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(54) **FIRE-RESISTANT CONTAINER**

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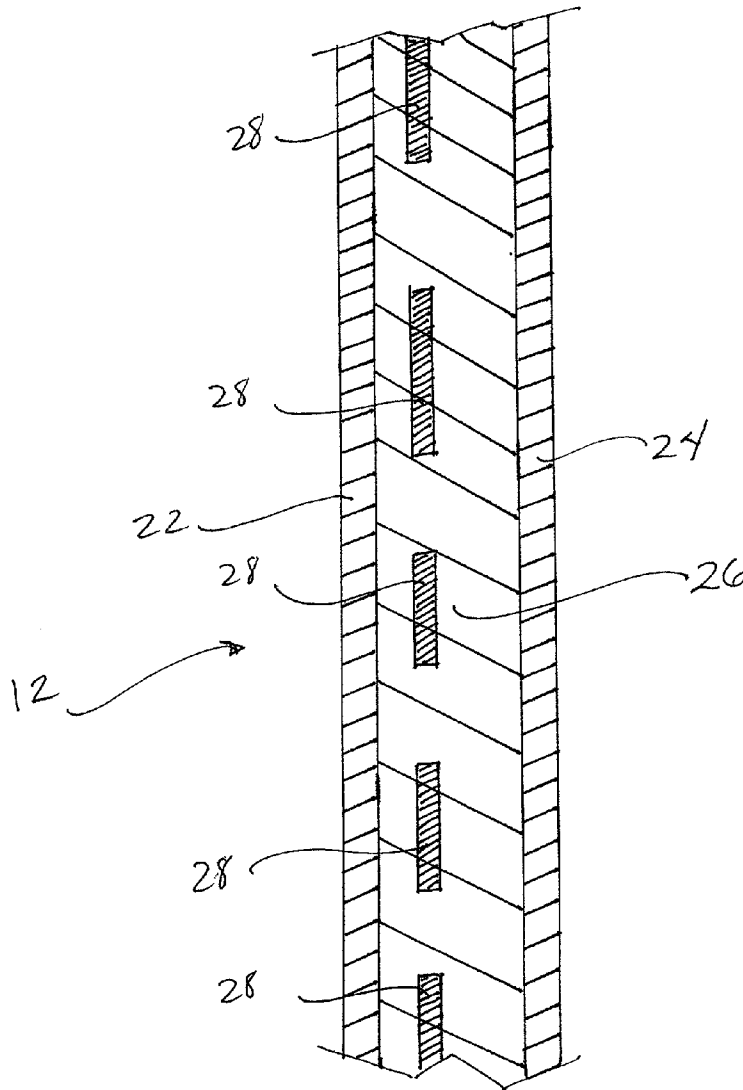
(57) **ABSTRACT**

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Related U.S. Application Data

(63) **Non-provisional of provisional application No. 60/245,562, filed on Nov. 6, 2000.**

A fire-resistant container has a fire-resistant exterior layer, and an intermediate layer of an intumescent or endothermic material. The container may be used to protect documents, photographs, computer disks, compact disks, jewelry or other objects from damage due to heat or fire.



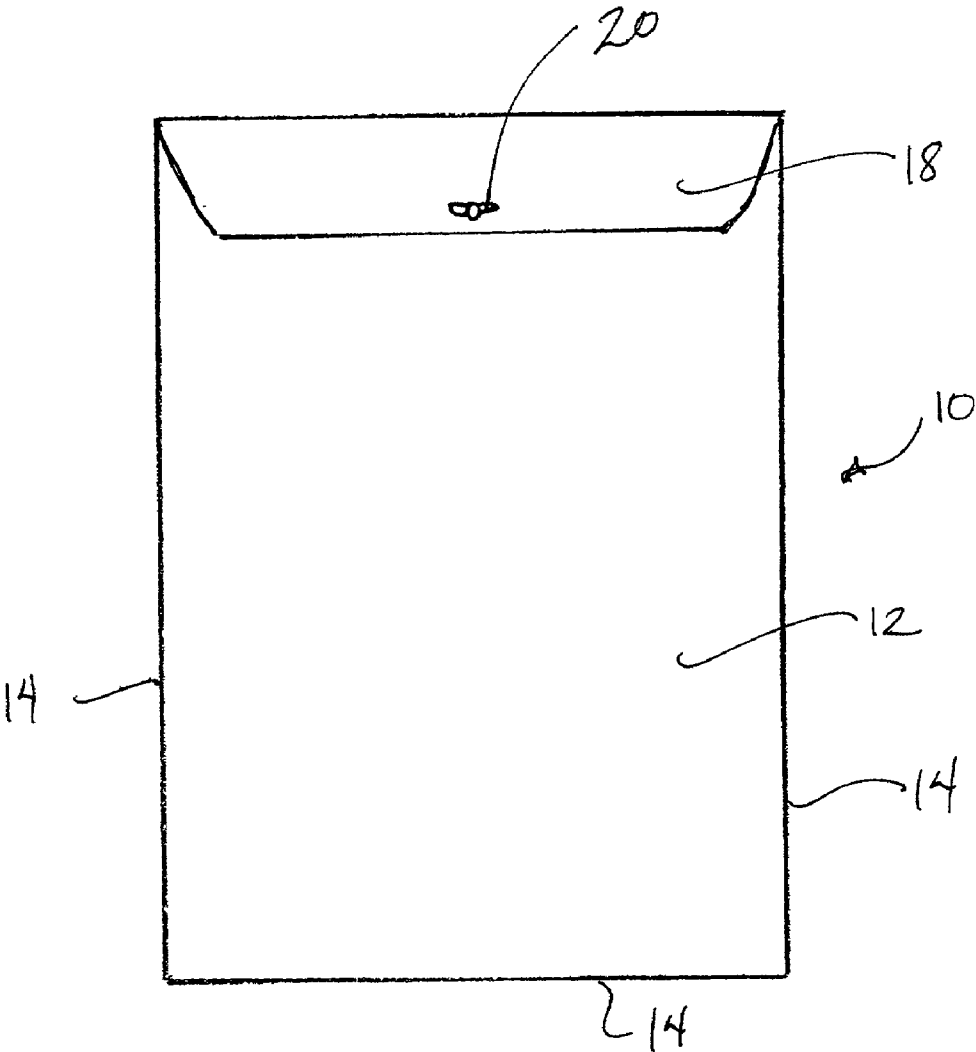


FIG. 1

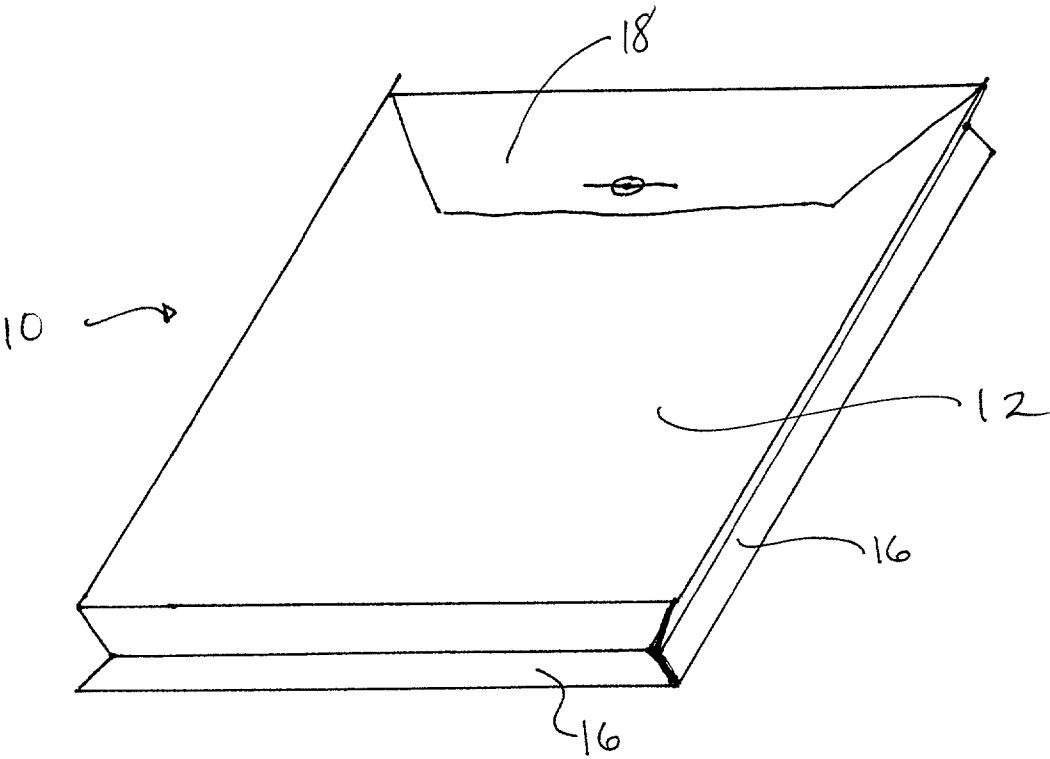


FIG. 2

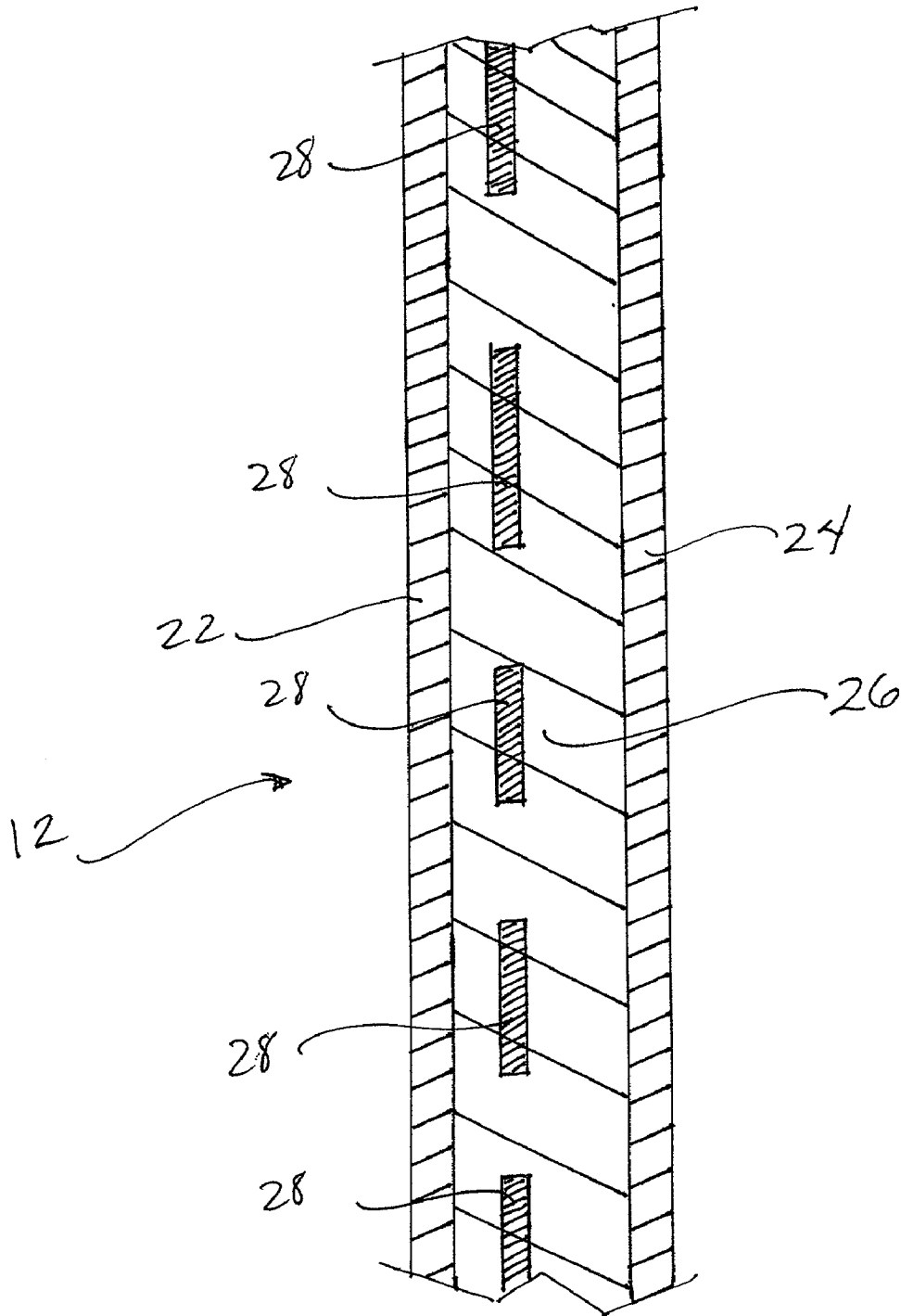


FIG. 3

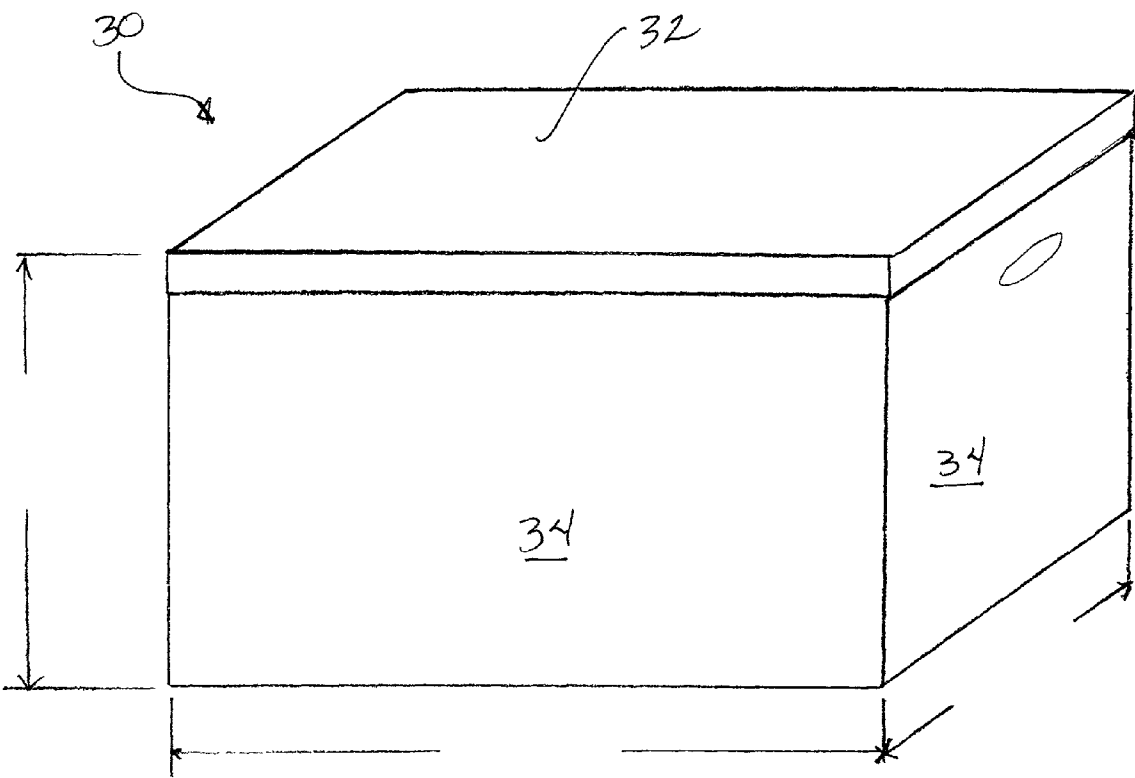


FIG. 4

FIRE-RESISTANT CONTAINER

[0001] This application claims the benefit of U.S. Provisional Patent Application Ser. No. 60/245,562, filed Nov. 6, 2000, the priority of which is hereby claimed.

BACKGROUND OF THE INVENTION

[0002] The present invention relates to a fire- and heat-resistant container, such as a file folder or box.

[0003] It is often desired to provide a fire-resistant container to protect important documents or other devices in a business or office. The conventional method for protecting important documents, photographs or other things from fire is to have such documents or things in a fireproof safe, or other such device. However, a fire safe does not meet the needs of many home or business owners. Such safes are heavy, often being made from metal or other heavy materials. Such devices are thus difficult to move in the event of an emergency that would require quick retrieval of the documents contained within the device. Fire safes are also expensive. This limits the amount of material which may be protected, since it may not be practical or cost-effective to store voluminous materials in a fire- or heat-resistant safe.

[0004] What is desired is a fireproof container for protecting documents or other devices that is lightweight, is relatively inexpensive, and that may be easily transported from one location to another.

BRIEF SUMMARY OF THE INVENTION

[0005] The present invention overcomes the aforesaid drawbacks of the prior art by providing a fire-resistant container in the form of a lightweight folder, box, jacket or other device which includes a layer of an intumescent or endothermic material.

[0006] In one aspect of the invention, a fire-resistant container comprises at least one panel having an exterior layer, an interior layer, and an intermediate layer. The exterior layer is a fire-resistant material. The intermediate layer comprises an intumescent or endothermic material.

[0007] In yet another aspect of the invention, a method is provided for protecting an object from fire. A container is formed from at least one fire-resistant panel, having an exterior layer, an interior layer and an intermediate layer. The exterior layer is a fire-resistant material. The intermediate layer comprises an endothermic or intumescent material. The object is placed inside the container so as to be protected from heat or fire.

[0008] The invention has several advantages. First, the invention is very lightweight, since the container may be constructed in part from aluminum foil, paper, cardboard, fiberglass or other similar material. The intumescent material, in response to the presence of heat, foams and thus protects the interior of the container from external sources of heat. Alternatively, the use of an endothermic material may cool the container and protect the internal contents from heat. The containers may be inexpensively prepared, and thus are suitable for use in many different home or office settings. The containers are also easily transportable, given their light weight and small size.

[0009] The foregoing and other features and advantages of the invention will be more readily understood upon consid-

eration of the following detailed description of the invention, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] FIG. 1 shows a top view of a fire-resistant container of the present invention.

[0011] FIG. 2 shows a perspective view of the fire-resistant container of FIG. 1.

[0012] FIG. 3 shows a cross-section of a portion of the front panel of the fire-resistant container of FIG. 1.

[0013] FIG. 4 shows another embodiment of the present invention, namely a fire-resistant container with a removable lid.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0014] Referring to the figures, wherein like numerals refer to like elements, FIG. 1 shows a container such as a fire folder 10. The fire folder 10 has a front panel 12, and a rear panel not visible in the drawings. The front and rear panels are connected along the outer margin 14 so as to form a container for receiving documents, photographs, compact disks, computer memory disks, jewelry, or other objects to be protected from fire or heat. The fire folder may optionally be pleated along its side 16, as illustrated in FIG. 2, so as to allow the folder to expand to receive documents or objects. Alternatively, the folder may be formed from a single panel which is sealed along its margins to form a container.

[0015] The folder 10 has an opening at the top for allowing objects to be placed inside. As shown in FIGS. 1 and 2, the fire folder 10 has a flap 18 to cover the opening. The flap 18 may be lifted so as to allow access to the interior of the container. The flap 18 may be folded over to close the opening, as shown in FIG. 1, to protect the contents housed within the folder 10. The flap 18 may be secured using any conventional device. For example, as illustrated in FIG. 1, a simple mechanical clasp 20 is used to secure the flap 18. Alternatively, the flap 20 may be adhered to the top of the fire folder. As yet another alternative, a zipper or other closure device may be provided in order to close the opening to the fire folder 10 without the use of a flap.

[0016] The key to the present invention is the construction of the panels and sides of the fire folder. Referring now more particularly to FIG. 3, FIG. 3 shows a cross-section of the front panel 12. The front panel 12 comprises several different layers: an exterior layer 22, an intermediate layer 26 and an interior layer 24. In general, one or more panels are arranged to form a container so that when the opening is closed, the three layers 22-26 surround the documents or objects in the container. The interior layer faces and surrounds the document or object to be protected. The exterior layer surrounds the entire outer surface. The intermediate layer contains a material that is either capable of insulating the contents from heat, or a material capable of absorbing heat.

[0017] The exterior layer 22 is formed from a fire-resistant material that is light-weight. An exemplary material suitable for use as the exterior layer 22 is a thin layer of a metallic foil, such as aluminum foil. As explained in more detail below, when the intermediate layer is an intumescent mate-

rial, the thickness of the panel will expand in the presence of heat. Thus, it is preferred that the exterior layer is flexible or bendable.

[0018] The space in between the external layer **22** and the interior layer **24** is filled with an intermediate layer **26** of either an intumescent or endothermic material. An intumescent material is capable of expanding substantially in the presence of elevated temperature. Examples of intumescent materials that can be used in the present invention are 3M CP-25 caulking material that can be obtained from 3M Fire Protection Products, St. Paul, Minn., or FX-100 coating material available from Flame Seal Products, Inc., Houston, Tex. The greater the expansion capacity of the intumescent material utilized in the invention, the greater the fire-resistant capability of the system. Intumescent materials suitable for use may have an expansion capability of at least 200%, preferably 500%, and even more preferably, 700% or more.

[0019] The reaction temperature of most intumescent materials is about 300° F. to 400° F. The exterior portion of the intumescent material directly facing the fire or heat source will expand when the temperature at the surface of the intumescent material reaches the reaction temperature. As the intumescent material expands, it insulates the remainder of the intumescent material from the source of heat. Additional amounts of intumescent material will not begin to expand until the reaction temperature has been reached internally. Accordingly, a moderate layer of intumescent material, for example, 35 mils thick, will not completely expand until the external temperature, applied to the exterior portion of the intumescent material, exceeds 1000° F. A thin layer of intumescent material 35 mils thick can expand to approximately 3½" in thickness when fully activated. In general, each 10 mils of intumescent material expands to approximately 1" thick when completely reacted. The amount of intumescent material used in the present invention will necessarily depend on the expansion properties of the intumescent material. Once expanded, the intumescent material insulates the interior of the fire folder **10** to protect the contents of the folder **10** from damage due to heat.

[0020] In one embodiment, the layer of intumescent material is approximately ⅜" thick. For typical intumescent materials, the ⅜" layer when fully reacted will expand to a thickness of about 4" to 6".

[0021] Alternatively, the intermediate layer **26** may comprise an endothermic material. An endothermic material is one that absorbs heat. For example, endothermic materials may be composed of compounds that activate in a fire situation by breaking down at the molecular level and releasing trapped water which then cools the protected item. An example of this is aluminum tri-hydrate which is a dry white powder that releases large amounts of water at about 1100° F. A well-known endothermic product is the INTERAM™ E-50 Series flexible wrap systems available from 3M Fire Protection Products of St. Paul, Minn.

[0022] The intermediate layer **26** may also optionally be provided with a piece of reinforcing material **28** that provides structural support and/or is capable of absorbing the intumescent material. The reinforcing material **28** may be screen-like or mesh-like in nature. For example, the material may be a piece of fabric scrim, a fiberglass screen, a metal screen or a nylon mesh.

[0023] The panel **12** also has an interior layer **24** which faces the objects to be protected. When the opening is

closed, interior layer(s) of the panel(s) used to form the container surrounds the document to be protected. The interior layer **24** may be formed from a variety of materials, such as paper, fabric, metallic foil or the like. In a preferred embodiment, the interior layer **24** is formed from a heat-resistant and/or water-resistant material. Preferably, the interior layer also protects the container contents from the material used to form the intermediate layer. Thus, the interior layer **24** is preferably impervious to the intumescent or endothermic material. A preferred material for the interior layer **24** is a thin layer of aluminum foil.

[0024] The combination of the aluminum foil for the exterior layer **22**, and intumescent material in the intermediate layer **26**, protects the documents, photographs or other objects contained in the folder **10** from external sources of heat. The aluminum foil reflects radiant heat, while the intumescent material provides a thick layer of insulation. The interior layer **24** protects the documents from the reacting intumescent material.

[0025] The fire folder **10** may be made according to any method that results in the construction described above. For example, an intermediate layer **26** may be formed first by pouring a liquid form of an intumescent material over a piece of plastic or fiberglass mesh, and allowing the intumescent material to dry to form a flexible layer. Aluminum foil sheets may then be adhered to either side of the intermediate layer. Alternatively, the intumescent material may be applied directly to a sheet of aluminum foil and allowed to dry. Another sheet of aluminum foil may then be adhered to the intumescent material. As yet another example, a fiberglass mesh may be placed over a sheet of aluminum foil. The intumescent material may be poured over the mesh so as to adhere to the mesh to the aluminum foil. An interior sheet of aluminum foil or other material may then be adhered to the intumescent material. As yet another example, a layer of fiberglass or plastic mesh may be adhered to a sheet of aluminum foil. A powdered or liquid intumescent material may then be poured into the spaces between the mesh. An interior layer may then be adhered to the plastic mesh.

[0026] Alternatively, the fire folder may be constructed as above, but substituting an endothermic material for the intumescent material.

[0027] The container formed from the above materials has several advantages. First, the containers are very light weight. An exemplary container, such as a fire folder, may weigh less than 1 pound. Thus, the containers are easily portable. In addition, the containers may be easily constructed in a variety of different sizes. For example, a medium sized fire folder may be sized to be about 9×12 inches, so as to receive 8½×11-inch sheets of paper. Larger sizes may be constructed so as to receive larger documents, while smaller sizes may be constructed to protect smaller objects such as computer floppy disks. Because the fire folders are light weight they may be stored in a typical office environment without the need for structural reinforcement, as would be required of a fireproof safe. Thus, the fireproof folders may be placed in standard office cabinets, on shelves, in bookcases or other convenient storage spaces.

[0028] FIG. 4 shows another embodiment of the present invention. FIG. 4 shows a container **30** constructed in the shape of a box. A removable lid **32** is provided in order to allow the container **30** to be opened to place documents or other objects inside the container **30**. The lid **32** may be placed on top of the box, and closed securely if desired. The

various walls **34** of the container are constructed like the panels of the fire folder illustrated in **FIG. 3**. However, with respect to the container **30**, the materials used to form the respective layers **22-26** are thicker or more rigid in order to provide structural support. Thus, the intermediate layer **26** may include a thicker reinforcing material of fiberglass or a plastic screen or mesh in order to provide structural support. Alternatively, the interior layer may be a reinforced layer of cardboard or other material in order to provide structural rigidity.

[0029] As yet another embodiment, a standard cardboard box may be provided. The cardboard box may then be covered with sheets having a construction like that shown in **FIG. 3**. The sheets may be adhered to the exterior of the cardboard box, thus providing a fire-resistant outer covering to the box.

[0030] In yet another embodiment, a heat and water resistant plastic bag may be provided to further protect the contents within the fire-resistant container. Such a bag may be placed inside of the fire-resistant container to hold the documents or other objects to be protected. For example, a standard oven cooking bag may be used. Examples of such bags are Reynolds® OVEN BAGS sold by Reynolds Metals Company of Richmond, Va. The use of such a heat and water resistant plastic bag inside of the fire-resistant container protects the documents and other objects from being water damaged. Such water damage may occur when efforts are undertaken to suppress a fire.

EXAMPLE

[0031] A fire-resistant container of the present invention was prepared as follows. An intermediate layer was formed by pouring a liquid intumescent material FX-100 from Flame Seal Products of Houston, Tex., over a polyester mesh and allowing the intumescent material to dry. The intumescent material was in the form of a layer about 10 mils thick. A sheet of aluminum foil was adhered to either side of the intumescent material. Two such fire-resistant sheets were adhered along the outer margin to create a container.

[0032] A paper document was placed inside of the so-formed container. The container was heated to a temperature of about 500° F. for a period of 20 minutes. The intumescent material expanded to a thickness of about 1 inch. The container was allowed to cool and opened. The paper document placed inside of the container was slightly browned, but still legible.

[0033] In contrast, a paper document placed within two sheets of aluminum foil and heated to a temperature of about 500° F. for 20 minutes was reduced to an unreadable black ash.

[0034] The terms and expressions which have been employed in the foregoing specification are used therein as terms of description and not of limitation, and there is no intention, in the use of such terms and expressions, of excluding equivalents of the features shown and described or portions thereof, it being recognized that the scope of the invention is defined and limited only by the claims which follow.

1. A fire-resistant container capable of receiving an object to be protected, comprising an exterior layer, an interior layer, and an intermediate layer, said exterior layer being a fire-resistant material, and said intermediate layer compris-

ing at least one of an intumescent material and an endothermic material, said container having a closeable opening, and said exterior layer, said intermediate layer and said interior layer surrounding said object when said opening is closed.

2. The fire-resistant container of claim 1 wherein said intermediate layer comprises said intumescent material, and said intumescent material is capable of expanding by at least 2-fold in thickness when heated to at least 400° F.

3. The fire-resistant container of claim 2 wherein said intumescent material is capable of expanding by at least 5-fold in thickness when heated to 400° F.

4. The fire-resistant container of claim 1 wherein said exterior layer is aluminum foil.

5. The fire-resistant container of claim 1 wherein said interior layer is aluminum foil.

6. The fire-resistant container of claim 1 wherein said intermediate layer further comprises a reinforcing material.

7. The fire-resistant container of claim 6 wherein said reinforcing material is mesh-like.

8. The fire-resistant container of claim 1 wherein said container is in the form of a folder.

9. The fire-resistant container of claim 1 wherein said container is in the form of a box.

10. The fire-resistant container of claim 1 further comprising a heat and water resistant bag within said container.

11. A method for protecting an object from fire, comprising:

(a) forming a container having a closeable opening from at least one fire-resistant panel having an exterior layer, an interior layer, and an intermediate layer, said exterior layer being a fire-resistant material, and said intermediate layer comprising an intumescent or endothermic material;

(b) placing said object to be protected inside said container; and

(c) closing said opening.

12. The method of claim 11 further comprising the step of placing said object in a heat and water resistant bag, and placing said heat and water resistant bag in said container.

13. The method of claim 11 wherein said intermediate layer comprises said intumescent material, and said intumescent material is capable of expanding by at least 2-fold in thickness when heated to 400° F.

14. The method of claim 13 wherein said intumescent material is capable of expanding by at least 5-fold in thickness when heated to 400° F.

15. The method of claim 11 wherein said exterior layer is aluminum foil.

16. The method of claim 11 wherein said interior layer is aluminum foil.

17. The method of claim 11 wherein said intermediate layer further comprises a reinforcing material.

18. The method of claim 11 wherein said reinforcing material is mesh-like.

19. The method of claim 11 wherein said container is in the form of a folder.

20. The method of claim 11 wherein said container is in the form of a box.

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