May 16, 1933. W. J. PODBIELNIAK 1,909,315

INSULATED JACKET FOR DISTILLATION APPARATUS

Filed June 20, 1931 2 Sheets-Sheet 1

Fig. 1.

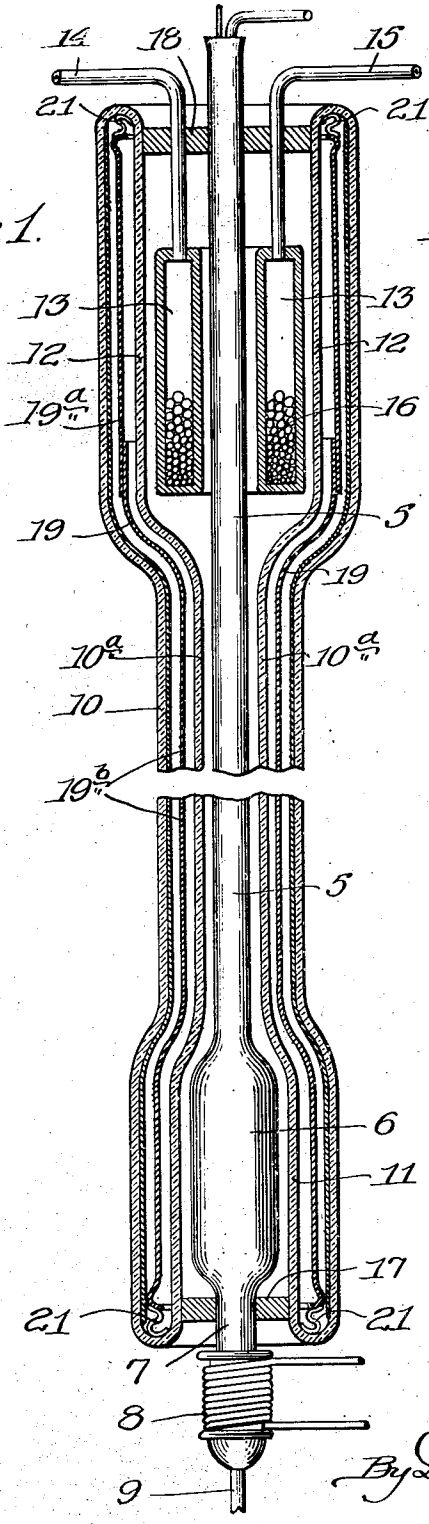
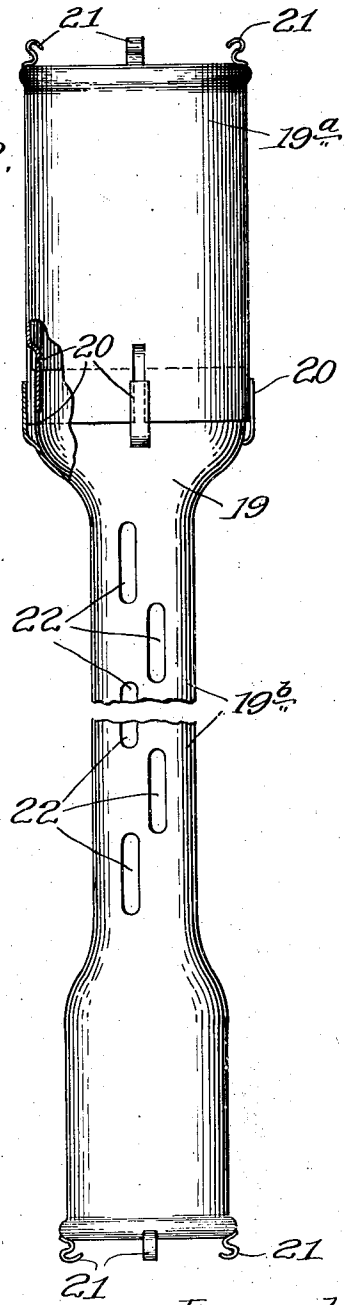


Fig. 2.



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Filed June 20, 1931 2 Sheets-Sheet 2

Fig. 3.

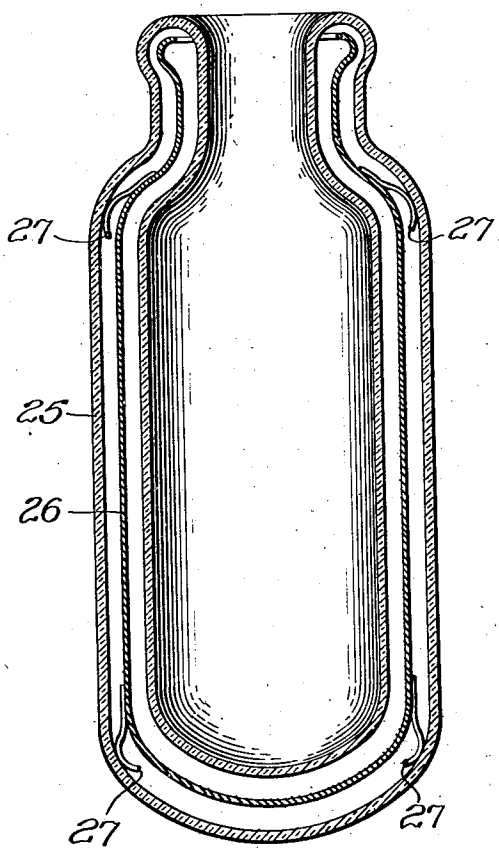
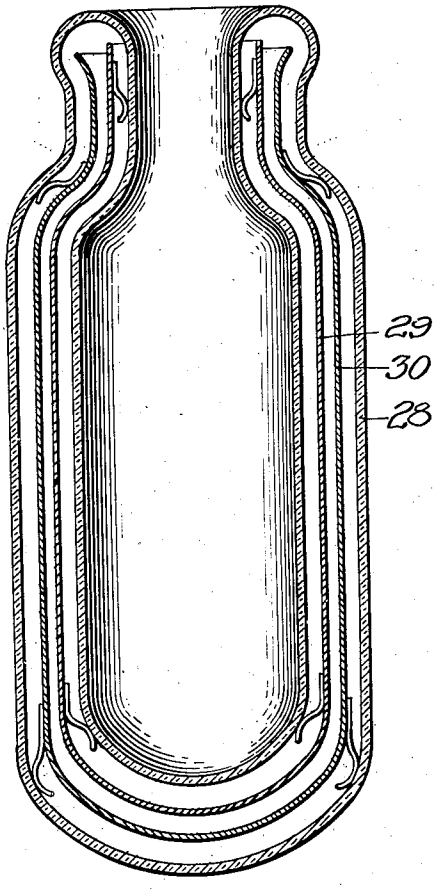


Fig. 4.



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UNITED STATES PATENT OFFICE

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INSULATED JACKET FOR DISTILLATION APPARATUS

Application filed June 20, 1931. Serial No. 545,755.

The present invention relates to improvements in insulating containers or jackets and more particularly those of the double-walled, evacuated type. It is particularly applicable to such containers or jackets of elongated form employed as distillation columns or as insulating means therefor. It will be fully understood in the following description, illustrated by the accompanying drawings, in which:

Figure 1 is a longitudinal sectional view, partly broken away, of a device embodying the present invention;

Fig. 2 is a side elevation, partly broken away, of a reflector member employed in accordance with the present invention;

Fig. 3 is a longitudinal sectional view through a container of ordinary form, embodying the present invention; and

Fig. 4 is a vertical sectional view through a container embodying the invention in a modified form.

In the construction of double-walled, evacuated insulating containers of the "Dewar flask" type as hitherto practiced, the sealed space between the walls of the container has been evacuated to as high a degree as is practicable in order to reduce the transfer of heat by conduction and convection. It has likewise been customary to deposit a silver mirror on a wall of the container within the evacuated space in order to reduce the transfer of heat by radiation. While such a construction improves the insulating properties of the container, it is not satisfactory where high temperatures are employed, since undesirably large transfers of heat may take place and the mirror surfaces are rapidly destroyed, for example, at temperatures as high as 400 to 600°. By constructing such insulating containers or jackets in accordance with the present invention, markedly improved insulating qualities are secured and the container may be subjected to very high temperatures without impairment of its efficiency.

The invention is illustrated in Figs. 1 and 2 in a form of construction suitable for use as an insulating jacket for a precision analytical column, such as those described in my prior applications 475,584 and 475,585, filed August 15, 1930. In the form of construction shown in these figures, the numeral 5 designates a distillation column of considerable length, provided at its lower end with an enlargement or distillation bulb 6 for containing the material to be distilled, the latter having a downward projection 7 of reduced diameter to which heat may be applied, for example, by means of the heating element 8. The material to be distilled may be suitably supplied through the tube 9.

There is provided around the distillation column 5 an elongated, double-walled jacket 10 which is somewhat enlarged at its lower end, as at 11, to surround the distillation bulb 6. The double-walled column or jacket 10 may be also enlarged at its upper end, as shown at 12, to provide an enlarged space around the distillation tube, in which may be provided a container 13 of annular cross section. A cooling medium of any suitable character may be supplied to the latter by means of the inlet pipe 14, and a tube or pipe 15 is provided for the exit of the cooling medium. When a vaporizable liquid, such as liquid air, is employed as the cooling medium, a coarse packing 16 may be provided in the annular cooling chamber 13 for the better distribution of the vaporizing liquid. Suitable corks or washers 17 and 18 are provided at the lower and upper ends of the double-walled jacket or container 10 to support the distillation column 5 in position. If desired, a dry packing of any suitable type, such as mineral wool, asbestos or the like, may be provided around the lower end of the distillation bulb 6 and in the space surrounding the distillation bulb 5 within the enlargement 12 of the double-walled jacket 10.

The insulating container or jacket 10 is suitably formed of a low expansion, heat resistant glass, such as that commercially known as "Pyrex", or may in fact be made of quartz, for example, the inner wall 10^a, as set forth in my co-pending application Serial No. 543,969, filed June 12, 1931. Within the jacket or container, prior to evacuation and sealing, there is placed a separate reflector member 19, shown in side elevation in Fig. 2.

This reflector member is suitably constructed of light material having a highly polished, reflecting surface on its interior, and preferably also on its exterior. While this reflecting surface may be secured by directly polishing the metal of which the reflector member is formed, which may suitably be iron, steel, copper, zinc or the like, or preferably a nickeliferous metal, such as nickel-chromium alloy, Monel metal or nickel. Nickeliferous metals, particularly nichrome and Monel metal, are desirable by reason of their low heat conductivity, ranging from one-fifth to one-tenth that of silver, so that by their use the longitudinal conduction of heat by the reflector can be made as low or lower than that of a silver mirror. Nichrome is particularly desirable for use.

In order to facilitate the construction and insertion of the reflector member 19, it is preferably formed in two parts, an upper enlarged cylindrical portion 19^a which is inserted within the upper enlarged portion 12 of the insulating container 10, and a body portion 19^b which is disposed within the elongated cylindrical body portion of the insulating container 10 and the lower enlargement 11 thereof. The portion 19^a and 19^b of the reflector member may be held in relative position with respect to each other by the spring clips 20, and spring projections 21 may be provided at each end of the reflector member 19 to bear against the end walls of the insulating container 10 and supports the reflector member in proper position. By this construction proper support of the reflector member is secured with but few small spaced contact areas between the reflector and the container. After the container has been built up and its parts joined by the usual glass blowing methods or in any other suitable manner, it is evacuated and sealed in the usual manner.

In order that the action taking place within the distilling column 5 may be viewed from the exterior, slots or perforations 22 may be provided at intervals along the length of the reflector member 19.

By constructing the apparatus as hereinbefore described, the insulating efficiency of the jacket or container was found to be markedly improved over that secured, for example, with ordinary silvered surfaces on the interior walls of the evacuated jacket. This increase in insulating efficiency is particularly evident in the analytical distillation of petroleum oil fractions during which temperatures as high as 400° F. or higher, say to 600° F. were attained; and also in the case of gases, temperatures as low as −150° F. to −200° F. or lower. Furthermore, by using fused quartz as the material for the construction of the distillation column and of the inner wall or both walls of the insulating jacket, as described in my co-pending application Serial No. 543,969, filed June 12, 1931, the device may be used at even higher temperatures. At such temperatures, say above 400° F., the limited efficiency of a silvered-mirrored surface is not retained for any substantial period of time, as it is rapidly broken down or even volatilized at higher temperatures. With very low temperatures on the inner side of the container, for example, temperatures approximating those of liquid air or lower, the markedly improved efficiency of the insulating jacket or container is also apparent, being shown by a much lower loss of cooling medium through vaporization than with the conventional silvered container of similar dimensions.

It is readily apparent that the elongated inner wall of an insulating container such as that shown at 10 in the drawings may likewise serve as the outer wall of the distillation column itself, instead of merely as an insulating member surrounding the column.

In Figs. 3 and 4 embodiments of the invention have been shown in connection with vacuum bottles or Dewar flasks of the ordinary type. In Fig. 3, the numeral 25 indicates the double-walled, evacuated glass or quartz container, within which is provided a separate reflector member 26, preferably spaced from both walls of the container and suitably supported in position by the springs 27. The reflector member 26 is constructed of any suitable sheet metal, such as copper, iron, zinc or the like, with its surface polished to a mirror finish or provided with a suitable plating of nickel, chromium or the like, likewise preferably buffed to a mirror finish.

Fig. 4 shows an embodiment of the invention in connection with a vacuum bottle or Dewar flask 28 of ordinary type, having either glass or metal walls, in which there are provided two spaced reflector members 29 and 30, each of a construction similar to those hereinbefore described. By the use of a plurality of spaced reflector members of this kind, a further marked improvement in insulating efficiency of the container can be secured, each playing its part in the reflection of radiant heat waves and thus preventing transmission of heat through the container. It is readily apparent that where great temperature differences are encountered or where extremely high insulating efficiency is desired, the number of reflecting members employed may be even further increased.

I claim:

1. In distillation apparatus, an insulating jacket having an elongated body portion, exposed interiorly to the temperature of the material being distilled, said jacket having double walls forming a sealed space therebetween, said space being evacuated, and a separate metallic reflecting member within said evacuated space and spaced from the

walls thereof, said reflector member extending the length of said elongated body portion.

2. In distillation apparatus, an insulating jacket having an elongated body portion, exposed interiorly to the temperature of the material being distilled, said jacket having double walls forming a sealed space therebetween, said space being evacuated, and a separate metallic reflecting member within said evacuated space and spaced from the walls thereof, said reflector member extending the length of said elongated body portion, said reflector member having spaced spring contact members secured thereto, thereby retaining said reflector member in position and engaging and forming limited spaced contact areas with said jacket.

3. In distillation apparatus, an insulating jacket having an elongated body portion, exposed interiorly to the temperature of the material being distilled, said jacket having double walls forming a sealed space therebetween, said space being evacuated, a separate metallic reflecting member within said evacuated space and spaced from the walls thereof, said reflector member extending the length of said elongated body portion, and being provided with perforations along the length thereof permitting a view of the interior of the insulating jacket.

4. Distillation apparatus comprising an elongated distilling tube, means for applying a heating medium at the lower end thereof, and means for applying a cooling medium at the upper end thereof, an insulating jacket surrounding said distillation column, said insulating jacket having double walls forming a sealed space therebetween, said space being evacuated, and a separate metallic reflecting member within said sealed space and extending longitudinally thereof.

5. Distillation apparatus comprising an elongated distilling tube, means for applying a heating medium at the lower end thereof, and means for applying a cooling medium at the upper end thereof, an insulating jacket surrounding said distillation column, said insulating jacket having double walls forming a sealed space therebetween, said space being evacuated, and a plurality of separate metallic reflecting members within said sealed space and extending longitudinally thereof.

6. In distillation apparatus, an insulating jacket having an elongated body portion exposed interiorly to the temperature of the material being distilled, said jacket having double walls forming a sealed space therebetween and being provided at one end with an enlarged portion, the space between said walls being evacuated, and a separate metallic reflecting member within said evacuated space and spaced from the walls thereof, said reflector member having an enlarged portion positioned within the enlarged portion of the container and a separate portion extending into the smaller diameter portion of the container, yielding means for retaining the two portions of the reflector member in engagement with each other, and spaced, resilient contact members secured to each portion of the reflector member and engaging the interior walls of said container.

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