Oct. 22, 1963 A. BERGERETTO 3,107,712

COLLAPSIBLE CONTAINERS ADAPTED FOR STORING LOOSE, FLOWABLE MATERIAL

Filed Jan. 30, 1961 2 Sheets-Sheet 1

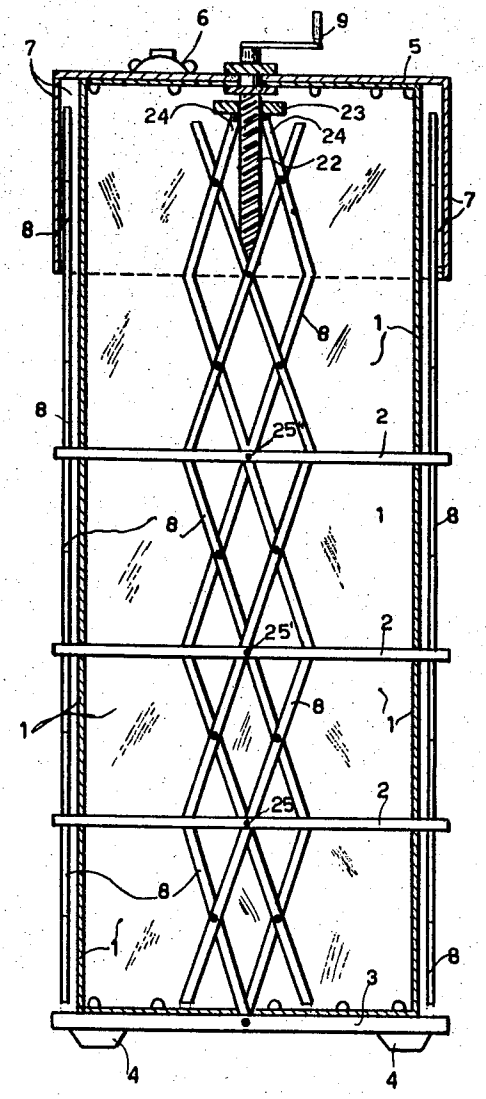


FIG. 1

Oct. 22, 1963 A. BERGERETTO 3,107,712
COLLAPSIBLE CONTAINERS ADAPTED FOR STORING LOOSE, FLOWABLE MATERIAL
Filed Jan. 30, 1961 2 Sheets-Sheet 2

FIG. 3

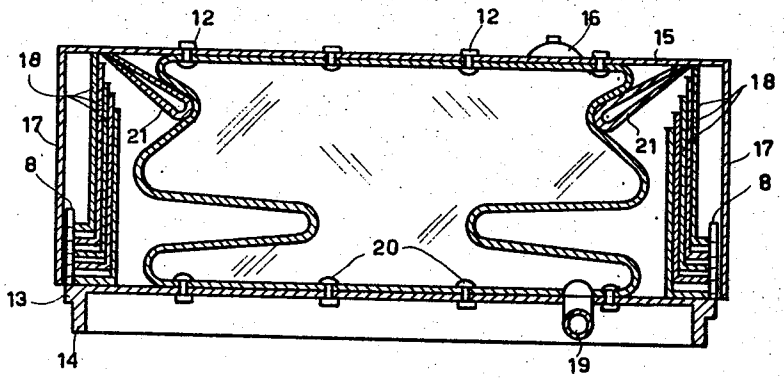
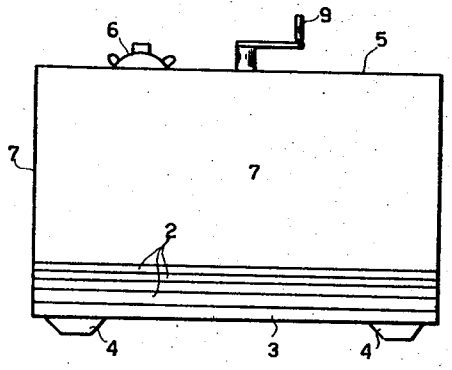


FIG. 2



United States Patent Office 3,107,712
Patented Oct. 22, 1963

3,107,712

COLLAPSIBLE CONTAINERS ADAPTED FOR STORING LOOSE, FLOWABLE MATERIAL

Adelmo Bergeretto, Via Circonvalazione Ostiense 236, Rome, Italy

Filed Jan. 30, 1961, Ser. No. 85,602
4 Claims. (Cl. 150—.5)

This invention relates to a container of variable volume for the transport and storage of loose flowable material such as liquids, granular materials, and the like.

It is an object of the invention to provide improved variable volume containers.

It is a particular object of the invention to provide a container defined by a flexible lining which can be adjusted between expanded and collapsed positions to vary the volume of the container.

It is a further object of the invention to provide an improved linkage in the container to expand and contract the lining between large volume changes.

According to the invention, the expansible and contractable container comprises a rigid container having an open mouth, and a rigid frame spaced from the container and facing the open mouth. A flexible cover is provided which is coupled to the frame and the container and defines therewith a closed enclosure or envelope. The flexible cover is adapted to permit relative movement between the container and the frame to vary the volume of the enclosure. In further accordance with the invention, there is provided linkage means coupled to the frame and the container for moving the container and the frame relative to one another. The linkage means is located in a plane positioned between the rigid container and the flexible cover and is enclosed along with the flexible cover by the rigid container when the latter is collapsed towards the frame. The linkage means comprises a lazy tongs linkage which is coupled to the frame and the rigid container.

The objects and features of the invention will become apparent from a consideration of the accompanying drawing, wherein preferred embodiments of a container with variable volume according to the invention have been illustrated only by way of example.

In the drawings:

FIG. 1 is a sectional view of a container of variable volume shown in an expanded state.

FIG. 2 shows the container of FIG. 1 in a collapsed state.

FIG. 3 shows in section another embodiment of the container in a collapsed state.

The container is constituted by an envelope or flexible liner **1** of a flexible material.

The envelope **1** is closed at the bottom thereof by a plate member **3** of rigid material and preferably provided with feet **4**.

This envelope **1** is secured at the top thereof to a plate member **5** of a rigid material, constituting a cover for the flexible material. The member **5** is provided with a filler **6** for the introduction of material into the container. The member **5** is extended downward on all sides thereof, by wall members **7** of rigid material, a suitable height in such a way as to form together with the member **5** an open mouth enclosure. Frames **2**, preferably of hoop shape surround the envelope **1** and are collapsible onto one another as shown in FIG. 2 when the links **8** (to be discussed more fully hereinafter) are collapsed.

The walls of envelope **1**, are of a flexible material, to permit contraction of the envelope from the position of maximum extension as shown in FIG. 1. Upon contraction of the envelope the spacing of the frames **2** is diminished, until they contact one another when the envelope is fully collapsed and lie beneath rigid walls **7**, as shown in FIG. 2.

Suitable means of any kind, such as mechanical, hydraulic, pneumatic, electric means and the like can be used for the purpose of varying the volume of the container.

In the embodiment shown, there is provided linkage means comprising a system of links **8**, which are hingeably connected to each other by pins to form a lazy tongs linkage. Pins **25**, **25'**, **25''** connect the links together and join the linkage to the frames **2** such that, by exerting a force on said linkage by means of handwheel **9**, it is possible to expand and contract the walls of the deformable envelope **1** and to cause the frames to accordingly move relative to one another. The handwheel is connected to a threaded member **22** on which is mounted a traveling nut **23**. The upper end of the linkage is pivotally connected to the traveling nut **23** so that when the handle **9** is turned in opposite directions the linkage is expanded and contracted in accordance with the travel of the nut. Traveling nuts on a threaded member which is adapted to rotate are well known and an example of such a construction are the elements **148**, **150** in U.S. Patent 3,054,-310.

In this embodiment, four systems of articulated rods are preferably provided, said rod systems being arranged in the middle part of each container side.

It is to be understood that an outlet opening can be provided in the bottom of the envelope to allow outflow of material from the envelope.

With reference to the embodiment in FIGURE 3, the container is constituted by an upper part of rigid material consisting of a plate member **15** and rigid wall member **17**. The envelope **11** of flexible material is secured to the inside of member **15**. The envelope **11** is connected at the bottom thereof to a rigid plate member **13**, by screw bolts **20**.

In this embodiment, the volume adjustment of the container is permitted by members **18**, that are slidably connected to one another and adapted for internesting one within the other as shown in FIG. 3 in the collapsed state of the envelope.

The deformable envelope **11** can be made in the same way as in the example according to FIGS. 1 and 2, that is, open at its top and secured by means of its upper and lower edges to the cover **15** and rigid bottom **13**, respectively or it can be entirely closed as shown in FIG. 3 and fastened through screw bolts, and the like, by means of its upper or lower part to the cover **15** and the rigid bottom **13**, respectively. In the embodiment in FIG. 3, the outwardly projecting horizontal members of the elements **18** substitute for frames **2** of the first embodiment and are hinged to the articulation points **25**, **25'**, **25''** and etc., of the lazy tongs linkage.

The container is shown with a supporting base **14** for the bottom **13**. A filter **16** in the cover **15** permits the introduction of material into the envelope and numeral **19** represents an outlet opening in the bottom **13**.

Push members **21** can be provided for protection and holding purposes and also to cause extension of envelope **11**.

The container can be of any kind, for instance it may be polygonal, of circular section, hemispherical or any other desirable shape.

I claim:

1. An expansible and contractable container comprising a pair of flat rigid plate members lying in parallel planes, a wall member extending from one of said plate members towards the other plate member, said wall member forming with said one plate member an open mouth enclosure, a framework interconnecting the plate mem-

bers for permitting relative movement of the plate members towards and away from one another, said framework comprising: a plurality of elements located between the plate members and including portions extending in planes parallel to the plate members, links lying in planes perpendicular to the plate members and interconnecting the plate members and the elements which are located between the plate members, said links lying in planes which are bounded within the enclosure defined by said wall member and said one plate member, pins hingeably connecting the links together in the form of a lazy tongs linkage and pins pivotally connecting the lazy tongs linkage to both said plate members and the elements located therebetween whereby upon expansion and contraction of said linkage said plate members and the elements located therebetween move relative to one another accordingly; and a flexible lining connected to the plate members and defining a closed container adapted for storing material which varies in volume dependent upon the relative position of the plate members, said lining being located within the framework so that the latter does not interfere with material in the closed container when the latter is expanded and contracted, said open mouth enclosure being of sufficient size to enclose the lining and the framework when the framework is collapsed.

2. A container as claimed in claim 1 wherein said elements located between the plate members are of identical hoop shape and surround the lining.

3. A container as claimed in claim 1 wherein said elements located between the plate members are interconnected, slidably supported members of L shaped cross section which are adapted to internest with one another when the framework is collapsed.

4. A container as claimed in claim 1 comprising means associated with the framework and extending externally of the container for collapsing and expanding the framework.

References Cited in the file of this patent

UNITED STATES PATENTS

1,573,721	Loeffler	Feb. 16, 1926
1,931,970	Thurston	Oct. 24, 1933
2,990,970	Murdock	July 4, 1961