Nov. 26, 1935. P. D. MALLAY ET AL 2,022,251

FIREPROOF CONTAINER

Filed June 1, 1932

Fig. 1.

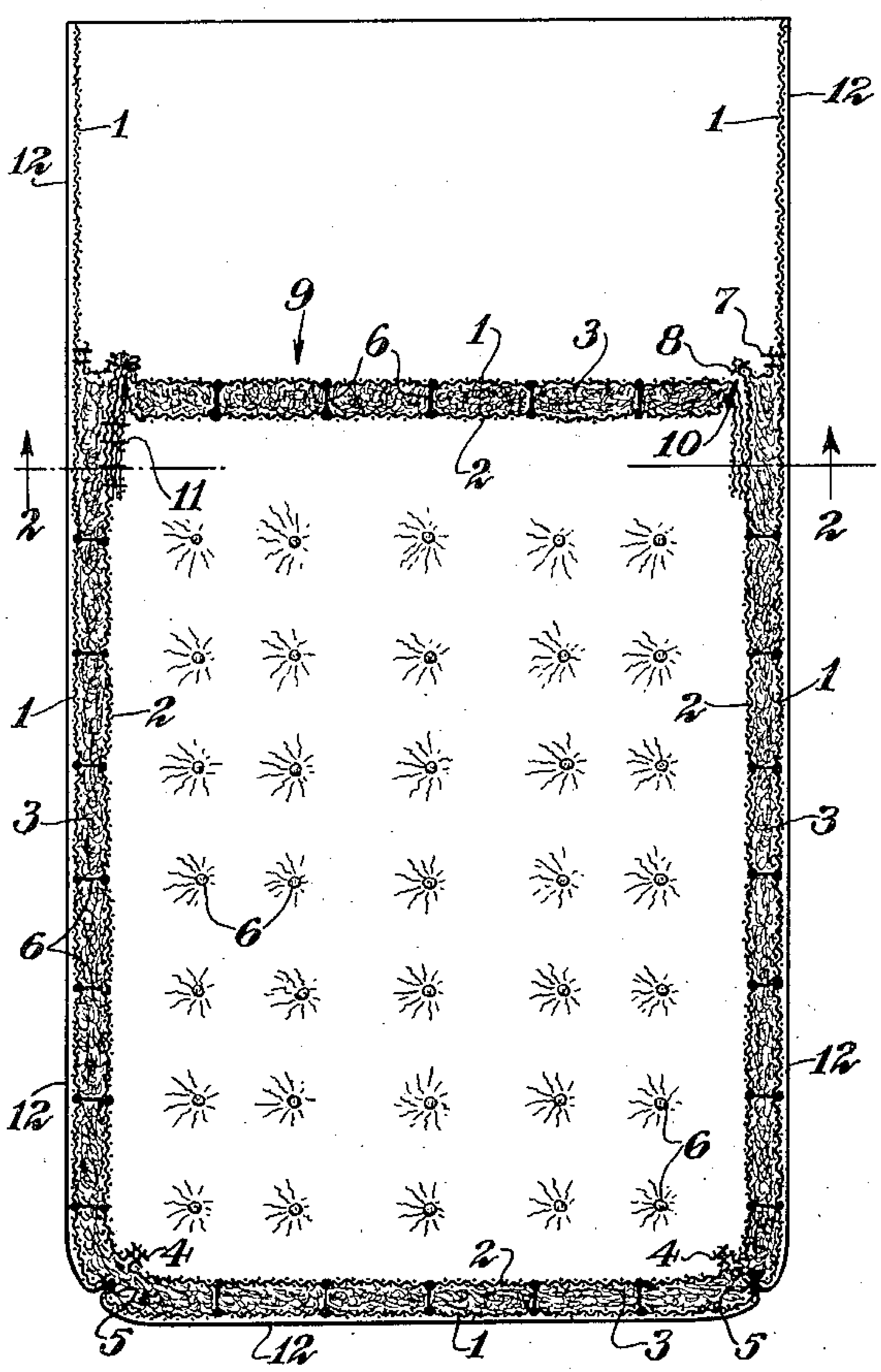


Fig. 5.

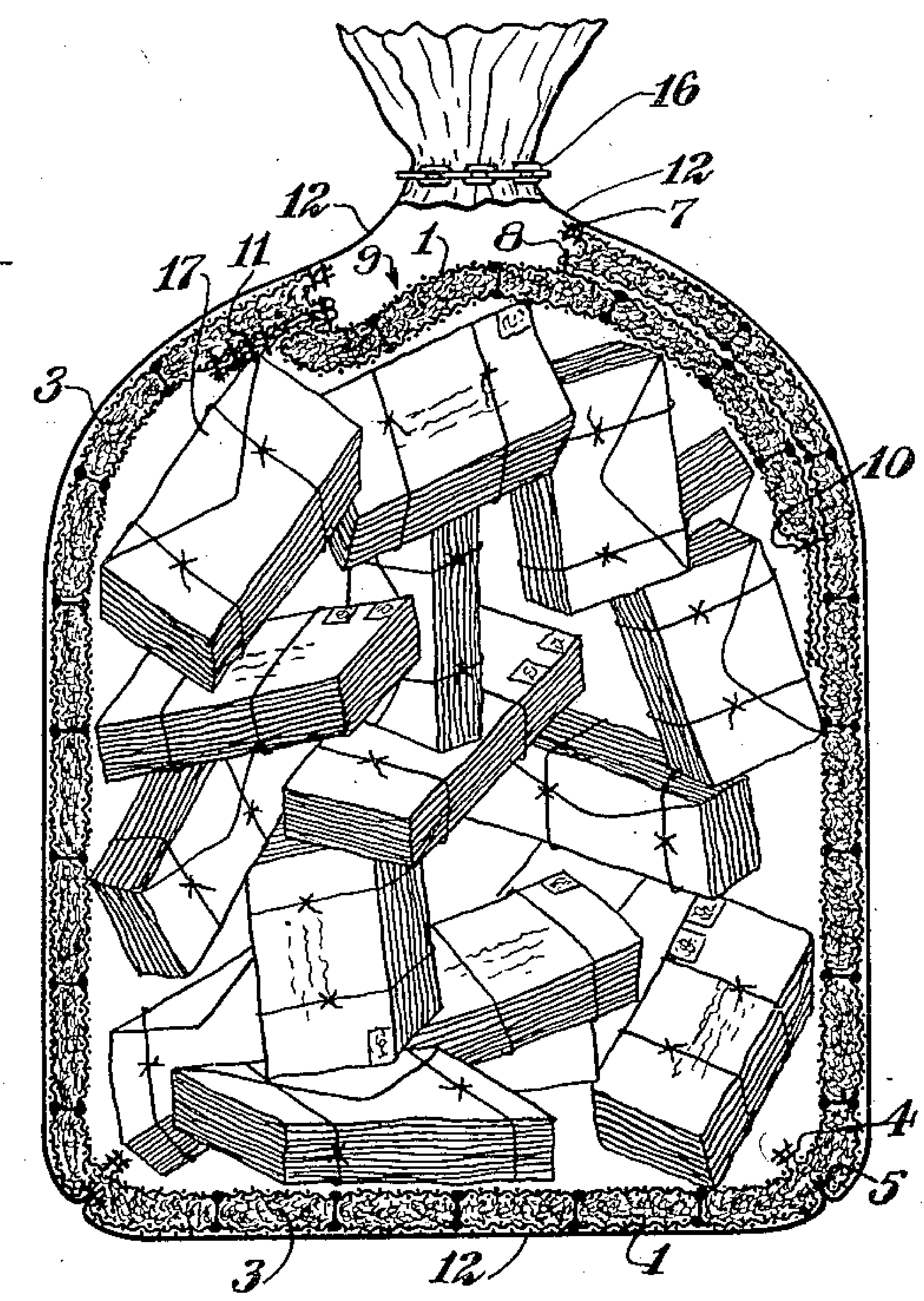


Fig. 2.

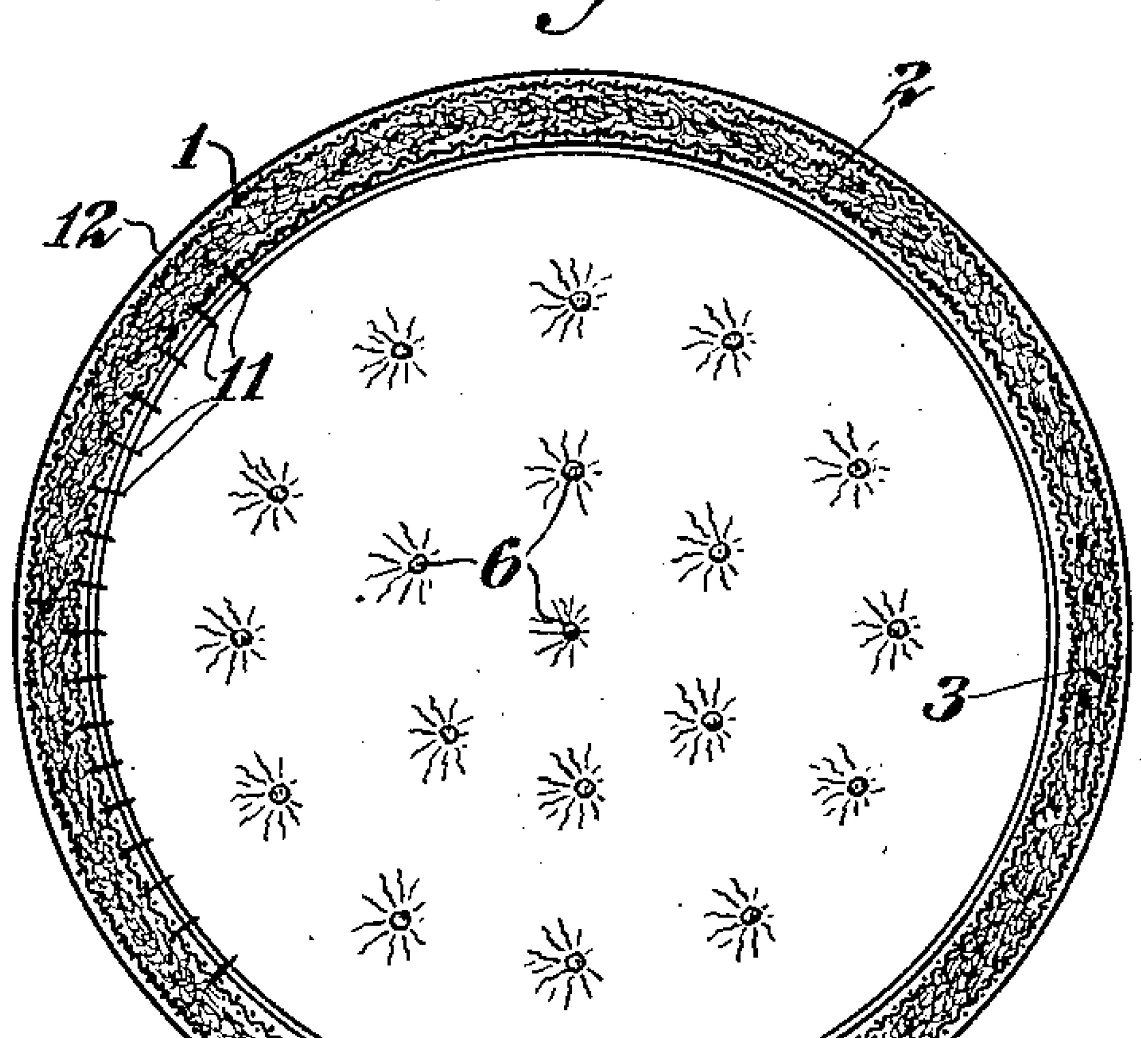


Fig. 3.

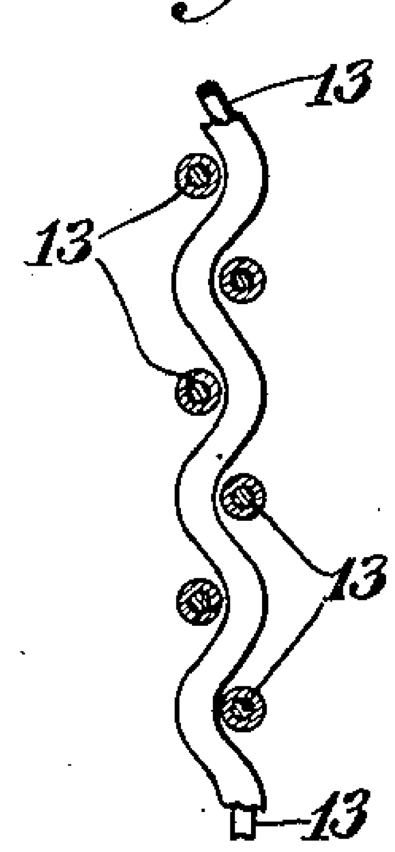
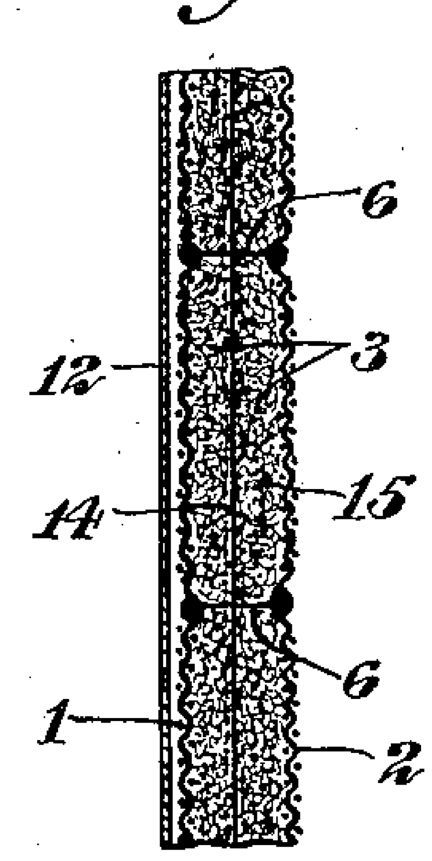


Fig. 4.



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2,022,251

FIREPROOF CONTAINER

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Application June 1, 1932, Serial No. 614,670

3 Claims. (Cl. 150—13)

This invention relates to a fire-proof and heat-proof container, and particularly to one useful as an airplane mail or express bag.

The invention comprises a non-rigid container that is relatively light in weight and that has walls that are fire- and heat-proof. In a preferred embodiment of the invention, the container is provided with an impervious exterior.

There is considerable need of a container for valuable particles of mail and the like that will protect them from injury in the case of wreck of a carrying airplane and attendant spreading and burning of the fuel supply of the airplane. A satisfactory container for this purpose should be light in weight, non-rigid, that is, unbreakable by shock and yieldable, incombustible, and of substantial heat insulating properties. The heat insulating properties required are herein designated by the term "heat-proof", which is used to define thermal insulating properties sufficient to prevent charring, carbonizing, or ignition of combustible matter, such as paper, enclosed within the structure, when the structure is subjected to a gasoline fire such as may follow the wrecking of a mail plane. It will be understood that the structure does not prevent entirely the transfer of heat from a highly heated exterior to the interior of the container provided with the heat-proof structure.

It will be evident from the requirements stated that a container consisting of combustible material will be unsatisfactory for the purpose outlined. It is evident also that fabric such as asbestos cloth of usual thickness, even though incombustible, will not have sufficient heat insulating properties to protect paper and the like enclosed within such fabric.

A preferred embodiment of the invention is illustrated in the drawing.

Fig. 1 shows a sectional elevation of a container suitable for use as an airplane mail or express bag.

Fig. 2 shows a horizontal section on section line 2—2 of Fig. 1, in the direction of the arrows.

Fig. 3 shows an enlarged cross section of a fabric suitable for use in the wall of a container constructed in accordance with the invention.

Fig. 4 shows an enlarged section of a wall of a modified form of container.

Fig. 5 is a sectional elevation of the container shown in Fig. 1 when the container is in closed position, with papers or the like enclosed.

In the several figures like reference characters denote like parts.

The reference characters 1 and 2 denote spaced non-rigid fire-resistant members, such as woven fabric. Asbestos cloth woven from asbestos yarn provided with inner reenforcing wire of brass or the like is the fabric preferred. These members are spaced sufficiently far apart to permit the disposal of a thermal insulating material between them. Thus, the two spaced members may be approximately ¾'' apart and the space between them may be filled or packed with non-rigid, fire-resistant, thermal insulating material 3, suitably a fibrous material such as asbestos fibers, mineral wool, or the like.

The upright portions of the said spaced members may form each the side wall of a sack or container as illustrated, one sack being smaller than the other, whereby there results a double wall with a substantial thickness of insulating material confined therein. The bottom of the sack may be closed by sewing an inner member to the inner upright member, as at position 4, and by sewing a member spaced therefrom to the upright member 1, at position 5. The space between these bottom closing members contains insulating material, suitably of the same structure and type and thickness as used in the side walls.

The insulating material, particularly if it is fibrous or inclined to settle or otherwise become unevenly distributed in the space between the two sacks, formed respectively by the members 1 and 2, should be maintained in position by any convenient means. Thus, fibrous asbestos may be maintained in position by tufting or quilting, as indicated at 6. The tufting or quilting may consist of spaced, reenforced asbestos threads, small wires, or the like, inserted through the members 1 and 2 and the fibrous material. The said quilting threads may be inserted on 3'' centers and tied in such manner as to decrease the wall thickness at the tufting points by not more than ¼'', for example, when the overall thickness of the wall, including the fabric members 1 and 2, is approximately 1'' at the maximum.

At the top of the insulated structure described, the edge or space between the member 1 and the upper edge of the inner member 2, is closed by a strip, suitably of the same composition as the said members 1 and 2. This strip may be held by sewing or otherwise to the outer member, at position 7, and to the inner member, at position 8.

Also, the top of the insulated structure is provided with insulating closing means 9, suitably of the same general construction as the walls and bottom of the container and of approximately equal fire-proofness and heat-proofness therewith.

This closing member or lid may comprise a tufted or quilted article having spaced members 1 and 2 and inwardly disposed fibrous insulating material 3, tufted at positions 6. The members 1 and 2 in the lid suitably are secured to each other as by sewing at position 10 beyond the outer edge of the fibrous insulating material. The closing means is supported near the mouth of the insulated container, as, for example, by stitching 11. The stitching 11 may extend approximately one quarter of the total distance around the mouth of the container, as illustrated in Fig. 2, whereby the closing member is maintained more or less in the closing position, unless displaced deliberately therefrom.

For a bag that may be exposed to a liquid such as water, gasoline, or other motor fuel, it is desirable that the exterior of the bag should be impervious or, at least, not quickly permeable to such liquid. Thus, there may be provided an exterior that will resist, for a time, penetration by gasoline, for example, that may be spilled on the bag at the time of the crashing of an airplane. For this purpose there may be provided a non-rigid, non-porous, outer bag 12, enclosing the insulating structure heretofore described, and consisting suitably of a fabric such as canvas coated with a rubber compound or other suitable material. If impermeability to hydrocarbon motor fuels for a substantial period of time is desired, the coating may consist of a composition that is insoluble in such fuels. Thus, the composition may comprise protein, preferably glue or casein, a softening agent such as glycerin or a vegetable oil, and a hardening or setting agent, of which aqueous potassium dichromate or formaldehyde compositions are examples. When a mixture of the kind described is made in the form of a paste containing sufficient water to give a suitable consistency, coated onto canvas, and allowed to dry, there results a hardened protein composition that provides the insoluble coating desired.

The reenforcing wire 13, such as fine wire of brass or other metal, that may be present in the yarn of which the asbestos cloth is fabricated, is shown in the enlarged cross sectional view of a reenforced asbestos fabric in Fig. 3. Besides providing increased strength and reenforcement, the wire serves other useful functions in the present invention. It is fire-resistant approximately up to the melting point. Further, it has a high specific thermal conductance and, as such, serves as a heat distributing member. Thus, if the container were subjected to a high temperature in a localized area, the heat distributing member or wire would tend to conduct heat throughout the wall in such manner as to distribute the heat in the wall, and thus decrease the danger of localized overheating.

Another form of heat distributing member that may be used is illustrated in Fig. 4. This figure shows an enlarged section of the wall in which there is incorporated an additional heat distributing member 14 consisting of a metal gauze, such as one of copper wire or other material of high specific thermal conductance. Expressed in engineering units, the specific thermal conductance is the amount of heat in British thermal units transferred per hour per square foot of area of section measured at right angles to the direction of heat flow when the temperature gradient is 1° F. per linear inch in the direction of the heat flow. To prevent oxidation or melting of the wire at very high temperatures, the metal gauze is suitably placed between the members 1 and 2, say near the center of the layer of heat insulating material 5.

Fig. 4 shows also another modification of the invention that is not now preferred, namely, the incorporation of a cooling material 15 into the wall of the container. The cooling material may be associated with the fabric of the members 1 and 2 and/or with the insulating material 5 and adapted to absorb a substantial quantity of heat without increasing appreciably in temperature when subjected to a high temperature. Thus, the cooling material may be a chemical containing water of hydration (sometimes called water of crystallization), that, when subjected to a high temperature, absorbs heat as the water of hydration is expelled in the form of steam. Such a chemical that may be used is magnesium ammonium phosphate of the formula

$$MgNH_4PO_4.6H_2O.$$

Other hydrated chemicals, such as hydrated calcium sulfate (gypsum) or potash alum in crystal form, may be used. It is preferred that the chemical selected for this purpose should neither absorb moisture, with the production of a solution, nor lose its water of hydration at ordinary temperatures. Further, a high proportion of water of hydration in the compound is desirable in increasing the amount of heat that may be absorbed as the water is expelled at an elevated temperature. Insolubility of the chemical in water is desirable when the structure containing the chemical is to be exposed to water.

A method of closing a container of the class described and the position that may be taken by the various parts thereof during closing is illustrated in Fig. 5. The tops of the bags formed by member 1 and the enclosing, impervious, exterior bag 12, extend, as illustrated, a substantial distance above the top of the insulated structure containing the fibrous insulating material. The said tops are brought together above the insulated structure and closed by a conventional means, including, for example, a chain 16. Also, during closing, the lid or closing means 9 of the insulating structure, may be forced down more or less into contact with the contents 17 and the top portion of the insulated upright wall may be drawn towards the center. It will be seen that there is little chance for the contents to get outside the insulated portion of the container and that the contents are protected on all sides, by a heat insulating layer, from heat that may be applied to the exterior of the bag.

The insulating efficiency of the wall of the container may be selected to fit the requirements for which the container is designed. For the purpose of protecting combustible, carbonizable material from a fire that may follow the crashing of an airplane, it is recommended that the wall of the container (this includes not only the upright wall, but also the bottom and closing means 9) should have a thermal resistance at least as large as that of a layer of asbestos fibers ½" thick, when the asbestos fibers are dry-packed, at low pressure, into the space between enclosing members. Thus, there may be used a wall of average thickness of ½ to 1 inch, say ¾ inch, and of thermal conductance approximately equal to that of a layer of loosely packed asbestos fibers of the same thickness.

The containers may be made in various sizes.

A size that has been used satisfactorily for air mail has an outside diameter of 14″ and an inside diameter of 12″, an overall height of 20″ and a space available for mail that is approximately 12″ x 17″. When the average thickness of the quilted wall is 3/4″ throughout and is made with reenforced asbestos cloth in the members 1 and 2 and asbestos fibers as the thermal insulating material, such a bag will weigh not substantially more than 25 pounds.

The details that have been given are for the purpose of illustration and not restriction, and many variations therefrom may be made without departing from the scope of the invention.

What we claim is:

1. A non-rigid article adapted for use as a heat-proof container for mail, said container comprising a wall and closing means each including spaced members of fire-resistant woven fabric and thermal insulating, fibrous material disposed between the said fabric members and a non-rigid, non-porous casing constituting the outer member of the said article.

2. An article adapted for use as a heat-proof container for mail, said container comprising an integral wall extending completely around the container and including spaced members of asbestos cloth, asbestos fibers disposed between the said spaced members, and a heat distributing member of high specific thermal conductance and of area approximately coextensive with the wall.

3. A non-rigid article adapted for use as a heat-proof container for mail, express packages and the like comprising a wall and closing means each including spaced heat-resistant, non-rigid, fabricated members and thermal insulating material disposed between the said members and a non-rigid, non-porous casing constituting the outer member of the said article.

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