April 3, 1951 G. F. SULFRIAN 2,547,607

DOUBLE WALLED THERMALLY INSULATED VESSEL

Filed Dec. 30, 1947

2 Sheets-Sheet 1

Fig. 1.

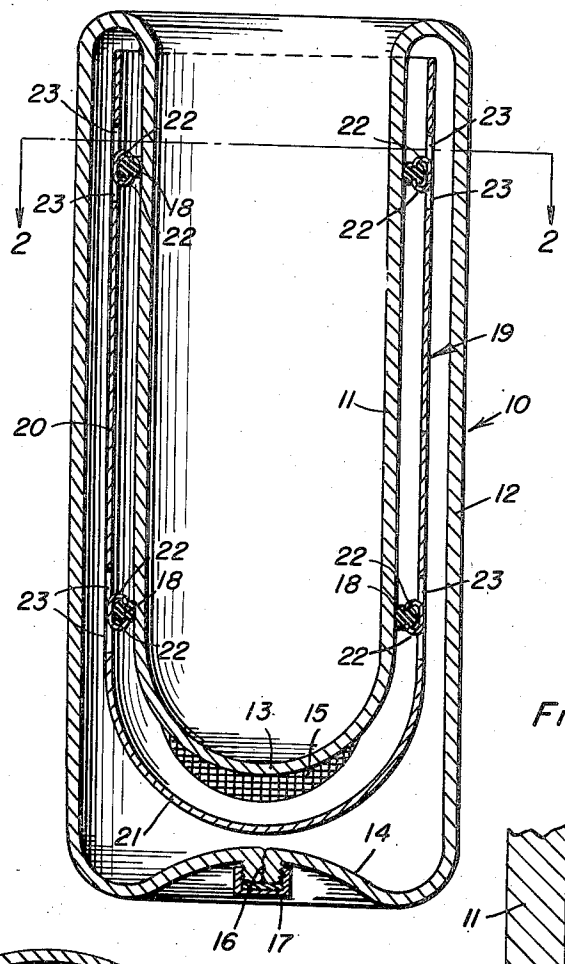

Fig. 2.

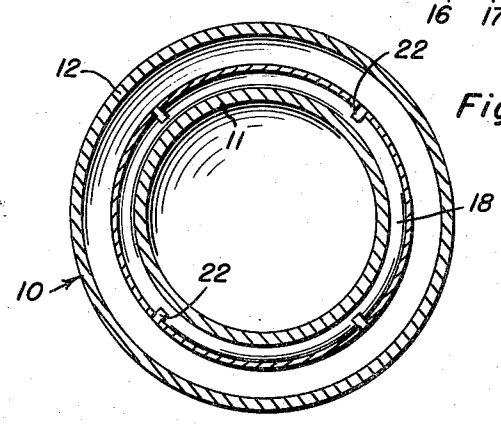

Fig. 3.

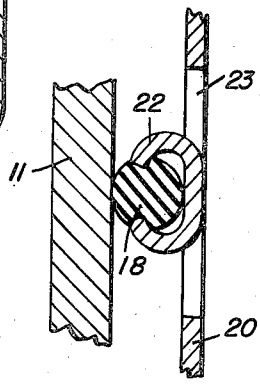

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Fig. 4.

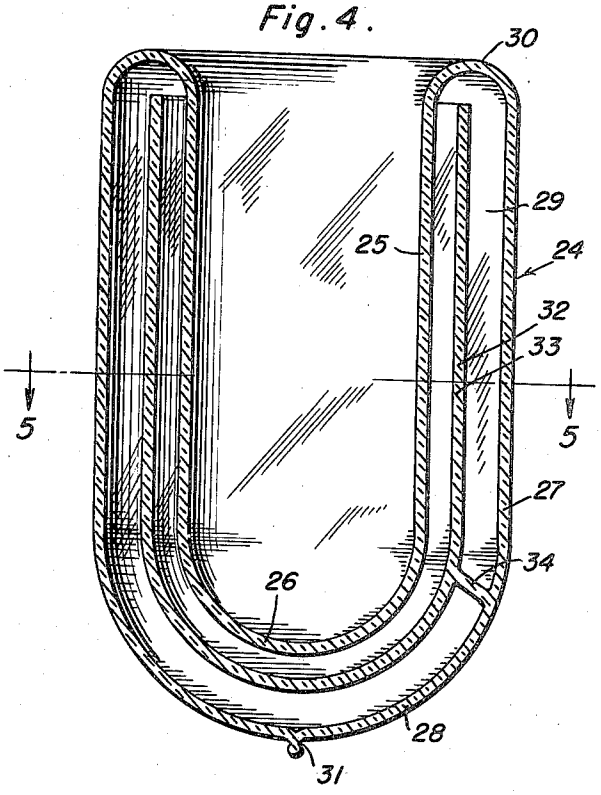
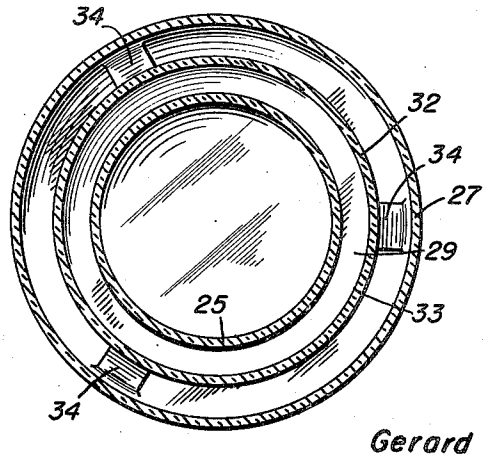


Fig. 5.



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2,547,607

UNITED STATES PATENT OFFICE

2,547,607

DOUBLE-WALLED THERMALLY INSULATED VESSEL

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Application December 30, 1947, Serial No. 794,573

3 Claims. (Cl. 220—9)

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This invention relates to a double walled thermally insulated vessel and has for its primary object to improve the insulating characteristics of the vessel.

Thermally insulated vessels of the type to which this invention relates are primarily employed for confining liquified gases, such as liquid hydrogen, liquid air and the like which when subjected to normal temperatures tend to return to their normally gaseous state. One means of preserving the liquified gases in a liquid state is to introduce them into thermally insulated vessels, such as Dewar flasks and the like. By thus preserving the temperature of the liquid as low as possible, its volatilization is inhibited, and hence the storage and transportation of such liquified gases is usually effected in thermally insulated vessels. In view of the highly volatile nature of these liquified gases it becomes of paramount importance to prevent as far as possible the transmission of heat from the surrounding atmosphere to the liquids and hence evacuated vessels, such as Dewar flasks and the like have been extensively employed. These as heretofore constructed, however, do not satisfactorily interrupt the flow of radiant energy into the vessels containing the liquified gases, nor will the ordinary silvering of the surfaces of the walls of the vessels, such as that commonly employed in "Thermos" bottles, and the like turn back sufficient radiant energy to enable them satisfactorily to serve as containers for liquified gases such as those above mentioned.

It is therefore another object of this invention to arrest and turn back energy radiations before they can contact the inner wall of a double walled thermally insulated vessel and thus prevent the absorption of the energy in said inner wall and the subsequent transmission of the energy into the liquid contained within the vessel.

In the modern construction of thermally insulated double walled vessels of one type to which this invention relates, the vessels are constructed of metal, preferably stainless steel having a low thermal conductivity. Such material does not readily lend itself to the silvering process employed in the conventional "Thermos" bottle and therefore the necessity for protecting the contents of the vessel from radiant energy becomes of paramount importance in order to preserve to the greatest degree possible the liquid condition of the contents of the vessel.

A further object is to satisfactorily inhibit the passage of radiant energy into the contents of a modern steel thermally insulated container.

The above and other objects may be attained

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by employing this invention which embodies among its features a thermally insulated vessel which includes an inner wall and an outer wall in spaced relation to the inner wall and a radiation shield supported in the space between the walls and out of contact with the inner wall.

Other features includes spaced bands of a material possessing low thermal conductivity encircling the inner wall and spurs on the radiation shield for engaging the bands and holding the shield in space.

Still other features include forming in the shield adjacent the spurs openings to facilitate the evacuation of the space between the walls of the vessel, and avoid the trapping of air between the spaced bands and the radiation shield.

In the drawings:

Figure 1 is a vertical sectional view through a typical thermally insulated vessel of the type employed for the holding of liquified gases, showing this improved radiation shield in place;

Figure 2 is a horizontal sectional view taken substantially along the line 2—2 of Figure 1;

Figure 3 is a fragmentary enlarged sectional view through a portion of the inner wall of the vessel and the radiation shield to illustrate in detail the manner of supporting the radiation shield in place;

Figure 4 is a longitudinal sectional view through a modified form of this invention, and;

Figure 5 is a transverse sectional view taken substantially along the line 5—5 of Figure 4.

Referring to the drawings in detail a conventional thermally insulated vessel designated generally 10 comprises an inner bottle or container 11 which is surrounded by an outer wall 12 which as illustrated in the drawings is spaced from the wall 11 to form a closed chamber. The wall or vessel 11 is provided with a bottom 13, and supported on the underside of the bottom between the bottom 13 and the bottom wall 14 of the outer container 12 is a conventional basket 15 in which finely divided charcoal or the like is contained. The bottom 14 of the outer cylinder 12 is provided with an evacuating passage 16 of conventional form which is adapted to be closed and sealed by a cap 17 after the evacuation of the space between the walls 11 and 12.

Surrounding the inner container 11 are longitudinally spaced bands 18 of asbestos rope or like material possessing low thermal conductivity and transmission characteristics, and extending around the band 18 is a radiation shield designated generally 19 which in its present form comprises a tubular body 20 having a bottom 21

which lies between the bottom 13 of the inner vessel 11 and the bottom 14 of the outer vessel 12. The tubular body 20 lies between the side walls of the inner vessel 1 and the outer vessel 12 and completely out of contact with either wall.

In order to support the radiation shield 19 in proper position in the space between the inner and outer walls of the vessel, incisions are formed in the shield 19 adjacent the bands 18 and the material of the wall between the incisions is forced inwardly to form inwardly extending tongues or spurs 22 which bite into the respective bands 18, and thus firmly support the shield 19 in place. The spaces 23 formed by the inward bending of the tongues 22 serve to prevent the trapping of air between the shield 19 and the wall of the inner vessel 11 during the evacuation of the space between the walls 11 and 12.

The radiation shield 19 is formed of soft copper sheet of about 1/100 of an inch in thickness, and both sides of the copper sheet are highly polished to produce a mirror finish. It will thus be seen that when the vessel 10 is subjected to radiant energy, its passage through the vessel and into the contents thereof will be inhibited by the shield 19, and since the insulation characteristics of the evacuated space between the inner and outer vessels 11 and 12 prevents the conduction of heat from the exterior to the interior of the vessel, it is evident that a vessel equipped with this improved radiation shield not only protects the contents against conducted heat, but also protects the contents from the effects of radiant energy.

In the modified form of the invention illustrated in Figures 4 and 5 there is disclosed a flask designated generally 24 which comprises an inner tubular body 25 closed at one end by a concavo-convex wall 26. Surrounding the body 25 in spaced relation thereto is a tubular body 27 which is closed at one end by a concavo-convex wall 28, and the body 25 is fitted into the body 27 to form between the walls thereof a space 29. The open ends of the bodies 25 and 27 are sealed together at 30, rigidly to support the body 25 in spaced relation to the body 27 as will be readily understood upon reference to the drawings. After joining the bodies 25 and 27 as above described the space 29 between the walls thereof is evacuated and sealed off as at 31 in a manner conventionally employed in the production of what are commonly known in the art as Dewar flasks.

The improvement in the flask just referred to comprises securing in the body 27, and in spaced relation to the walls of the bodies 25 and 27 a radiation shield 32 which as illustrated in the drawings comprises a hollow body 33 of a diameter greater than the body 25 and of a diameter less than the body 27. The tubular portion of this shield is substantially coextensive in length with the bodies 25 and 27 so that one end is spaced from the junction 30 of the bodies. A suitable support 34 is carried by the end of the tubular portion of the body 33 remote from the sealed ends of the bodies 25 and 27 and extends outwardly as shown to engage the bottom 28 of the body 27 near its junction with the body.

When the parts are formed of glass as suggested by the cross hatching in Figures 4 and 5 the support 34 is sealed to the bottom 28, and thus the position of the radiation shield 32 is fixed within the space 29. In the preferred form of the invention both the inner and outer surfaces of the walls 25 and 26 forming the inner vessel, as well as the walls 27 and 28 forming the outer vessel are silvered and the inner and outer surfaces of the hollow body 33 forming the radiation shield 32 are likewise silvered so as to protect the contents of the inner vessel from the effects of radiant energy.

In constructing a flask in accordance with the modified form of the invention, the inner and outer vessels are first formed in a conventional manner after which the tubular body 33 carrying its support 34 is sealed in place in the outer vessel as illustrated. The inner vessel is next introduced into place and the open ends of the vessels are sealed together at 30 to form a double walled vessel having a space 29 therebetween and the radiation shield interposed between the cylindrical portions 25 and 27 of the inner and outer vessels. The space 29 between the vessels is then evacuated in a conventional manner and sealed as at 31 to form a complete vacuum vessel in which the radiation shield is supported in the evacuated space. With the inner and outer surfaces of the walls of the inner and outer vessels, and the radiation shield silvered or otherwise treated to inhibit the passage of radiant energy therethrough, it will be obvious that the contents of the flask will be protected from the effects of any radiant energy striking the vessel. Since the radiation shield is supported in spaced relation to the inner vessel, it will be obvious that any heat absorbed by the radiation shield will not be passed by way of conduction to the contents of the vessel and since the radiation shield interrupts the transmission of radiant energy through the vessel, the contents of the vessel will remain unaffected for long periods of time.

While in the foregoing there has been shown and described the preferred embodiment of this invention it is to be understood that minor changes in the details of construction and arrangement of parts may be resorted to without departing from the spirit and scope of the invention as claimed.

Having described the invention, what is claimed as new is:

1. As a new article of manufacture a thermally insulated vessel which includes an inner wall, an outer wall in spaced relation to the inner wall, the space between the walls being evacuated, spaced bands of a material possessing low thermal conductivity encircling the inner wall and spaced from the outer wall, a radiation shield supported on said bands in the evacuated space and out of contact with either wall, and spurs on the radiation shield for engaging the bands and holding the shield in place.

2. As a new article of manufacture a thermally insulated vessel which includes an inner wall, an outer wall in spaced relation to the inner wall, the space between the walls being evacuated, spaced bands of a material possessing low thermal conductivity encircling the inner wall and spaced from the outer wall, a radiation shield supported on said bands in the evacuated space and out of contact with either wall, spurs on the radiation shield for engaging the bands and holding the shield in place, and said radiation shield having spaced openings extending therethrough adjacent the spurs.

3. As a new article of manufacture a thermally insulated vessel comprising an inner hollow cylindrical body closed at one end, an outer hollow cylindrical body closed at one end, said inner and outer bodies being joined at their open ends to form a closed space between the walls of the bodies, a tubular radiation shield having a closed end, said shield being disposed in the space be-

tween the bodies in spaced relation to the junction of the open ends of the bodies, the closed end of the shield being spaced from the closed ends of the bodies the inner and outer surfaces of the inner and outer bodies and of the radiation shield being highly reflective to radiant energy, spaced bands of low thermal conductivity material embracing the inner wall and spaced from the outer wall, and outstruck spurs in said shield engaging said bands for supporting the shield.

GERARD F. SULFRIAN.

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CERTIFICATE OF CORRECTION

Patent No. 2,547,607 April 3, 1951

Gerard F. Sulfrian

It is hereby certified that error appears in the above numbered patent requiring correction and that the said Letters Patent should read as corrected below.

Column 1, lines 29 and 46, for '"Thermos"', each occurrence, read -- vacuum --.

Signed and sealed this 27th day of February 1962.

(SEAL)
Attest:

ERNEST W. SWIDER
Attesting Officer

DAVID L. LADD
Commissioner of Patents