paper or other material impervious to air and water. The covering material **4** of the filter material is made of a material suitable for being bonded to the material of the container body, and may be of plastic, paper, metal foil, textile fabric or the like. The bonding may be by means of an adhesive or, in the case of a plastic material, by heat welding.

The container body is sealed except for the filter-fitted mouth, and thus air entering the container must pass through the filter, being thereby sterilized.

Initially, the bottom or one side of the container may be open, to receive the contents to be packed, and is closed by heat-sealing, by the application of adhesive or by other suitable sealing method, after the contents have been inserted. The container may then be exhausted of its original air content so that any air or other gas subsequently entering the container is compelled to pass through the filter, being thereby sterilized. If desired, the contents of the container, whilst in place therein, may be sterilized by any convenient process, such as in an

autoclave, or by the ethylene oxide or other gas sterilization technique, or by a dry heat process, provided that the packaging material is suitable for the conditions imposed. The container may be subsequently filled with nitrogen, and, if desired, hermetically sealed so that the contents would be preserved from changes due to oxidation.

In the modification illustrated in FIGURES 4 to 6 the filter device consists of a flat strip 3 of air filtering material surrounded by and bonded to a flat elongated sleeve-like cover 4, of any suitable material, to form an elongated filter unit with top and bottom edges of the filtering material exposed; and this unit is fitted closely and bonded within the mouth 2 of the container, between the walls thereof, with the top edge flush with the edges of said walls.

As shown in FIGURE 7, however, the filter device may consist of a flat elongated strip 3 of the filtering material fitted directly within the mouth 2 of the container without any covering material around the said filtering material, the filter being directly bonded to the walls of the container. This construction may be used when the filtering material is of a suitably fine texture to permit of a satisfactory bond being obtained by the use of an adhesive without the latter penetrating into the interior of the filtering material.

FIGURES 8 and 9 illustrate the use of a dual filter device. The device comprises an outer sterilizing strip 3 of filtering material suitably treated to intercept bacteria, and an inner strip 8 of untreated chemically-inert filtering material. Both strips are enclosed and bonded to covering tapes or strips 4, 4, applied to opposite sides to form a tape unit. The filter strips 3, 8 are arranged edgewise in co-planar alignment and are spaced vertically from one another in parallel relation. The covering 4 extends above the top strip 3 to form margins 9 at front and back, these being bonded together along their length except at the middle, where they are bulged outwards to form an air inlet duct 10 communicating with the top edge of the filter strip 3. The two front and back covering strips 4, 4, are also bonded together between the filter strips 3, 8, as at 11, and also below the strip 8, except at the middle to form an air duct 12 communicating with the interior of the container 1. The ends of said covering strips 4 are secured together at the ends, as at 13, but leaving spaces 14 between them at opposite ends of the filter strips 3, 8. The dual filter unit, constructed as above described, is closely fitted between the walls of the mouth portion 2 of the container and is bonded thereto. Thus, air entering at 10 can only pass into the container 1 by first traversing filter strip 3 longitudinally, then passing through the spaces 14 into the lower filter strip 8 which it has to traverse longitudinally in order to reach the duct 12 leading into the container.

Another modification is shown in FIGURES 10 and 11. A container 1 has an opening 15 in its top 16, and bonded to said top 16 is an air filter unit comprising air filtering material 3 as already described, contained in and bonded to an encircling covering strip 4 of any suitable air-impervious material that can be secured by adhesive to the container 1 as well as to the filtering material 3. An air inlet slot 17 is provided in the covering 4 at one edge of the filter unit, and an opening 18 is provided in said covering material at the base of the unit in a position such as to coincide with the opening 15 in the container. The ends of the filter unit may be open, as indicated in FIGURE 10, so that the material 3 is exposed, provided the opening 18 is at a sufficient distance from the open ends to give the necessary effective length of filtering material to be traversed by air entering the said open ends. Or the said ends may be closed by the covering material.

In the form shown in FIGURES 12 and 13, a filter unit A is secured by adhesive or is otherwise bonded between the side walls of the mouth portion 2 of a container 1. This unit A (FIGURE 13) consists of air filtering material 3 enclosed between two side strips of covering material 4, 4, extended in the form of side-by-side flanges 19 at the top and similar side-by-side flanges 20 at the bottom. These flanges are suitably cemented or bonded together, and gaps 21 are formed at the middle of the top flanges 19 extending downwards to expose the filtering material, and a similar gap 22 is formed at the middle of the bottom flanges 20, the latter being situated within the container. The ends of the covering strips 4, 4, extend beyond the material 3 and are suitably secured together so as entirely to enclose the filtering material except where the gaps 21, 22, are provided. Air entering the top gap 21 has to pass through the material 3 and out through the lower gap 22 in order to enter the container.

In the form of the invention illustrated in FIGURES 14 to 16, a filter tape or strip unit consists of a flat strip of air filtering material 3 enclosed between and bonded to two upper and lower covering strips 4, 4' of any suitable tape material, as hereinbefore described, and strips 4, 4', being wider than the strip 3 of filtering material so as to form longitudinal margins 23, 23' at opposite sides. The opposed margins of the top and bottom strips 4, 4', receive between them and are bonded to the edge portions 24 of the container 1 which are adjacent an opening or mouth provided in said container, so that the filter device bridges said opening or mouth. The top covering strip 4 has a single row of spaced-apart holes 25 in it and the lower strip 4' has a similar single row of holes 26 in it, but the holes in the one row are staggered relatively to those in the other row, so that air entering the holes 25 in the top strip 4 has to pass through a predetermined minimum length of the filtering material 3 before it can enter the container through the holes 26 in the lower strip 4', being thereby sterilized. The margins 23, 23' are continued around the ends of the filter strip 3 and receive between them and are bonded to the wall of the container 1 at the ends of the opening or mouth of the latter, as shown in FIGURE 16.

In the modification represented in FIGURES 17 and 18, there is a single row of holes 25 in the upper tape strip 4 along the longitudinal centre line thereof, but in the lower strip 4' there are two laterally-spaced rows of holes 27, 27 disposed respectively at equal distances from the centre line; and these holes 27, 27 are also arranged with pairs in transverse alignment at positions mid-way between successive holes 25 in the upper strip 4. The air entering the upper holes 4 has to pass in oblique directions through the filtering material 3 enclosed between the strips 4, 4', before it can pass through the holes 27 into the container 1. The arrangement of the holes could be reversed, there being two laterally-spaced holes in the upper strip 4 and a single central row of holes in the lower strip 4'.

In the further alternative shown in FIGURE 19, the construction of the filter device and its attachment to the container 1 is as in FIGURES 14 to 18, but there are a series of transverse rows of holes 28 in the upper covering strip 4 and a series of similar transverse rows of holes 29 (shown dotted) in the lower covering strip 4', the rows in the said upper strip 4 being staggered in relation to those in the lower strip 4'.

According to another modification, as illustrated in FIGURES 20 to 22, a package is formed from a wrapper consisting initially in a flat sheet 30 of air impervious transparent material in one half 30 of which a number of recesses or cavities 31 are moulded, and applied along one edge of this half of the material is a strip of air filtering and sterilizing material 3, contained between two covering strips of material 4, as in the other construction (only one strip 4 is indicated), the same being bonded to the sheet 30. The filter strip 3 is common to all the cavities, being in communication therewith by means of ducts 32. Articles to be packed are placed in the cavities and then the left-hand half 33 of the sheet 30 is folded along the line 34 so as to lie over the recessed right-hand

half 30, being bonded to the latter along the edges and between the cavities 31 and also to the covering material 4 of the filter strip, so as to produce a multiple-compartment package as shown in FIGURES 21 and 22. Instead of one half of a single sheet being folded over on to the other half of the sheet, there may be two separate sheets corresponding to the two halves 30, 33, of the single sheet, one of these sheets being formed with the cavities 31 and having a filter strip common to them, and the other sheet being plain and applied over and bonded to the first-named sheet in order to form the multiple-compartment package. Or, if desired, both sheets may be recessed to form the cavities in the completed package.

These multiple-compartment packages are particularly useful for the sterilization and storage of surgical instruments such as hypodermic syringes, hypodermic needles, blood transfusion sets, spinal puncture sets and the like, each item or set of items being housed in a seperately sealable compartment connected with a common sterilizing filter. It will be seen from the description herein that the air entering a container or package must pass through a sterilizing air filter in the form of a flat strip or tape-like length of air filtering and sterilizing material, whether edgewise through a longitudinal edge surface of the filter, or through an end surface thereof, or transversely from one side surface to the other, or through any two of said surfaces. It is also to be understood that in all forms of the invention the filter, or at least one filter where more than one is used (as in FIGURES 8 and 9), is to be treated to ensure sterilization of air passing through it, and also may be treated to give other qualities, such as being water-repellent and fire resistant.

When the covering of the filter device comprises side margins, as in FIGURES 14 and 19, these margins may have holes in them, or may embody a magnetic recorder tape, for use with a punched-card or magnetic coding device whereby the identity of the contents of the container may be announced.

In the case of pillows and mattresses, they may be sterilized internally by suitable gas treatment, such as by ethylene oxide and the like, or formaldehyde; and also externally by the application of liquid detergents and disinfectants. Moreover, the air filter covers allow the mattress or pillow to expand and contract resiliently in response to the weight imposed upon it.

I claim:

1. A package comprising a flexible bag-like container made of air- and water-impervious material, and means disposed in said container to be maintained substantially in the condition in which it was deposited in said container, said container having at one end an elongated mouth closed by an air sterilizing filter consisting of an elongated flat-sided strip of air-filtering water-repellant sponge-like material which is of a homogenous texture and which has been pre-treated, prior to incorporating in the container, with a sterilizing medium which will be lethal to the growth of any viable matter intercepted in the filtering material, said strip of material being of greater length than width with flat parallel faces and being bonded by its side portions to the container at opposite sides of said mouth, with the lower surface directly exposed to the interior of the container and with another surface exposed to the outside atmosphere so that the only ingress of air into the container is through the filtering material.

2. A package as set forth in claim 1 including a strip of covering material bonded in sealed relation to the opposed sides of said strip of material and the adjacent side surfaces of said flexible container.

3. A package as claimed in claim 1, wherein a flat strip of the air filtering material is fitted, between the sides of the opening of the container with its longer dimension extending along the length of said opening with one longitudinal edge of said strip being exposed to external atmosphere and the other longitudinal edge being in communication with the interior of the container.

4. A package as claimed in claim 1, wherein the filter is composed of two flat strips of air filtering material which are arranged edgewise and in coplanar alignment in a single tape fitted within the mouth or opening of the container so that air entering the latter has to pass through both strips in succession, an edge of the outer strip being exposed to the exterior atmosphere and an edge of the inner strip being in communication with the interior of the container, at least one of said strips being pretreated with an air-sterilizing material.

5. A package according to claim 1, wherein said package comprises two superimposed sheets of material joined together along three sides, with said flat strip of air filtering and sterilizing material bonded between the remaining sides of the sheets, and said sheets also being joined together at positions between opposite sides, so as to form a plurality of compartments with respect to which the strip of filtering material is common.

6. A package according to claim 5, wherein at least one of the two sheets is recessed to form a plurality of hollow compartments or cavities, each compartment or cavity communicating by a duct with the strip of air filtering material.

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