March 17, 1970 W. J. GARTNER 3,501,215

SUPPORT DEVICE FOR INSULATED STORAGE CONTAINER

Filed March 6, 1968 2 Sheets-Sheet 1

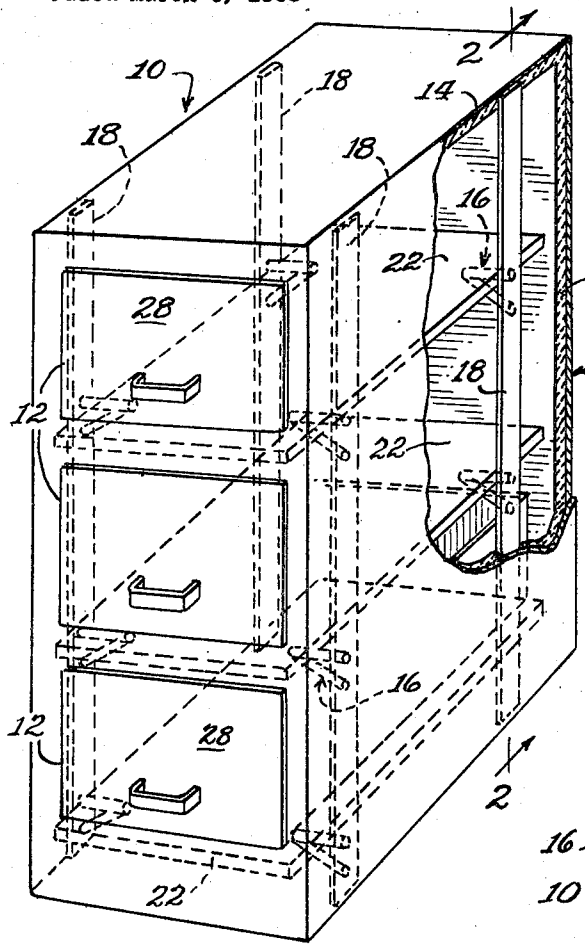



Fig. 1.

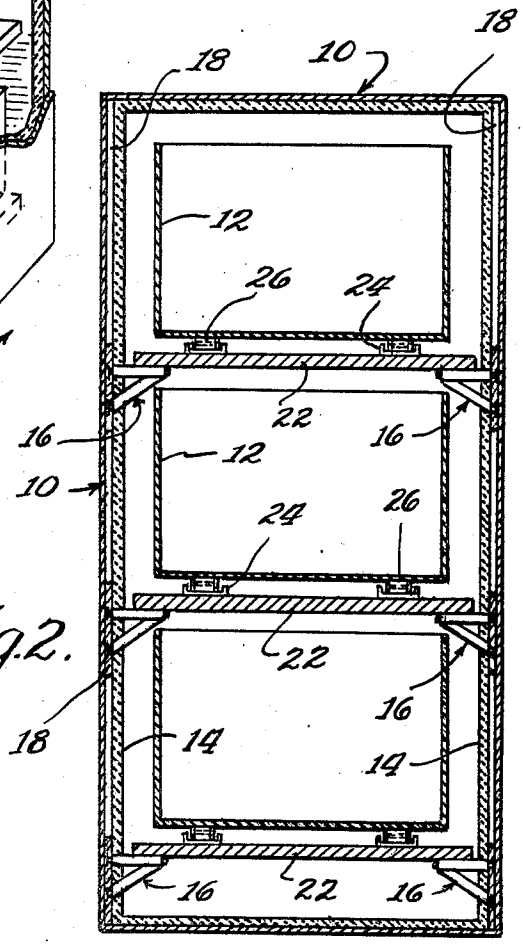



Fig. 2.

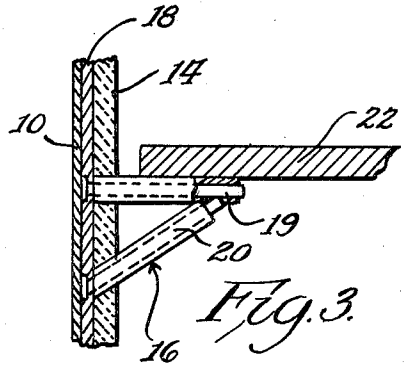



Fig. 3.

Inventor
William J. Gartner
By Dressler, Goldsmith,
Clement & Gordon
Attys.

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SUPPORT DEVICE FOR INSULATED STORAGE CONTAINER

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Fig. 4

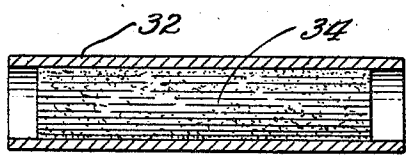



Fig. 4A.

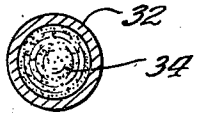



Fig. 5.

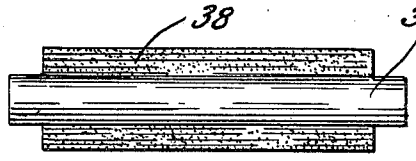



Fig. 5A.

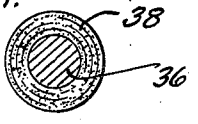



Fig. 6.

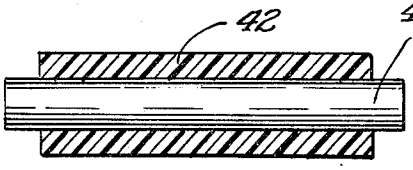
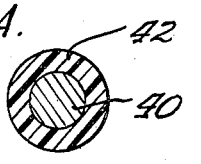



Fig. 6A.



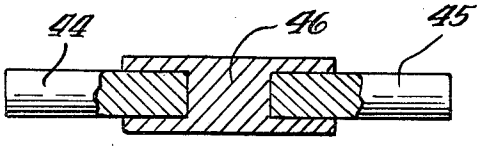




Fig. 7.

Fig. 8.

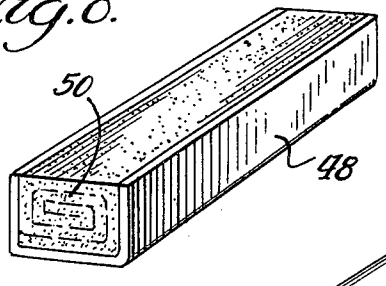
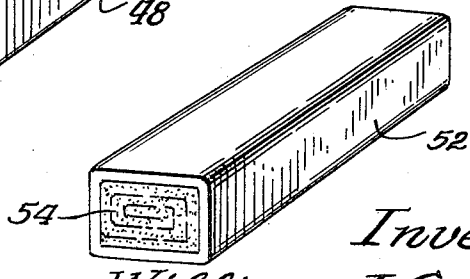



Fig. 9.




Inventor
William J. Gartner
By Dressler, Goldsmith
Clement & Gordon
Attys

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# SUPPORT DEVICE FOR INSULATED STORAGE CONTAINER

William J. Gartner, Schaumberg, Ill., assignor to De Soto, Inc., a corporation of Delaware

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Int. Cl. A47b 55/00, 63/00
U.S. Cl. 312—214 21 Claims

## ABSTRACT OF THE DISCLOSURE

A container assembly having an outer frame enclosing a major portion of the assembly, at least one inner container, and heat protection means between the outer frame and the inner container. The inner container is held within the outer frame by support members which are attached at one end to the outer frame and which carry the inner container in a spaced relation to the frame. Each support member has heat-retarding material for providing resistance to the conduction of heat along the support member from its end attached to the frame to the inner container.

## BACKGROUND OF THE INVENTION

This invention relates to an improvement in lightweight container assemblies which are capable of protecting their contents from the effects of intense, long-lasting heat applied to the exterior of the container. These containers are generally used to protect documents from fires. The invention is particularly useful in lightweight fire resistant file cabinets.

While many heat-resistant containers are insulated with cement to provide a long-lasting insulation against extremely high temperatures generated by fire, recently developed heat-resistant containers utilize lightweight insulation. These lightweight containers are obviously more desirable than the heavy containers which use concrete for insulation since the lightweight containers are more portable and can be built in larger sizes without becoming too heavy for practical use. Lightweight, heat-resistant containers generally have an outer frame and at least one inner container with insulation of low compressive strength disposed between the outer container and the inner frame.

In lightweight, heat-resistant container systems it is usually necessary to utilize supports to affix the inner container to the outer frame since the insulating material, which generally comprises such substances as fibrous glass or ceramic, is usually too weak to carry the inner container, particularly when the container is heavily weighted by its contents. Thus, for example, Underwriters Laboratories usually test fire resistant file cabinets loaded with 60 pounds of contents per drawer, so that a four drawer cabinet will require support for 240 pounds of contents in addition to the weight of the drawers, themselves. Manifestly, an insulation material of low compressive strength cannot support such weight, and additional support is necessary.

One problem that arises in the use of supports between the outer frame and the inner container is that they can serve as conduits for heat to bypass the insulation of the container assembly, thus permitting destruction of the contents of the container assembly in a short period of time when the exterior of the container assembly is exposed to extreme temperatures.

The container assembly of this invention overcomes this difficulty, and provides a means for utilizing the advantages of lightweight container insulation, while avoiding the disadvantage previously encountered when the inner container of an insulated container assembly is supported by members directly attached to the outer frame.



## DESCRIPTION OF THE INVENTION

In accordance with this invention, a container assembly is provided having an outer frame enclosing a major portion of the assembly, at least one inner container, and heat protection means between the outer frame and the inner container. Support members are attached to the outer frame and carry the inner container in a position spaced from the frame. The support members have heat-retarding material which resists conduction of heat along each support member from its end attached to the frame to the inner container. The container assembly of this invention also has closure means to substantially seal the inner container within the frame in an air-excluding manner, thus providing an insulated container assembly capable of protecting its contents from high exterior temperatures.

The container assembly of this invention can be of any design, e.g., a top-opening or side-opening box, or it can be a file cabinet having a series of drawers, each drawer comprising an inner container which is normally enclosed by the outer frame.

The support members used herein can be made from elongated, metallic members which extend between the frame and the inner container, each of which is in contact with a heat-absorbing member at a location between the frame and the inner container to impede the migration of heat from the outer frame along the metallic members to the inner container.

Alternatively, the support members can be made of a ceramic material to be resistant to the conduction of heat along their entire length.

In another embodiment, the support members can have elongated, metallic members held in a parallel, end-to-end relationship and spaced from each other by an insulating member which is made of ceramic or other material resistant to the conduction of heat. The insulating member is generally positioned in the support member at a point between the frame and the inner container.

One heat-absorbing member which can be used in conjunction with elongated metallic members to make the support members of this invention is a porous carrier such as cotton cloth or fibrous glass paper which contains liquid water interspersed throughout its pores, and which is enclosed in a water-impermeable casing. This structure serves as a heat sink to absorb heat from the elongated, metallic member, preventing the conduction of heat to the inner container.

Another type of heat-absorbing member is an ablative resin of the type used on the nose cones of space vehicles to shield the vehicle from the temperatures encountered during re-entry into the atmosphere. Such materials absorb heat by undergoing an endothermic decomposition reaction. Good results are achieved with organosilicon ablative materials, for example, those of the type disclosed in United States Patent No. 3,317,455.

## THE DRAWINGS

FIGURE 1 is a perspective view, partially broken away, of one embodiment of the container assembly of this invention, some internal structure being shown in dotted lines.

FIGURE 2 is a sectional view of the same container assembly, taken along line **2—2** of FIGURE 1.

FIGURE 3 is a detailed view of a support member this invention, as shown in FIGURE 2.

FIGURES 4 to 9 and FIGURES 4*a* to 6*a* all show various embodiments of elongated members which are used in support members of this invention.

## DESCRIPTION OF SPECIFIC EMBODIMENT

Referring to FIGURES 1 to 3, the insulated container assembly shown has an outer frame **10** and three inner

containers **12** which are in generally spaced relation with frame **10**. The inside walls of frame **10** are covered with at least one layer of insulation **14** which serves to protect the inner containers from external heat.

A plurality of support members **16** pass through insulation layer **14** to extend inwardly from vertical supporting strips **18**, which strips are attached to frame **10** to strengthen the frame and to prevent the frame from bending when a heavy load is placed upon support members **16**. As further described below, the support members carry inner containers **12**.

Each support member **16** has, in this embodiment, an elongated horizontal member **19** and an elongated bracing member **20**. The support members **16** carry platform members **22**, upon which tracks **24** are laid to permit the inner containers **12** to move along the tracks on rollers **26**. This permits the inner containers to assume the function of drawers to slide in and out of frame **10**.

The inner containers **12** each carry an insulated front wall **28**, each of which fits into an aperture in frame **10** to form an airtight insulating seal in cooperation with the frame when the containers are in a closed position inside of frame **10**.

In accordance with this invention, each of the support members, which are directly connected to the outer frame **10** by vertical strip **18**, has heat-retarding material for providing resistance to the conduction of heat along each support member from the portions attached to the frame to the inner containers. Thus, support members **16** can be directly attached to the frame without encountering a severe loss in the capability of the container assembly to protect the inner containers from external heat.

FIGURES 4 to 9 and FIGURES 4*a* to 6*a* illustrate several embodiments of elongated members **19** and **20** which can be used to form the support members of this invention. It should be noted that there are many conventional ways for supporting an inner container in spaced relation to an outer frame, and that the load of the inner container may be transmitted to the bottom, sides, or top of the outer frame, or to more than one of these locations, if desired. Specifically, for example, the support members can be vertical posts extending through the platform members **22**, horizontal bars extending from one side to the other of frame **10**, or any other conventional, mechanical configuration to space the one or more inner containers of a container assembly from the outer frame. The elongated members described herein and their equivalents can be used in any of a large variety of support members of this invention. Where a plurality of inner containers are used, they may be individually supported from the frame by support members; or one of the frames may be so supported while the other inner containers are carried by the one supported container.

FIGURE 4 is a longitudinal sectional view of an elongated member which can be used in a support member of this invention, while FIGURE 4*a* is a transverse, sectional view of the same elongated member. A hollow cylindrical metal support rod **32** is filled, at a region intermediate the two ends of rod **32**, with a heat-absorbing member **34**, consisting of about four sheets of fibrous glass paper which are soaked in an aqueous solution and sealed in a water-impermeable plastic casing or envelope. Typically, the casing can be made of polyethylene, poly(vinyl chloride-vinylidene chloride), sold under the trademark Saran, or laminated films containing a layer of each of the two above-named materials. The aqueous solution held by the fibrous glass paper consists primarily of water, but a humectant such as calcium chloride can be added in order to inhibit the loss of water by evaporation, and a gelling agent such as methylcellulose can be added to prevent the water from settling to the bottom of the casing.

The casing containing the fibrous glass paper and the aqueous solution is folded or rolled, and inserted into metal rod **32**. There it serves to absorb the heat which is transmitted along the metal rod **32** from its point of contact with the outer frame. The high specific heat of vapor permits heat-absorbing member **34** to absorb a substantial amount of heat from this source, thus greatly reducing the rate of thermal build-up in the inner containers when the exterior of the container assembly is subjected to high temperatures.

In an alternative modification of the embodiment of FIGURES 4 and 4*a*, the plastic casing or envelope may be omitted, and the soaked fibrous glass paper may be encased within metal rod **32**, itself, the rod being sealed at both ends to prevent loss of liquid.

FIGURES 5 and 5*a* show respectively longitudinal and transverse sectional views of another embodiment of an elongated member which can be used in support members of this invention. In this embodiment, a solid metal rod **36** is surrounded by a heat-absorbing member **38** at a region intermediate the two ends of the rod. Thus, as heat passes along rod **36** from one end thereof which is attached to an outer frame of a container assembly toward the other end which supports an inner container in the container assembly, the heat is absorbed by member **38**. Member **38** can be wet fibrous glass paper which is sealed in a water-impermeable, plastic envelope, as disclosed above. Member **38** can be wrapped around rod **36**.

FIGURES 6 and 6*a* show respectively a longitudinal section and a transverse section of another elongated member of this invention. A solid metal rod **40** serves as the structural member for supporting the inner container. Rod **40** is surrounded at a region intermediate its ends with an organosilicon ablative material **42** (e.g., Dow Corning 325, presently available from The Dow Corning Corporation, or Stauffer 06035, available from the Stauffer Chemical Company). This ablative coating absorbs heat as it chemically decomposes, inhibiting the flow of heat along rod **40**.

FIGURE 7 shows a plan view, partly in section, of another elongated member of this invention. Two metal rods **44** and **45** are held in an end-to-end relationship and spaced from each other by an insulating member **46** which is generally made of a heat-insulating ceramic material. Thus, heat which is absorbed at a remote end of one of rods **44** and **45** is transmitted only slowly across member **46**, inhibiting the flow of heat between rods **44** and **45**.

FIGURE 8 shows another elongated member of this invention. A U-shaped, metallic member **48**, which serves as a structural member, is filled with a heat-absorbing member **50** which can consist of the composite of wet fibrous glass paper and the water-impermeable envelope described above.

FIGURE 9 discloses an elongated member having a hollow, rectangular metallic bar **52** which serves as the structural support. Bar **52** is filled with heat-absorbing member **52**, similar to member **50** above.

The elongated members of FIGURES 4, 5, 6, 7 and 9 were tested for their capability to retard the flow of heat from end-to-end, as compared with a control member of similar configuration but lacking a heat-absorbing or heat-insulating member.

Each elongated member tested was six inches in length. In the case of the elongated members shown in FIGURES 4, 5, 6 and 9, the heat-absorbing material was also approximately six inches in length, while for the elongated member shown in FIGURE 7, the ceramic insert **46** separated rods **44** and **45** by about ⅜ inch.

In the test, each elongated member was clamped in a horizontal position, and one end of the member was directly exposed to a gas flame having a temperature of approximately 1900° F. The heating was continued until a thermocouple located at the opposite end of the elongated member indicated that the temperature at that location had reached 350° F. The time required for this temperature to be reached was then recorded.

The following is a description of the elongated members tested:

(a) One elongated member was an embodiment of FIGURE 4. A six-inch black steel pipe having an outer diameter of ½ inch and inner diameter of ⅜ inch was filled with a rolled heat-absorbing pack of four sheets of fibrous glass paper, sealed in a polyethylene envelope. Before sealing the glass paper sheets, they were dipped in a water solution containing 16 weight percent of calcium chloride and one weight percent of a gelling agent containing a vinylic polymer having sufficient carboxylic acid groups to render the polymer water-soluble (Carbopol, sold by The B. F. Goodrich Company). The glass paper was then sprayed with an aqueous solution of ammonia to gel the vinylic polymer, and was then sealed in the envelope. The elongated member used as a control for the above was an identical steel pipe without a heat-absorbing member.

(b) An elongated member similar to that shown in FIGURE 5 was tested, using a solid steel rod having an outer diameter of ½ inch and surrounded by a polyethylene-jacketed heat-absorbing pack similar to the pack disclosed in (a) above. The thickness o fthe pack about the steel rod was ¼ inch. An identical steel rod without a heat-absorbing member was used as the control.

(c) An elongated member similar to that shown in FIGURE 6 was tested, using a steel rod ½ inch in diameter and surrounded with a ⅛ inch coating of Dow Corning 325, an ablative material. An identical, uncoated steel rod was used as the control.

(d) The elongated member similar to that shown in FIGURE 7 was tested, using a pair of steel rods of about 2⅞ inches in length and ½ inch in diameter, separated by a ceramic insert which spaced them in an end-to-end relationship about ⅜ inch apart. The control member in this instance was a six-inch steel rod having an outer diameter of ½ inch.

(e) An elongated member similar to that disclosed in FIGURE 9 was made from a steel rod having a hollow square cross section which measured ¾ inch by ¾ inch. The walls of the rod were ⅛ inch thick, and the hollow interior was filled with the heat-absorbing pack used in paragraph (a) above. The control member was an identical hollow square rod without a heat absorbing member.

The time required in each case for the temperature at the end of each elongated member remote from the open flame to rise to a temperature of 350° F. was as follows:

| Paragraph | Elongated member with heat absorber or insulator (min.) | Control member (min.) |
|---|---|---|
| (a) | 28 | 13 |
| (b) | 31 | 11 |
| (c) | 46 | 11 |
| (d) | 34 | 11 |
| (e) | 46 | 15 |

From the foregoing, it will be observed that numerous variations and modifications may be effected without departing from the true spirit and scope of the novel concept of the invention.

I claim:

**1.** A container assembly which comprises: an outer frame enclosing a major portion of the assembly; at least one inner container; heat protection means comprising an insulating material of low compressive strength between said outer frame and said inner container, support members for said inner container, said support members being attached at one end to said frame and passing through said heat protection means to carry said inner container in a spaced relation with said frame, each said support member comprising a heat-retarding material for providing resistance to the conduction of heat along said support member from said one end attached to said frame to said inner container; and closure means to substantially seal said inner container within said frame in an air-excluding manner.

**2.** The container assembly of claim **1** having a plurality of inner containers, each of which comprises a sliding container member; a platform member to carry said container; each said platform member being carried by said support members; said frame defining at least one aperture to permit each said sliding container member to slide along its platform member to project through said aperture in the frame.

**3.** The container assembly of claim **1** in which each said support member comprises an elongated, metallic member in contact with a heat-absorbing member located between said frame and said inner container.

**4.** The container assembly of claim **3** in which said heat-absorbing member comprises a porous carrier containing liquid water interspersed throughout the pores of said carrier, said carrier being enclosed in a water-impermeable casing.

**5.** The container assembly of claim **3** is which said heat-absorbing member comprises an organosilicon ablative material.

**6.** The container assembly of claim **3** in which said elongated, metallic member has a cross section defining a hollow polygon.

**7.** The container assembly of claim **6** in which said elongated, metallic member is rectilinear in cross section.

**8.** The container assembly of claim **3** in which said elongated, metallic member is circular in cross section.

**9.** The container assembly of claim **3** in which said elongated, metallic member is a hollow tube sealed at both ends and said heat-absorbing member comprises a porous carrier containing liquid water interspersed throughout the pores of said carrier, filling the hollow within said tube.

**10.** The container assembly of claim **1** in which said support members are made of a ceramic material which is resistant to the conduction of heat.

**11.** The container assembly of claim **1** in which said support members comprise elongated, metallic members which are held in parallel, end-to-end relationship and spaced from each other by an insulating member between said metallic members, said insulating member being made of a ceramic material resistant to the conduction of heat.

**12.** The container assembly of claim **1** in which said outer frame comprises a bottom wall, a top wall and side walls and said support members transmit load from said inner container to at least one of said side walls.

**13.** The container assembly of claim **1** in which said outer frame comprises a bottom wall, a top wall and side walls and said support members transmit load from said inner container to said bottom wall.

**14.** A support member for carrying an inner container spaced within an outer frame of an insulated container assembly and for connecting to said outer frame, which member resists the conduction of heat, comprising: an elongated, metallic member; and a heat-absorbing member in contact with said elongated, metallic member at a location intermediate the ends thereof, said heat-absorbing member comprising a porous carrier containing liquid water interspersed throughout the pores of said carrier.

**15.** The support member of claim **14** in which said heat-absorbing member is enclosed in a water-impermeable casing.

**16.** The support member of claim **14** in which said elongated, metallic member has a cross section defining a hollow polygon.

**17.** The support member of claim **14** in which said elongated, metallic member is circular in cross section.

**18.** A support member for carrying an inner container spaced within an outer frame of an insulated container assembly and for connecting to said outer frame, which member resists the conduction of heat, comprising: an elongated, metallic member; and a heat-absorbing member in contact with said elongated, metallic member at a location intermediate the ends thereof, said heat-absorbing member comprising an organosilicon ablative material.

19. The support member of claim 18 in which said elongated, metallic member has a cross section defining a hollow polygon.

20. The support member of claim 18 in which said elongated, metallic member is circular in cross section.

21. A support member for carrying an inner container spaced within an outer frame of an insulated container assembly and for connecting to said outer frame, which member resists the conduction of heat, comprising: elongated, metallic members, said elongated, metallic members being held in parallel, end-to-end relationship, and spaced from each other by an insulating member made of a ceramic material resistant to the conduction of heat.



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CASMIR A. NUNBERG, Primary Examiner

U.S. Cl. X.R.

52—128; 109—80; 312—236