

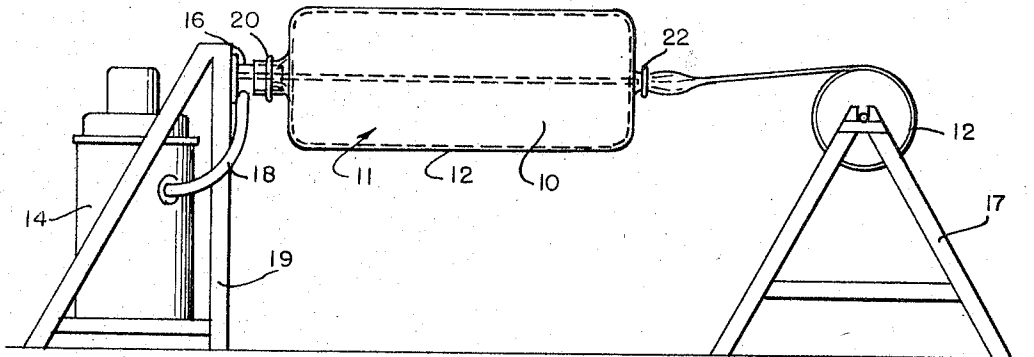
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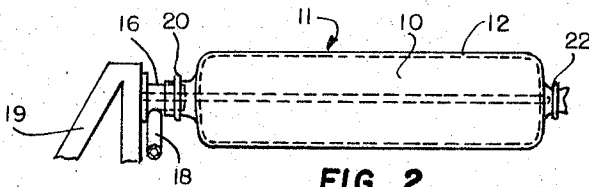
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METHOD OF VACUUM PACKAGING AIR FILTER MATERIALS

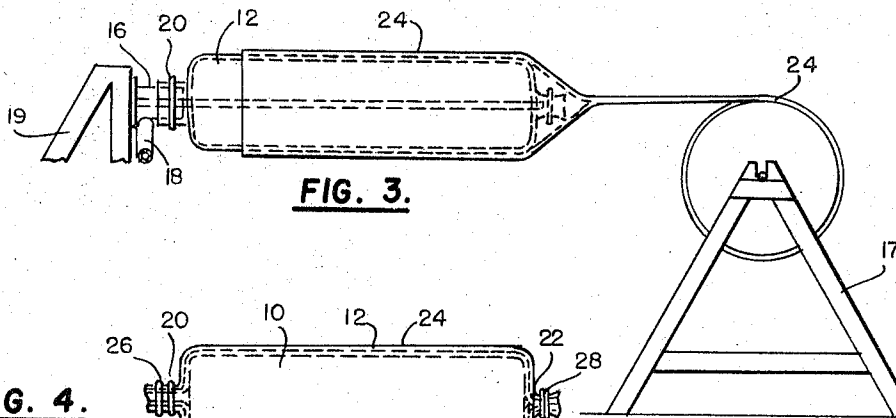
Filed Aug. 12, 1963



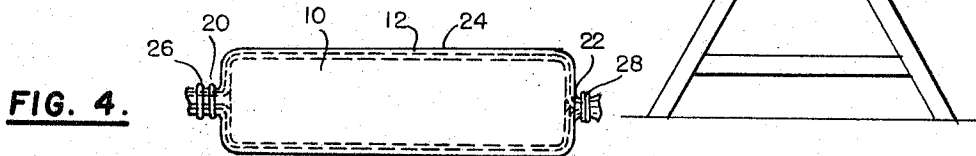
**FIG. 1.**



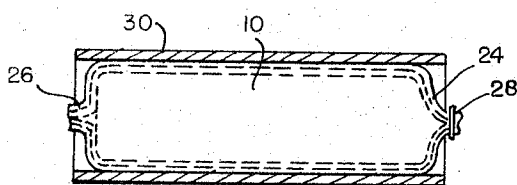
**FIG. 2.**



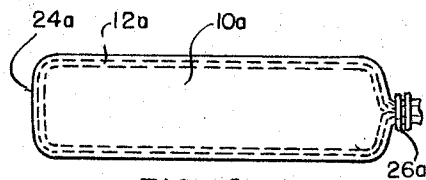
**FIG. 3.**



**FIG. 4.**



**FIG. 5.**



**FIG. 6.**

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## METHOD OF VACUUM PACKAGING AIR FILTER MATERIALS

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8 Claims. (Cl. 53—22)

This invention relates to a method of vacuum packaging air filter media, which are bulky due to the nature of the materials and the presence of air in the interstices thereof.

The present invention is concerned particularly with vacuum packaging and reducing the diameter of rolls of glass fiber, cellulose, filter pads, and the like.

Certain difficulties have arisen in providing a satisfactory packaging for air filter media. The present practice in the art is to wind a roll of filter media on a mandrel by compression winding, after which a paper-like covering is secured around the wound roll of filter material for protection. This is an unsatisfactory method of packing such material as it results in a bulky package, inefficient utilization of space and increased transportation expense to supply customers with an order of filter material.

The new method of packaging as taught by this invention substantially overcomes the above problems of packaging filter material.

Briefly, the exemplary method of this invention consists, generally, of at least one step of evacuation of cut filter pads or a wound roll of material and the application of one or a plurality of progressively smaller air-tight containers for the material for each consecutive step of evacuation of air. The containers structural arrangement of the invention may be in various forms and of various selections of materials. For example, each roll of filter material may be evacuated, reduced in diameter and prepared as a polyethylene wrapped package, a package wrapped in paper tubes, corrugated paper tubes, kraft paper, and the like. Likewise, the package may be of alternate structural combinations in which a flexible tubing of paper, polyethylene, other plastics, and the like may not only be used during the evacuating steps of the method of the invention, but may be used as a final or outside wrapping for control of the size of the packaged unit of material.

For example, many manufacturers attractively color their rolls of filter materials for public display, and to make the filter material impervious to fungus, odors, etc. For such public display and handling of filter media, all structural wrapping of the package may be of polyethylene tubing or of clear plastic materials and the like.

The primary object of this invention is to provide a new and improved method of packaging, evacuating air therefrom and increasing the density of air filter materials and the like.

A further object of the invention is to provide a method of packaging and evacuating air from rolls of compressible materials into compact and attractive units.

Another object of the invention is to provide a method of packaging which is simple, inexpensive, and requires a minimum of equipment and apparatus.

Another object of the invention is to provide a method of packaging rolls of air filter material including the steps of evacuating the air from the package and interstices of the material thereby increasing the density of the material, and further packaging the material as displayable commercial units of various uniform sizes, such that the filter material will be kept clean from dust and other foreign matter.

A still further object of the invention is to provide a method of vacuum packaging cut pads and rolls of air filter materials into compact units to fit the space in which it is desired to store or display the article without destructively compressing or diminishing the width or original length of the cut pad or roll of filter material when packaged.

These and other objects of the invention will become apparent to those skilled in the art in the following drawings and specification.

A detailed description of the present invention will now be given with reference to the drawing in which like reference numerals represent like parts.

FIGURE 1 illustrates a general type of apparatus which may be used for vacuum packaging rolls of filter material in accordance with the teaching of the present invention.

FIGURE 2 illustrates the first step of vacuum packaging of a roll of compressible filter material in which the ends of the tubing material have been sealed or tied.

FIGURE 3 illustrates the next step or covering of the vacuum compressed roll of FIG. 2 with a smaller size of tubing material which acts as a control to limit the expansion of the roll when the vacuum is removed.

FIGURE 4 shows the completed application of the second container material with its ends sealed by tying or other desired means of sealing, such as by heat application or the like.

FIGURE 5 illustrates the application of an open end tube of paper or other desired material as an alternative or additional protective control form over the evacuated package of either FIG. 2 or FIG. 4; and

FIGURE 6 illustrates the application of the invention in which bags, of various materials and compositions, having one end closed are used for vacuum packaging of cut pads of filter materials or rolls of filter material and the like.

Referring to the drawing:

FIGURE 1 shows a roll of fiber glass or other material 10, of a size as would be customarily shipped in commerce, being mounted upon a pipe mandrel 16 through the core of the roll 10, after which a thin polyethylene tubing 12, having a thickness of, for example, 0.001 inch, or other desired tubing preferably mounted in roll form on a supporting means 17, is slipped over the entire length of the roll of filter material 10 being pulled a few inches further than the remote end thereof. This excess part of tubing 12 is gathered around mandrel 16 and tied or held by flexible band means 20, so that no air will escape through the opening formed thereby. The operator then moves to the end of roll 10 near the roll of tubing 12 with the tubing still uncut and allowing several inches of the tubing 12 to extend from this end of rolled filter material 10, cuts and trims the end of tubing 12. This gives enough tubing 12 overhanging the end of filter material 10 to gather the same and secure it by either tying, using a flexible band means, or other means indicated at 22, so that this completes enclosure 11 by being air sealed at this end.

Mandrel 16 is operatively connected to, and communicates by suction conduit 18, with conventional vacuum machine 14 supported on a stand 19 or the like. The mandrel 16 may have a plurality of longitudinally spaced apertures (not shown) along its surface.

The vacuum machine 14 is then turned on and enclosure 11 is evacuated to the size indicated in FIG. 2.

FIGURE 3 illustrates the application of another tubing 24, preferably formed of a somewhat thicker material such as 0.002 inch polyethylene and of the desired control size of package 11 in FIG. 2, being slipped over tubing 12. The tubing 24 may be slipped over the roll of FIG. 2 without evacuation of air with the ends tucked in or sealed as in FIG. 2 to function merely as a control

means for the finished diameter of filter material 10, after which the vacuum machine 14 is stopped. Alternately the tubing 24 may be cut, tied, sealed and evacuated as in the steps shown in FIGS. 1 and 2 to remove any air therefrom, thereby decreasing the package size still further.

FIGURE 5 illustrates the application of a rigid paper tubing 30, such as corrugated cardboard or the like, to function as a protective cover and as an additional control means for the finished diameter of filter material 10 or in place of the tubing 24 as the sole control means. The final position of the paper tube 30 with respect to the packaged filter material 10 is shown in section, thereby illustrating an alternate embodiment of the finished product of this invention.

More specifically, FIGS. 4 and 5 illustrate two embodiments of the final product of the novel method of the instant invention. In FIG. 4, final tubing means 24 may function both as a vacuum container means and as a final control means for the diameter of filter material 10 or in the alternative, tubing means 24 may only function as a final control means for the diameter of filter material 10. In FIG. 5, member 30 merely serves as a protection means and as a control means for the final diameter of filter material 10.

FIGURE 6 represents another embodiment of the invention in which bagging materials 12a and 24 are applied to a quantity of filter pads 10a and the like and evacuated in accordance with the steps of FIG. 3 in which mandrel 16 is connected to a vacuum source 14. After the vacuum is removed from the filter pads for each step of the enclosure, the open end of the bag is sealed or tucked in to make the package airtight. FIGURE 6 discloses the use of a combination product of polyethylene and kraft paper and the like, laminated or in other forms of manufacture.

The use of bags may be incorporated into the process shown in FIGS. 1-5 in place of either the first tubular material, the second tubular material, or both.

Likewise, a combination product of polyethylene and kraft paper may be substituted for any of the tubular material described hereinbefore.

While there has been described hereinabove steps for a one or two stage vacuum packaging procedure in connection with the application of plastic tubing 12 and 24, respectively, it is to be understood that this invention is not restricted to a method of any specific number of stages of vacuum packaging of filter material, but the new method may contain one or more vacuum packaging steps for a control of the final diameter of filter material 10, as desired; especially, if filter material 10 is to be stored in proximity to impervious gases in polyethylene tubing 12 and 24.

In the novel method of this invention no air valves or destructive compression forms have been used to compress or destructively impair the original width and length of glass filter material 10 or other similar fibrous filter materials within the purview of this invention.

In the steps of the invention already outlined for each embodiment of this inventive method, during the vacuum packaging of each roll of material 10, air is removed from both the container and the interstices of the material which allows substantially only the resilient structural stresses of the glass fiber or filter material to resist the greater outside air pressure which results in a substantial decrease in the diameter of filter material 10 which also results in greater density per unit volume of material 10 for storage purposes. For example, a 24 inch diameter roll of filter material 10, as shown in FIG. 1, may be decreased to a 14 inch diameter roll of product material, as shown in FIGS. 2-5.

In this method the vacuum is preferably applied slowly so as not to injure or shear the fibers perpendicularly to their longitudinal axes. Therefore, when the vacuum package is removed from each pad or roll of filter material 10 during use, the material springs back to substantially its original form and size without any deleterious

effect to the fiber structure and original longitudinal length of the filter, which is very important in providing good filter media satisfactory for use in the industry.

While there has been described, what is at present considered to be the preferred embodiments of this inventive method of packaging filter materials, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the spirit and scope of the invention. It is therefore, understood that this invention is not to be limited except as covered in the appended claims.

We claim:

1. The method of vacuum packaging and reducing the diameter of rolls of filter materials which comprises placing a roll of wound filter material on a hollow elongated apertured evacuating mandrel operatively connected to a vacuum source, placing a first tubing of flexible material of the size of the roll about the material, cutting the tubing to extend beyond the ends of said filter material, sealing said tubing material about said filter material and said mandrel to form an air-tight container, evacuating the air uniformly from said container and said material slowly through said mandrel along the full length thereof to form a first evacuated package, applying a second tubing of flexible material of the size of said first evacuated package about said first package, cutting the second tubing to extend around said first package, sealing said tubing about said first package to form a second container, for controlling the final diameter of said first evacuated package, sealing said second container, positioning a substantially rigid tube of a size of said evacuated package about said second package, stopping said vacuum, and removing said second package with said tube thereabout from said mandrel.

2. A method in accordance with claim 1 wherein said tube is formed of corrugated cardboard.

3. The method of packaging air filter materials comprising the steps of placing a roll of wound filter material on a hollow perforated evacuating mandrel operatively connected to a vacuum source, placing a thin tubing material around said filter material and said mandrel, sealing said tube material to form a first airtight container, evacuating air from said first container to diminish the diameter of said filter material and to form an evacuated package, placing a smaller diameter of thin tubing material about said evacuated package, sealing said second tubing about said evacuated package and said mandrel to form a container to control the diameter of said filter material, removing said container from said mandrel and sealing the same to prevent entry of air, and placing a rigid tubing over said container prior to removal from said mandrel.

4. The method of packaging air filter materials comprising the steps of placing a roll of wound filter material on a hollow perforated evacuating mandrel operatively connected to a vacuum source, placing a thin tubing material around said filter material and said mandrel, sealing said tubing material to form a first airtight container, evacuating air from said first container to diminish the diameter of said filter material and to form an evacuated package, placing a smaller diameter of thin tubing material about said evacuated package, sealing said second tubing about said evacuated package and said mandrel to form a container to control the diameter of said filter material, removing said container from said mandrel and sealing the same to prevent entry of air, and placing a tubing which is transparent over said container prior to removal from said mandrel.

5. A method of vacuum packaging rolls of compressible material comprising the steps of placing a roll of wound compressible material on an elongated apertured evacuating mandrel operatively connected to a vacuum means, feeding a length of relatively thin expandable and contractable tubing material from a source of supply around said compressible material and said mandrel, severing said length of tubing material, sealing the ends of said tubing material about said compressible material to form an air-

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tight container, evacuating air from said airtight container uniformly throughout its length through the evacuating mandrel to diminish the diameter of the compressible material and the tubing, placing a smaller tubing of relatively rigid inexpandible material over said reduced diameter tubing and compressible material to control the size of the diminished diameter of said compressible material, stopping the vacuum, removing the compressible material in said container and said tubing of relatively rigid inexpandible material from said mandrel, and allowing the compressible material and container to expand to fill the confines of the relatively rigid inexpandible container.

6. A method in accordance with claim 1 wherein the relatively rigid inexpandible tubing is of paper material.

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7. A method in accordance with claim 1 wherein the relatively thin expandible and contractable tubing is polyethylene.

8. The method of claim 1 wherein the material of said relatively thin tubing is a combination polyethylene and kraft paper.

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