Aug. 14, 1962 T. F. HAWK 3,049,070

SILO SEAL STRUCTURE

Filed June 8, 1961 2 Sheets-Sheet 1

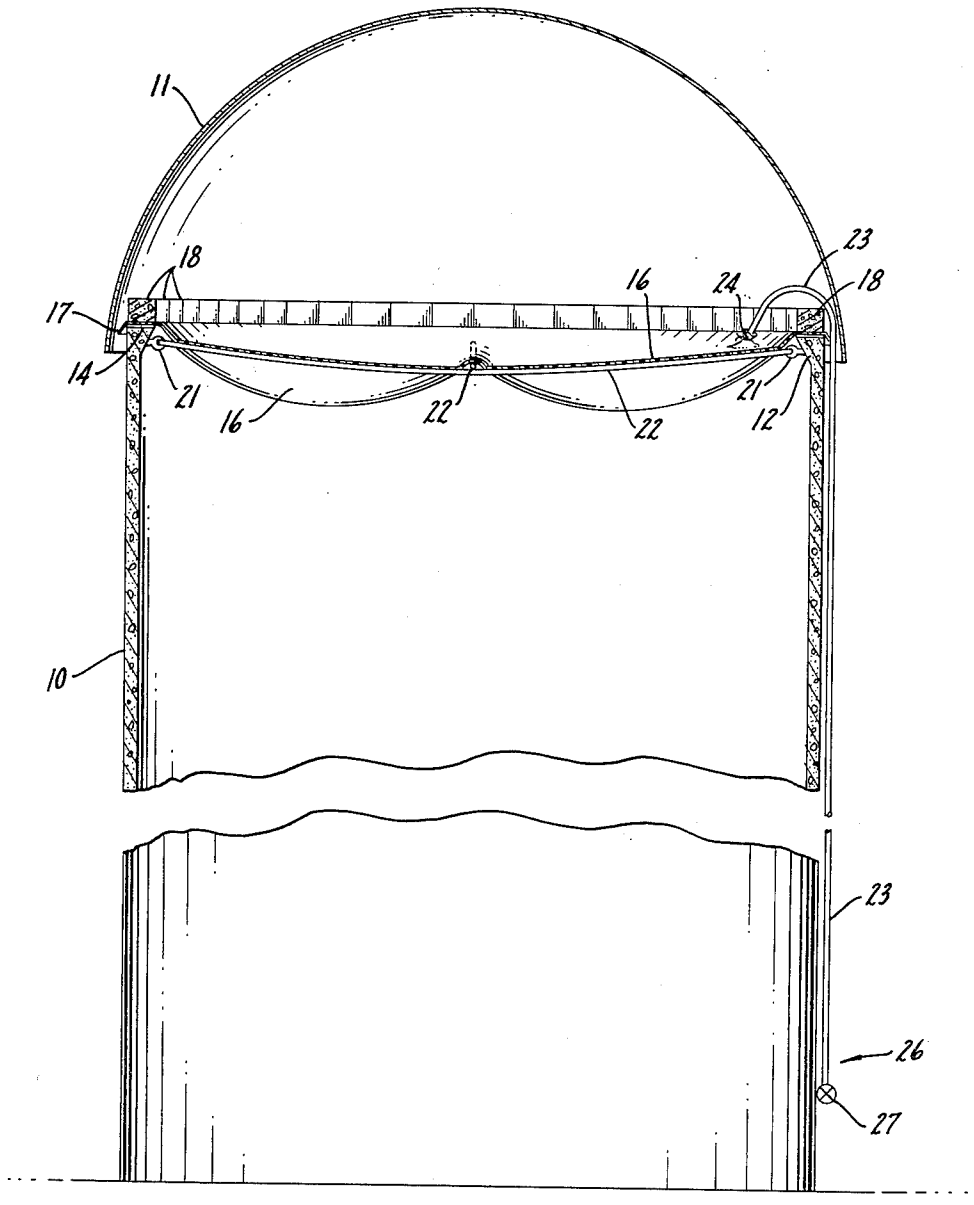


Fig. 1.

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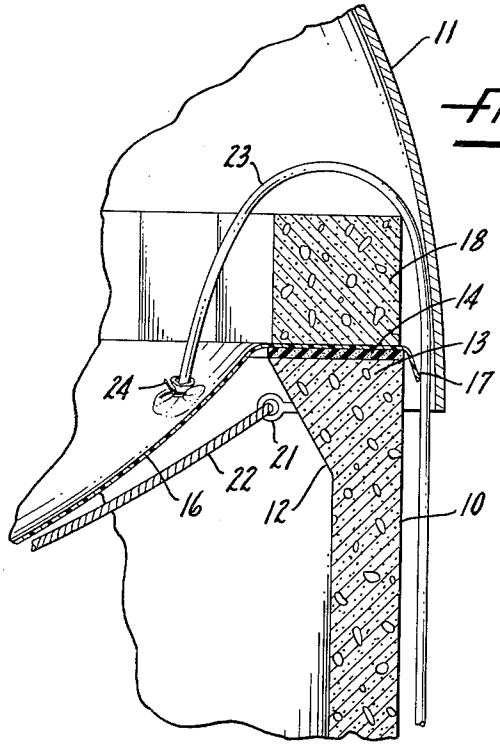


Fig. 2.

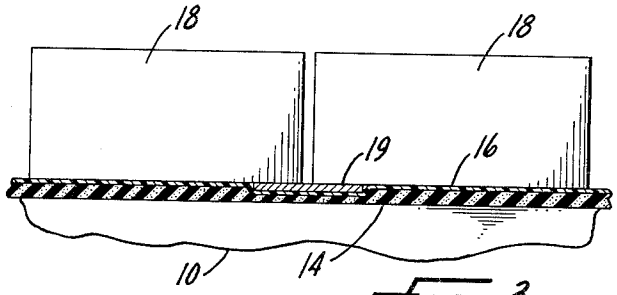


Fig. 3.

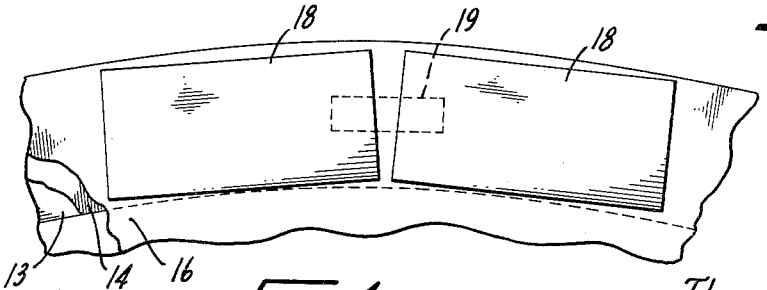


Fig. 4.

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3,049,070

SILO SEAL STRUCTURE

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5 Claims. (Cl. 99—235)

This invention relates generally to structures for maintaining the interior of silos at substantially atmospheric pressure without the entry and exit of air into and out of the silo, and relates particularly to a structure for conveniently converting an existing silo into the more modern sealed type.

It has been found that because of, among other reasons, daily and seasonal changes in temperature, even a "sealed" silo will breathe air into and out of the silo. The supplying of fresh oxygen to the silage because of this air flow enhances undesirable mold growth and consequent deterioration of the silage. Prior art structures have utilized a flexible sheet of air impervious material extending across the top of the silo to provide an expansion chamber between the upper face of the flexible sheet and the silo roof. The sealed interior of the silo can then vary its effective volume as a result of temperature change and no air will be circulated into and out of the silage since the pressure in the interior of the silo is maintained substantially at atmospheric pressure. A typical prior art structure using a flexible wall or sheet to provide an expansion chamber is disclosed in U.S. Patent 2,551,217 issued May 1, 1951 to Wesley G. Martin.

The structure of the present invention is an improvement over the arrangement shown in the above identified patent in respect to the means for supporting and sealing the juncture of the flexible wall or sheet and the upper end of the silo. The margins of the sheet are sealed to the silo by means of a series of weights, which may take the form of conveniently sized cement blocks, the weights serving to clamp the margins of the flexible sheet against a somewhat resilient strip of material, such as sponge rubber, supported on an internal ledge provided on the silo. The arrangement is such that it can be installed on an existing silo without the exercise of specialized skill and does not require any specialized tools. The structure can, correspondingly, be easily removed from a silo to thus render the silo readily convertible from sealed storage to open storage.

The primary object of the present invention is therefore to provide a flexible wall for a sealed storage silo which can be conveniently installed and removed without requiring any extensive alterations in the silo structure.

A further object of the present invention is to provide a flexible wall structure of the type referred to above in which the flexible wall is supported on its underface by radially extending lines or ropes.

These and other objects of the present invention will become apparent as the description proceeds with reference to the accompanying drawings in which:

FIG. 1 is a side sectional view of a silo into which the structure of the present invention is incorporated.

FIG. 2 is an enlarged detail view of a portion of the structure shown in FIG. 1.

FIG. 3 is a front elevation of a portion of the structure shown in FIG. 1.

FIG. 4 is a top plan view of a portion of the structure shown in FIG. 1.

Referring to the drawings and initially specifically to FIG. 1, there is shown a conventional silo having concrete side walls **10** and which is circular in cross-section. The open upper end of the silo is topped by a domed roof **11** which may be fabricated of any suitable material such as sheet metal or the like. The roof **11** is supported on

the silo in conventional fashion such that air can freely enter into the domed area beneath the silo roof and the lower portion of the silo **15** of conventional form, not shown in precise detail herein. As so far described the silo could be used for the open storage of silage, however, since air can freely enter the upper end of the silo, it could not be used for sealed storage.

The structure of the present invention adapts the conventional silo so far described for use as a sealed storage type silo. To install the structure of the present invention, where necessary concrete is applied to the inside surface of the silo wall adjacent its upper margin as indicated at **12**. In applications where the silo wall is relatively thick in cross-section, it will be understood that the added concrete **12** would be unnecessary since its function is merely to provide adequate sealing surface for the elements to be subsequently described.

The widened upper edge area **13** of the silo wall has disposed thereon an annular strip of resilient material **14** which preferably takes the form of sponge rubber. It will be understood that instead of sponge rubber the strip **14** might be formed of suitable mastic, tar base material or the like since its function is to act as a gasket for the elements superimposed upon it.

Extending across the open upper end of the silo and overlying the upper face of the strip **14** is a loosely draped sheet **16** of relatively thin, air impervious, flexible material such as polyethylene. The plastic film or sheet **16** extending across the silo is preferably of four mil thickness polyethylene, this material giving particularly satisfactory flexibility. The outer margins **17** of the sheet **16** extend outboard of the strip **14** and overlying the marginal area of the sheet **16** are a series of closely spaced blocks **18** which may be formed of any material having substantial weight but preferably take the form of cement blocks which are six inches by six inches by twelve inches in dimension.

The blocks rest on the upper face of the sheet **16** in closely spaced arrangement and occupy the entire upper marginal edge **13** of the silo.

As may best be seen in FIGS. 3 and 4, extending beneath adjacent blocks **18** and across the upper face of the sheet **16** are rigid elements **19** which preferably take the form of sheet metal strips. The elements **19** are held against the sheet **16** by the blocks and serve to make the seal continuous around the upper margin of the silo. Eyebolts **21** are secured to the upper, inner surface of the silo wall at spaced intervals around the silo wall and serve as support means for a series of radially extending support ropes **22** for the sheet **16**. While only two transverse ropes **22** are shown in FIG. 1, it will be understood that the actual number of ropes used might be varied. The ropes **22** are preferably formed of nylon so as to resist any chemical action of the gases issuing from the silage.

As may best be seen in FIG. 2, a bleed line or tube **23** extends through an aperture in the sheet **16** and the junction is sealed by any suitable means such as by gathering the seal at the junction and twisting thereabout a wire **24**. The tube **23** can be formed of metal or plastic and can extend downwardly between the silo roof and the silo wall so as to be accessible at the base of the silo as indicated at **26** in FIG. 1. At its lower end the tube **23** may be supplied with a valve of conventional type, indicated schematically at **27**, for bleeding air into the area beneath the sheet **16** when the contents of the silo are being withdrawn. It will be understood that the tube **23** merely serves as a means for permitting entry of air into the silo to replace the volume of silo contents withdrawn therefrom and could extend directly through the silo side wall.

In operation, the flexible sheet **16** will extend or move

toward the silo roof or recede therefrom as the conditions within the silo require, that is, despite the varying condition of the contents of the silo, movement of the sheet **16** will be such as to prevent any substantial change of pressure within the silo and the introduction of air into or the exit of gases from the silo. It will be particularly noted that the structure of the present invention can be conveniently installed in an existing silo and requires no skilled installation work or specialized machinery. It will be further noted that should it be desirable to transform the silo from sealed storage to open storage, the plastic sheet and blocks **18** may be easily removed and no further alterations in the silo construction are necessary. The elements **19** in the form of metal strips serve to prevent wrinkles or air passages from forming beneath the sheet **16** between the blocks **18**. While the sponge rubber strip **14** is shown as having substantial width, it will be understood that it might be narrowed considerably from the dimension illustrated in FIG. 2. While the supporting ropes **22** are a desirable feature of the structure, it will be understood that these might be omitted without substantially affecting the performance of the flexible sheet **16** and the seal formed at its margins.

While the invention has been disclosed and described in some detail in the drawings and foregoing description, they are to be considered as illustrative and not restrictive in character, as other modifications may readily suggest themselves to persons skilled in this art and within the broad scope of the invention, reference being had to the appended claims.

The invention claimed:

1. A structure providing an expansion chamber for a sealed storage type silo, said structure comprising in combination a silo having concrete side walls and a roof enclosing the upper end thereof, a strip of sponge rubber disposed along the upper edge area of the silo wall, a sheet of relatively thin flexible polyethylene covering the upper end of the silo and extending so that the margin of the sheet is outboard of the outer margin of said strip and the sheet overlies the upper face of the strip, a series of closely spaced blocks having substantial weight placed over the marginal area of said sheet overlying said strip, and rigid elements extending across the space between adjacent blocks and disposed between the blocks and the upper face of said sheet, whereby the weight of said blocks seals the marginal area of said sheet against said strip and said rigid elements provide continuity of the seal between the blocks, the flexible sheet being thus free to move upwardly toward the silo roof and to recede therefrom upon increase or decrease respectively of the pressure acting on the lower face of said sheet.

2. A structure as claimed in claim 1 having means for supporting the underface of said flexible sheet comprising a plurality of support ropes extending radially across the open upper end of the silo and beneath said flexible sheet underface.

3. A structure providing an expansion chamber for a sealed storage type silo, said structure comprising in combination a silo having side walls and a roof enclosing

the upper end thereof, a strip of sponge rubber disposed along the upper edge area of the silo wall, a sheet of relatively thin flexible polyethylene covering the upper end of the silo and extending so that the marginal area of the sheet overlies the upper face of the strip, a series of closely spaced blocks having substantial weight placed over the marginal area of said sheet overlying said strip, and rigid elements extending across the space between adjacent blocks and disposed between the blocks and the upper face of said sheet, whereby the weight of said blocks seals the marginal area of said sheet against said strip and said rigid elements provide continuity of the seal between the blocks, the flexible sheet being thus free to move upwardly toward the silo roof and to recede therefrom upon increase or decrease respectively of the pressure acting on the lower face of said sheet.

4. A structure providing an expansion chamber for a sealed storage type silo, said structure comprising in combination a silo having side walls and a roof enclosing the upper end thereof, a strip of compressible material disposed along the upper edge area of the silo wall, a sheet of relatively thin flexible material covering the upper end of the silo and extending so that the marginal area of the sheet overlies the upper face of the strip, a series of closely spaced blocks having substantial weight placed over the marginal area of said sheet overlying said strip, and rigid elements extending across the space between adjacent blocks and disposed between the blocks and the upper face of said sheet, whereby the weight of said blocks seals the marginal area of said sheet against said strip and said rigid elements provide continuity of the seal between the blocks, the flexible sheet being thus free to move upwardly toward the silo roof and to recede therefrom upon increase or decrease respectively of the pressure acting on the lower face of said sheet.

5. A structure providing an expansion chamber for a sealed storage type silo, said structure comprising in combination a silo having side walls and a roof enclosing the upper end thereof, a strip of compressible material disposed along the upper edge area of the silo wall, a sheet of relatively thin flexible material covering the upper end of the silo and extending so that the margin of the sheet overlies the upper face of the strip, a series of spaced members having substantial weight placed over the marginal area of said sheet overlying said strip, and rigid elements extending across the space between adjacent members and disposed between the members and the upper face of said sheet, whereby the weight of said members seals the marginal area of said sheet against said strip and said rigid elements provide continuity of the seal between the members, the flexible sheet being thus free to move upwardly toward the silo roof and to recede therefrom upon increase or decrease respectively of the pressure acting on the lower face of said sheet.

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