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SHIPPING CONTAINER

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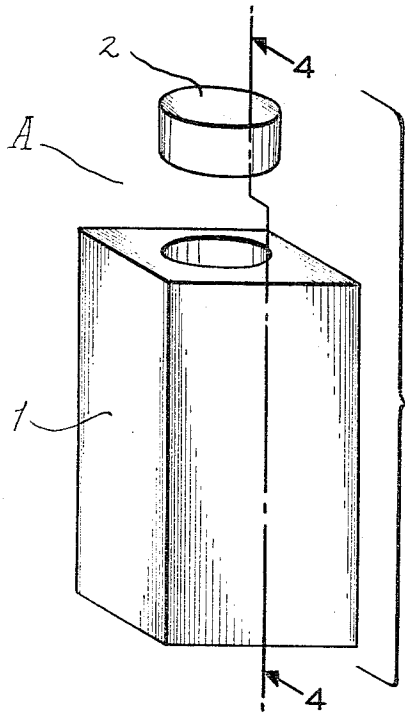


FIG. 1

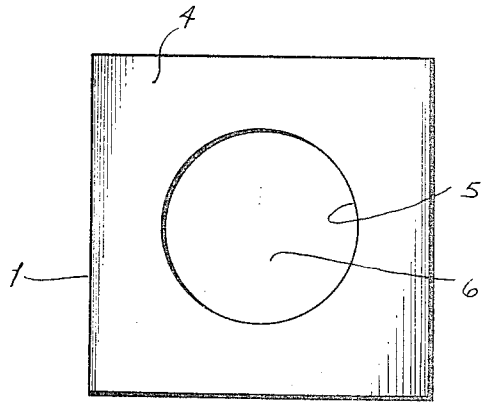


FIG. 2

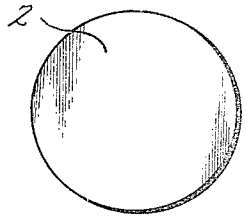


FIG. 3

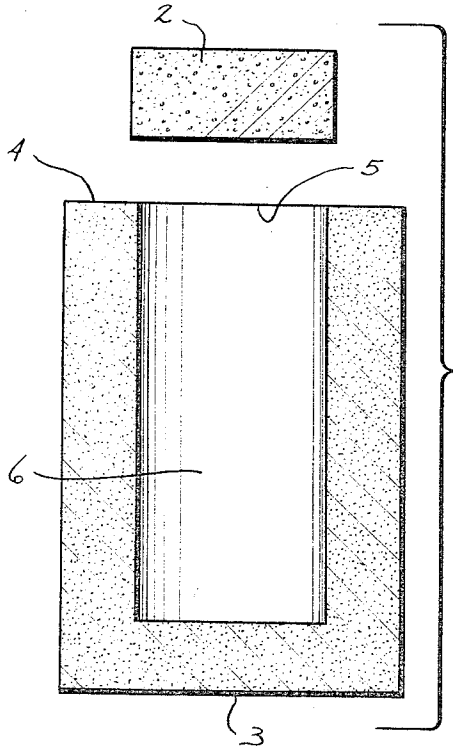


FIG. 4

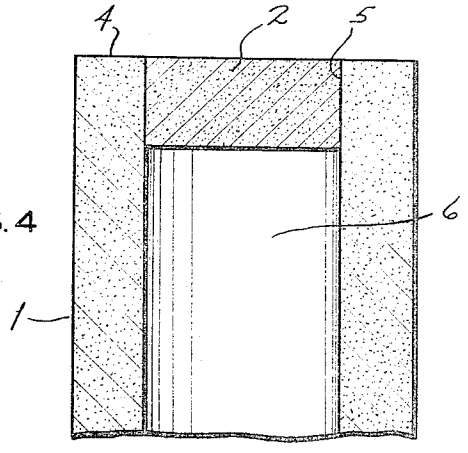


FIG. 5

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SHIPPING CONTAINER

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Continuation of application Ser. No. 458,834, May 17, 1965. This application Jan. 3, 1966, Ser. No. 525,792
2 Claims. (Cl. 62—372)

This invention relates, in general, to receptacles, and, more particularly, to an insulated shipping container.

This application is a continuation of our copending application, Ser. No. 458,834, filed May 17, 1965, now abandoned, for shipping container, which application was permitted to become abandoned in view of its being superseded by this present application.

It is an object of the present invention to provide a shipping container which is uniquely designed for temperature-maintenance of the contents during transit.

It is another object of the present invention to provide a container formed of materials designed for effective temperature-maintenance of the container contents but which permits of requisite ventilation to prevent development of undesired potentially explosive, or implosive, internal pressures.

It is an additional object of the present invention to provide a container of the type stated incorporating a closure member adapted for sealing engagement within the container body, which substantially reduces heat transfer, and is resistant to accidental dislodgment.

It is a further object of the present invention to provide a shipping container comprising a body having a markedly low heat-conductivity factor; which is of minimal weight; which is inexpensive in shipment; and which is of exceeding rigidity so as to fully protect the container contents against damage through careless handling and the like in the course of shipment.

It is a still further object of the present invention to provide a container of the type stated which may be most economically manufactured; which is durable in usage; and which reliably allows for temperature-maintenance of the contents in relatively substantial quantities through the use of a minimum of temperature controlling expedients.

Other objects and details of the invention will be apparent from the following description, when read in connection with the accompanying drawings wherein:

FIGURE 1 is a perspective, exploded view of a shipping container constructed in accordance with, and embodying, the present invention.

FIGURE 2 is a top plan view of the container body.

FIGURE 3 is a top plan view of the closure.

FIGURE 4 is a vertical transverse section taken on the line 4—4 of FIGURE 1.

FIGURE 5 is a fragmentary transverse sectional view taken substantially on the line 4—4 of FIGURE 1, but illustrating the closure in operative position.

Referring now by reference characters to the drawings which illustrate the preferred embodiment of the present invention, A designates a shipping container comprising a body 1 and a closure 2. Body 1 may be of any suitable size and shape, but for purposes of illustration is shown as being of elongate character, quadrilateral in cross section, and integrally formed from a suitable resin. At one end, as at 3, body 1 is closed, while at its opposite, or normally upper end 4, the same is provided with an opening 5 continuous with a chamber-forming cavity 6. Cavity 6 may be of any selected cross section but is, preferably, of circular cross section as shown in the drawing and extends from the opening 5 through a major portion of the length of body 1, so that body 1 forms an unbroken, integral casing about

said cavity 6 for protection of the contents therein.

The material of construction of body 1 is desirably a rigid polyurethane foam of relatively light weight, while possessing excellent insulation properties. The said material is of marked hardness and is resistant to damage such as might normally result from the customary careless handling in shipping, whereby the same provides safety for the most delicate of contents. Body 1, as formed from the aforesaid material, has a heat-conductivity factor (K factor) in the order of .11 to .20 B.t.u./hr./sq. ft./deg. F./inch at 75° F. and is thereby endowed with the critical property of conducing to temperature-maintenance within cavity 6 for relatively extended periods of time.

Closure 2 is, understandably, complementary in configuration to cavity 6 for sealing relationship therein. For purposes of illustration closure 2 is shown herein as being of cylindrical character and having a diameter greater than the diameter of cavity 6. Closure 2 is formed from a flexible polyurethane foam having a resiliency to allow of compressibility so that the same will serve in the manner of a sealing plug within the upper end of cavity 6 when in operative, container-closing position. Since the diameter of closure 2 is greater than that of cavity 6, the said closure will necessarily be compressed when in operative position and will, accordingly, exert a uniform, radially directed pressure against the inner face of cavity 6, thereby developing a relatively tight joint so that accidental displacement of closure 2 with inadvertent opening of container A is inhibited. Thus, closure 2, through its resiliency and flexibility, is in physical contrast to the rigid, inflexible character of body 1. Said closure 2 is porous allowing of breathing or ventilation for flow therethrough of gaseous or aeriform matter, effectively conducing to preventing the development of explosively, or implosively, potential pressures within body 1. Despite the porous nature of closure 2, the same has a low heat-conductivity factor (K factor), although higher than that of body 1, being in the order of .22 to .35 B.t.u./hr./sq. ft./deg. F./inch at 75° F. By the unique construction of closure 2, the same integrally serves as a safety valve so that no untoward accidents will be inadvertently caused by the use of gas-producing agents, such as Dry Ice and the like, for temperature-maintenance within body 1.

In usage, the present invention is particularly adapted for the transmittal of materials which, to preserve their efficacy, must be maintained within an environment of predetermined temperature. For example, container A has been used with noteworthy success for the shipping of vaccines wherein a limited quantity of Dry Ice in block form is provided within the base of cavity 6 and the vaccine-containing packages are disposed thereon. In experience it has been found that with five pounds of Dry Ice, 100 ml. of vaccine can be maintained within container A at a temperature of about 20° F. below zero for a period of four days. In various container constructions heretofore, considerable quantities of Dry Ice have been necessary to maintain temperature control with but a fraction of the volume above stated and for only a very short time. It is to be recognized that the unusual construction of closure 2 permits escape of carbon dioxide, as produced by Dry Ice, so that no explosive pressures are created within cavity 6. Thus, the present container is most suitably adapted for more efficient handling of materials of this character by allowing for greater quantities of the same to be shipped inexpensively as well as permitting of maintenance of the desired properties for extended periods of time.

Obviously, container A is equally suitable for utilization with material to be maintained at relatively elevated temperatures. The present invention may be easily handled by any shipping personnel without discomfort or in-

jury through contact with containers A, despite the relatively low or high temperature within the cavity 6. In view of the foregoing, it is apparent that shipping container A represents an advance in the art in constituting a container of light weight, which is damage-resistant, while permitting of temperature-maintenance for lengthy intervals without danger of the development of hazardous internal pressures.

It should be understood that changes and modifications in the formation, construction, arrangement, and combination of the several parts of the shipping container may be made and substituted for these herein shown and described without departing from the nature and principle of our invention.

Having thus described our invention, what we claim and desire to secure by Letters Patent is:

1. A shipping container for the transmittal of vaccines packed in Dry Ice under predetermined temperature maintenance, comprising:

(1) an elongated body,
  (a) being quadrilateral in cross section,
  (b) formed of a rigid, inflexible polyurethane foam,
  (c) having a heat-conductivity factor (K-factor) in the range of .11 to .20,

(2) said body being integrally provided with a cavity for receiving vaccines packed in Dry Ice,
  (a) being of circular cross section,
  (b) opening at one end of said body and being closed at its other end,

(3) a closure for said cavity
  (a) being of cylindrical form,
  (b) having a diameter greater than that of said cavity
  (c) being formed of resilient, flexible, and porous polyurethane foam for sealing engagement within the open end of said cavity for forming a tight joint with the walls thereof while permitting the escape of gases emitted by said Dry Ice within the container thereby preventing development within the container of potentially hazardous pressures, and
  (d) having a heat conductivity factor (K factor) in the range of .22 to .35.

2. A shipping container for the transmittal of vaccines packed in Dry Ice under predetermined temperature maintenance, comprising:

(1) an elongated body,
  (a) being quadrilateral in cross section,
  (b) formed of a rigid, inflexible polyurethane foam,
  (c) having a heat-conductivity factor (K-factor) in the range of .11 to .20,

(2) said body being integrally provided with a cavity for receiving vaccines packed in Dry Ice,
  (a) being of predetermined cross section,
  (b) opening at one end of said body and being closed at its other end,

(3) a closure for said cavity
  (a) being of form complementary to the said cavity,
  (b) having a cross section greater than that of said cavity
  (c) being formed of resilient, flexible, and porous polyurethane foam for sealing engagement within the open end of said cavity for forming a tight joint with the walls thereof while permitting the escape of gases emitted by said Dry Ice within the container thereby preventing development within the container of potentially hazardous pressures, and
  (d) having a heat conductivity factor (K factor) in the range of .22 to .35.

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