

[54] **ERODABLE MATERIAL**

[72] Inventor: **William L. Mackie**, 394 Court Avenue, Ventura, Calif. 93003

[22] Filed: **Sept. 18, 1970**

[21] Appl. No.: **73,469**

[52] U.S. Cl. **215/1 C**, 117/76 F, 117/138.8 PV, 161/165, 161/252, 161/254, 161/406, 220/54, 220/DIG. 30

[51] Int. Cl. **B32b 27/08**, B65d 23/00

[58] Field of Search 161/165, 252, 254, 406; 117/76 F, 138.8 PV; 215/1 C; 220/DIG. 30

[56] **References Cited**

UNITED STATES PATENTS

2,891,713	6/1959	O'Neil.....229/51 TS
3,415,402	12/1968	Webber 215/1 C
3,186,869	6/1965	Friedman 117/138.8 PV
3,279,511	10/1966	Griffin 220/DIG. 30
3,107,199	10/1963	Tocker 161/252
2,897,108	7/1959	Harwood 161/165
3,282,729	11/1966	Richardson et al.161/252 UX

3,214,291	10/1965	Dixler.....117/138.8 PV
3,274,020	9/1965	Heiberger et al.....117/76 F
3,563,244	2/1971	Asaka et al. 220/DIG. 30

OTHER PUBLICATIONS

Leach, G.; "Plastics Can Disintegrate, Say British," The Washington Post; p. A14, 7/20/70

Primary Examiner—Robert F. Burnett

Assistant Examiner—George W. Moxon, II

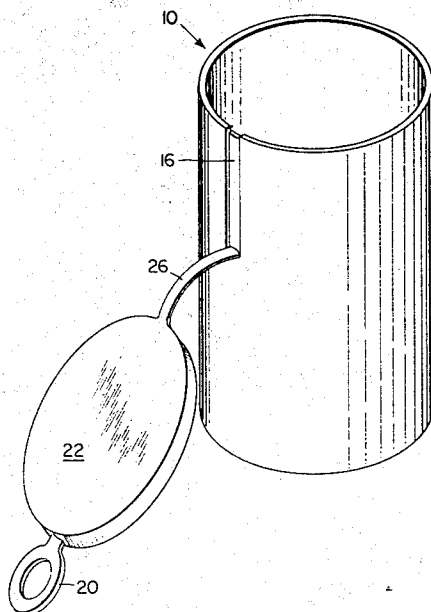
Attorney—Richard S. Sciascia, Q. Baxter Warner and Gayward N. Mann

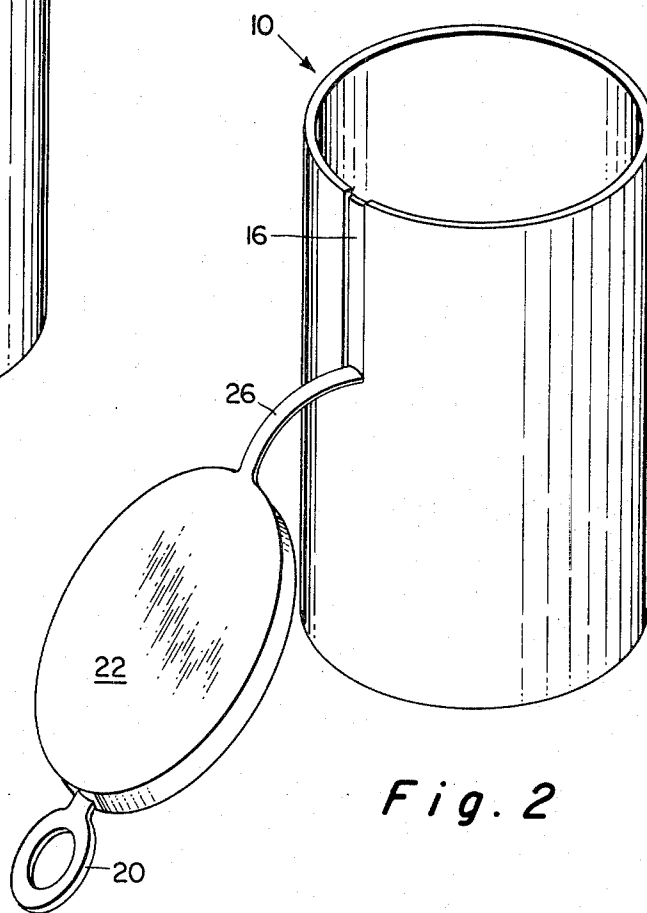
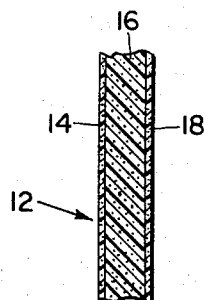
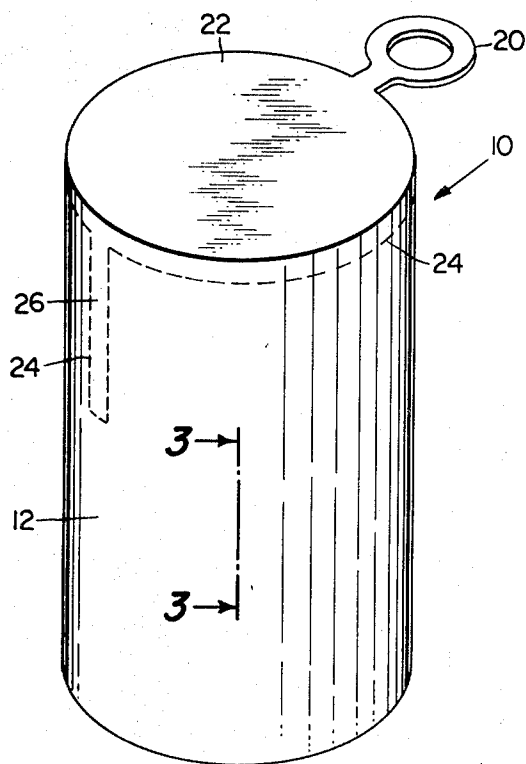
[57]

ABSTRACT

An improved material useful for a multitude of purposes which will dissolve or degrade in a short period of time when exposed to water, water vapor or sunlight. The material includes an intermediate layer of water soluble thermoplastic material with a layer of polyethylene film on both sides thereof. When the material is exposed to normal atmospheric conditions, the intermediate water soluble layer will ultimately dissolve. The thin outer and inner layers will degrade to a powdery film.

4 Claims, 3 Drawing Figures





WILLIAM L. MACKIE
INVENTOR

INVENTOR
BY *Gayward M. Mann*
Q. Banta Warner
ATTORNEYS

ERODABLE MATERIAL

STATEMENT OF GOVERNMENT INTEREST

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

BACKGROUND OF THE INVENTION

1. Field of the Invention.

This invention relates to an erodable material and more particularly to an erodable material useful in fabricating containers, sacks, wrapping material, etc., which disintegrates in a relatively short time upon exposure to normal environmental conditions.

2. Description of the Prior Art.

Most containers, such as bottles, cans and the like, are of a permanent nature and are capable of being reused numerous times. However, when discarded these containers pose a threat to the environment by reason of their permanent nature. Steel containers will rust away in a few years if exposed to environmental conditions but aluminum and glass containers survive indefinitely. Newly developed plastic containers also survive for a long period of time. Thus such containers accumulate to litter the world's streets and highways and pose a threat to the environment.

The present invention solves this distressing problem by providing an erodable material from which containers may be fabricated, said containers being destroyed by the natural elements of the atmosphere.

SUMMARY OF THE INVENTION

The present invention is an erodable material useful for sundry purposes which will degrade and dissolve or become decomposed in a relatively short period of time when exposed to the natural conditions of the environment. The structure of the material includes an inner and outer layer of clear, low-density polyethylene film surrounding an interior layer of soluble thermoplastic resin. The polyethylene is photo-degradable whereas the intermediate material is water soluble. When the interior material is exposed to environmental moisture it will dissolve. The polyethylene inner and outer layers will degrade in response to the deleterious effects of sunlight.

STATEMENT OF THE OBJECTS OF THE INVENTION

A primary use for the material of this invention is in the construction of containers which dissolve or degrade when opened.

Accordingly it is an object of the present invention to provide a material which erodes when subject to the deleterious effects of the environment.

Another object of the present invention is to provide a container which is destroyed by the natural conditions of the environment.

Another object is to provide a container for fluids or beverages which will dissolve or erode away within a relatively short time after being opened.

It is a further object to provide a container having a wall with at least three separate degradable layers which after being opened will degrade in response to the natural elements of the environment.

Another object is to provide a container which selectively is self-destructible and is simple in construction and efficient in use.

Another object is to provide a container which is fabricated from a material having at least three layers which will erode when the container is conventionally opened thereby exposing the intermediate layer to the atmosphere.

Other objects, advantages and novel features of the invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawing wherein:

BRIEF DESCRIPTION OF THE DRAWING

FIG. 1 is a perspective view of a container embodying the material of the present invention.

FIG. 2 is a similar view of the container of FIG. 1 showing a strip of container wall removed to expose an intermediate layer of the material.

FIG. 3 is a cross sectional view showing a portion of the laminated container wall taken along the line 3—3 of FIG. 1.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The invention comprises a laminated material readily formed into a container or like device useful for sundry purposes which material after opening of the container will degrade in a relatively short period of time in response to natural environmental conditions including water, water vapor and sunlight.

In the embodiment shown the wall 12 of container 10 is fabricated from a sheet material having at least three layers and as illustrated in FIG. 3 may include an outer layer of polyethylene film 14, an interior or intermediate layer of a water soluble resin 16 and an inner layer of polyethylene film 18 immediately adjacent the product carried within the container. The intermediate layer 16 of thermoplastic resinous material comprises the major portion of the wall 12 while the outer and inner layers 14 and 18 respectively are relatively thin, being approximately .001 inch in thickness.

In operation a tab 20 on the top surface 22 of container 10 is pulled which opens the container in the conventional manner along the scored marks 24. However, the tab 20 is also pulled downwardly along the wall 12 which removes a narrow band 26 of the outer polyethylene material 14 exposing the water soluble intermediate layer 16 to the weather. The intermediate layer will ultimately dissolve while the very thin inner and outer layers of polyethylene photo-degrade to a powdery residue. Degradation time of the entire container will depend on the disposal location because the annual rainfall and the sun's intensity will govern the time required for the container to completely disappear.

There are numerous materials which may be employed as the water soluble resins of the intermediate layer. Some of these are ethylene oxide, water soluble polyvinyl alcohol, carboxymethyl cellulose, hydroxyethyl cellulose and polyethylene glycol. Polyethylene oxide is the preferred material. It is soluble in water but resistant to oils and gases as well as biological attack. It is also low in toxicity which is an advantage in food or beverage containers.

Polyvinyl alcohol is also completely soluble in water and is unaffected by oils, greases and petroleum hydrocarbons. It is also impervious to most gases, a distinct advantage in some food products which contain dissolved gases.

The thin outer and inner layers are preferably both made of polyethylene due to its excellent resistance to water, oils and gases and fair resistance to gas transmission. Moreover it is approved by the Food and Drug Administration for use in food packaging operations.

Polyethylene is adversely affected by ultra-violet light and will degrade eventually to a powdery mass. The inner layer 18 which is in direct contact with a food or beverage must be resistant to chemical action by chemical constituents in the food or beverage. It must also be impervious to dissolved gas in the food or beverage such as carbon dioxide. For most purposes, polyethylene would suffice, but for foods or beverages having a high content of dissolved gas it may be necessary to line the inner polyethylene layer 18 with a gas-impermeable coating. Such coating would be very thin, substantially about 0.005 inch. Many materials would suffice for this purpose but polypropylene which has a very low gas permeability rate is preferred.

While the foregoing embodiment describes a container 10, it is clear that the erodable material from which the container is fabricated may be employed for sundry other purposes including sacks, wrapping material and the like.

Obviously many modifications and variations of the present invention are possible in the light of the above teachings. It is therefore to be understood that within the scope of the appended claims the invention may be practiced otherwise than as specifically described.

I claim:

1. A disposable container which is degraded by the natural elements of the environment, the structure of said container consisting essentially of:

an interior layer of water soluble resinous material selected from the group consisting of ethylene oxide, water soluble polyvinyl alcohol, carboxymethyl cellulose, hydroxyethyl cellulose and polyethylene glycol said interior layer forming the major portion of the composite structure;

an outer layer of photo-degradable polyethylene film;

an inner layer of photo-degradable polyethylene

film, both the inner and outer layers about .001 inch in thickness;

means for opening said container, said means adapted to strip away a band of outer polyethylene film, exposing the water soluble intermediate layer to the moisture of the environment which then dissolves while the outer and inner layers will degrade to a powder.

2. The disposable container of claim 1 wherein said means for opening the container includes:

a pull tab mounted on the top surface of said container and attached to a scored strip of the polyethylene outer layer of said container wall;

thus the top surface of said container is conventionally removed while simultaneously removing a narrow band of the outer polyethylene material which exposes the water soluble intermediate layer to environmental moisture dissolving the same while the outer and inner layers degrade to a powder.

3. The disposable container of claim 2 wherein said container is a can.

4. A disposable container which is degraded by the natural elements of the environment, the structure of the container consisting essentially of:

an interior layer of water soluble resinous material selected from the group consisting of ethylene oxide, water soluble polyvinyl alcohol, carboxymethyl cellulose, hydroxyethyl cellulose and polyethylene glycol, said interior layer forming the major portion of the composite structure;

an outer layer of photo-degradable polyethylene film;

an inner layer of photo-degradable polyethylene film, both the inner and outer layers being about 0.001 inch in thickness;

a gas-impermeable coating of polypropylene lining the inner polyethylene layer, said layer of polypropylene being about 0.005 inch in thickness;

means for opening said container, said means adapted to strip away a band of outer polyethylene film, exposing the water soluble intermediate layer to the moisture of the environment which then dissolves while the outer and inner layers will degrade to a powder.

* * * * *