109-82 CROSS REFERENCE SEARCH ROO

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FIRE RESISTANT ENVELOPE

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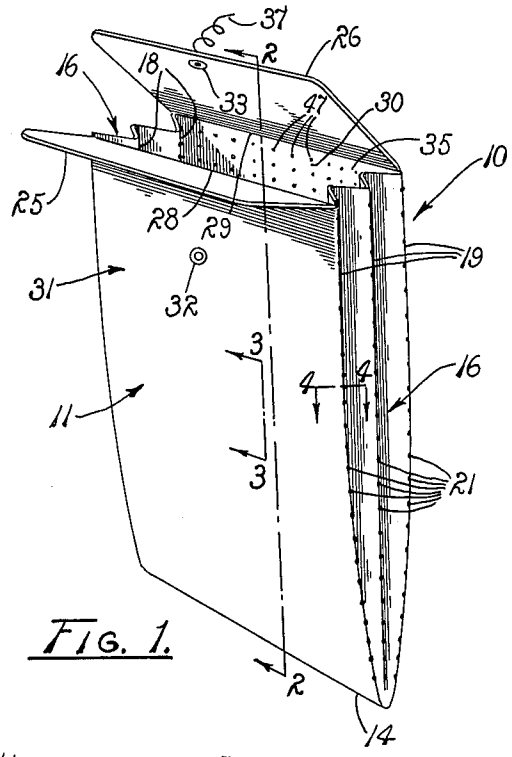


FIG. 1.

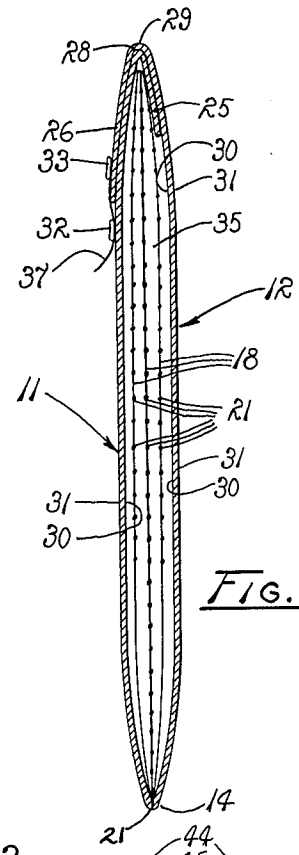


FIG. 2.

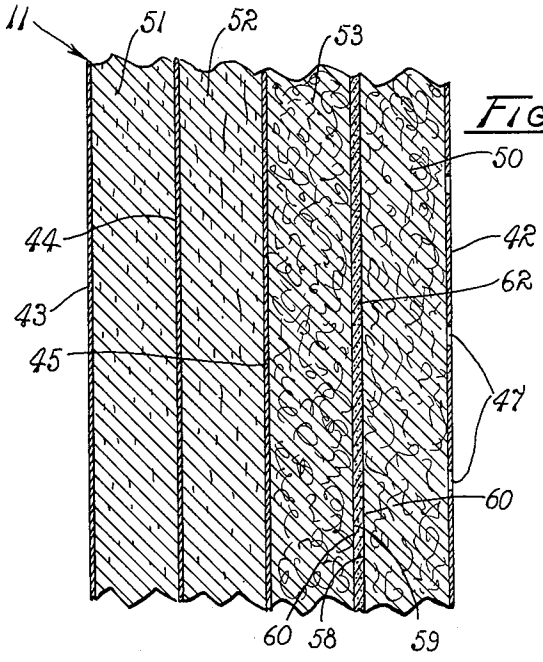


FIG. 3.

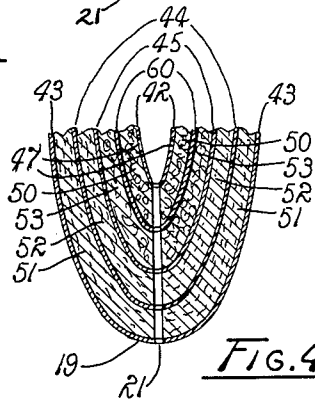


FIG. 4.

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FIRE RESISTANT ENVELOPE

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The present invention relates to a heat resistant envelope and, more particularly, to such an envelope for preserving documents, papers, and like materials against combustion and other heat damage incident to exposure to fire or other high temperature environments.

Fire-proof and fire resistant safes and files are well known for the safe keeping of documents but their expense and bulk preclude their use in many circumstances. Conventional envelopes are frequently used for the storage of documents but are as combustible as their normal contents. It is well known that mail in conventional envelopes is frequently destroyed when exposed to fire in railway mail cars, airplane accidents and the like. When exposed to office or residence fires, such envelopes offer no fire resistance whatsoever. Since the contents of such envelopes are frequently of appreciable value, it is highly desirable that they offer their contents as a strong measure of protection as their requirements of economy, compactness and light weight permit.

Accordingly, it is an object of the present invention to provide an improved envelope which makes provision for the protection of its contents.

Another object is to provide an envelope which protects its contents from excessive external heat.

Another object is to provide an envelope having heat reflective walls.

Another object is to provide an envelope having walls with insulating characteristics.

Another object is to increase the humidity of the air in the compartment of an envelope incident to predetermined temperature rise thereby to moisten and cool the compartment and its contents.

Another object is to provide a heat resistant envelope wherein water vapor is released from the walls of the envelope for passage into its compartment and for subsequent escape from the envelope thereby to provide a moving stream of moisture-laden air.

Another object is to provide an envelope of the nature described which is compact, attractive is external appearance, easy to use, simple to make, and durable in construction.

These, together with other objects, will become more fully apparent upon reference to the following description and accompanying drawing.

In the drawing:

FIG. 1 is a perspective view of an envelope embodying the principles of the present invention and shown with its flaps partially open.

FIG. 2 is a somewhat enlarged, transverse section taken on a plane at a position indicated by line 2—2 in FIG. 1 but with the flaps closed.

FIG. 3 is a fragmentary section taken on a plane at a position represented by line 3—3 in FIG. 1 and enlarged for illustrative convenience.

FIG. 4 is a somewhat enlarged, fragmentary section taken on line 4—4 in FIG. 1.

Referring more particularly to the drawing, an envelope incorporating the principles of the present invention is generally indicated by the numeral 10 in FIGS. 1 and 2. The envelope has opposed front and rear walls 11 and 12 interconnected along a lower fold 14. Pleated end walls 16 interconnect the front and rear walls and provide inner and outer creases 18 and 19 each of which has a plurality of longitudinally spaced orifices 21 extended therethrough, as best illustrated in FIG. 4. The orifices 21 are also extended through the fold 14.

Front and rear flaps 25 and 26 are foldably connected to upper edges 28 and 29 of the front and rear walls 11 and 12, respectively. It is to be noted that the walls have inside and outside surfaces 30 and 31 to which more specific reference will subsequently be made. Fire-proof fastening buttons 32 and 33, of metal or the like, are individually connected to the rear flap 26 and to the front wall. The flaps are foldable between a closed, interfitted position, as illustrated in FIG. 2, with the inner flap against the rear wall 12 and with the front flap overlying the front wall, and an open position, as shown in FIG. 1, permitting access to a compartment 35 defined by the front, rear, and end walls 11, 12, and 16 of the envelope. A flexible, fire-proof, tie member 37, as a piece of wire, is connected to one of the buttons and is wrapped around the other button in the closed position of the flaps thereby to hold the same in said closed position. While the buttons and tie member have been illustrated and described as the means for holding the flaps closed, it is to be understood that the flaps could be secured together or otherwise held in closed position in any other suitable manner without departing from the scope of the present invention.

Of particular significance to the subject invention is the construction of the front, rear, and end walls 11, 12 and 16 and the flaps 25 and 26. The front wall is typical of this construction, is fragmentarily illustrated in cross-section in FIG. 3. The wall provides inner, outer, first intermediate, and second intermediate, heat reflective laminae 42, 43, 44, and 45, respectively, in spaced relation to each other. The inner lamina is in immediate juxtaposition to the compartment 35 and is perforated to provide a plurality of apertures 47. Preferably aluminum foil is utilized for each lamina. Other heat reflecting, non-combustible, light weight, flexible or semi-flexible material may be utilized.

Inner, outer, first intermediate, and second intermediate insulative layers 50, 51, 52, and 53 are interposed the heat reflective laminae 42, 43, 44 and 45, as illustrated in FIG. 3. Preferably, the outer and first intermediate insulative layers 51 and 52 are of asbestos while matted spun glass fibre is employed for the second intermediate and inner insulatve layers 53 and 50. It is to be noted that at least the inner insulative layer is porous.

The inner and second intermediate insulative layers 50 and 53 have opposed surfaces 58 and 59 to which is applied a fireproof adhesive, generally indicated by the numeral 60. A vapor releasing layer 62 is positioned between said opposed surfaces and is secured thereto by means of the adhesive. This vapor releasing layer is a material which contains water in molecular form and is therefore a hydrated material. This material is characterised by its ability to release water at predetermined temperatures and, further, by its ability to absorb heat simultaneously with the release of moisture. Examples

of materials having these characteristics and suitable for use as the vapor releasing layer include hydrated aluminum sulfate and hydrated copper sulfate, the latter being frequently known as bluestone. While calcium sulfate or gypsum also has these characteristics, it is regarded as somewhat bulky for use in the subject invention but may be so employed where bulk is not particularly objectionable. The following tables indicate the de-hydration temperatures of the hydrated metallic sulfates noted above together with the number of molecules lost at indicated temperatures.

HYDRATED METALLIC SULFATE	Dehydration of Temperature in Degrees, F.	Number of Water Molecules Released at Specified Temperature Per Molecule of Hydrate
$AlSO_4 \cdot 16H_2O$	123	3
$AlSO_4 \cdot 13H_2O$	179	3
$AlSO_4 \cdot 10H_2O$	206	3
$AlSO_4 \cdot 7H_2O$	228	3
$AlSO_4 \cdot 4H_2O$	356	3
$AlSO_4 \cdot H_2O$	600	1
$CuSO_4 \cdot 5H_2O$	81	2
$CuSO_4 \cdot 3H_2O$	199	2
$CuSO_4 \cdot H_2O$	311	1
$CaSO_4 \cdot 2H_2O$	100	1
$CaSO_4 \cdot H_2O$	176	1

The front and rear walls **11** and **12**, the end walls **16**, and the flaps **25** and **26** all have the construction described above in connection with the front wall and as illustrated in FIG. 3. Also, it is to be observed that the orifices **21** in the creases **18** and **19** pass entirely through the laminae **42**, **43**, **44** and **45**, the insulative layers **50**, **51**, **52** and **53**, and the vapor releasing layer **62** so as to establish communication, albeit quite restricted, between the compartment **35** and the atmosphere.

When desired, the laminae and layers may be quilted or stitched to retain their desired relationship but this is not required with proper material selection and is an optional expedient.

Operation

The operation of the described embodiment of the subject invention is believed to be readily apparent and is briefly summarized at this point. With the flaps **25** and **26** open, valuable papers, documents, or the like subject to combustion or other damage from heat, not shown, are placed in the compartment **35**, the flaps closed, and the tie member **37** wound about the buttons **32** and **33**. The envelope **10** and its contents are then suitable for mailing, carrying, storage, or the like. If fire occurs in the environment wherein the envelope is located, part of the heat waves striking the outer, heat-reflective lamina **43** of the front and rear walls **11** and **12**, the end walls **16**, and the rear flap **26** is reflected away from the envelope. Only a portion of this impinging heat is conducted through the outer lamina. Further, only a portion of the heat passing through the outer lamina is conducted inwardly of the envelope through the outer insulative layer **51** inasmuch as this layer absorbs a considerable portion of the heat directed thereagainst. However, the small portion of the heat which is transmitted through the outer insulative layer and which impinges against the first intermediate lamina **44** is reflected outwardly of the envelope. Thus the first intermediate insulative layer **52** and the second intermediate lamina **45** act upon the small amount of inwardly transmitted heat in the same manner as the first intermediate layer and lamina, as described above. The second intermediate insulative layer **53** reduces still further the amount of heat conducted inwardly toward the vapor releasing layer **62** and the inner insulative layer **50**. Again, the inner insulative layer and the inner lamina **42** reduces the amount of heat reaching the compartment **35**. It is to be observed at this point that the number of successively alternating laminae and layers of reflective and insulative material can be varied as required but, of course, striking a balance between size limitations and effective protection. With the number of laminae and layers illustrated and the materials suggested for use, as described above, the overall thickness of any one of the walls or flaps is approximately five-eighths of an inch, as evidenced in thoroughly tested embodiments of the subject invention. It is to be understood, however, that the subject invention is not limited to any particular dimensions. In the embodiment shown and described, the amount of heat reaching the compartment is relatively negligible when the envelope is in an environment at a combustible temperature.

However, if the environmental temperature remains high for an appreciable duration, or if such temperature is extreme incident to an intense fire, for example, the minimum dehydration temperature of the vapor releasing layer **62** may be reached. Assuming that hydrated copper sulfate is employed as the layer **62**, when the temperature in said layer reaches 81° F., two molecules of water per one molecule of hydrated copper sulfate are released. The moisture collectively released from the layer **62** passes through the porous inner insulative layer **50** and through the apertures **47** in the inner lamina **42** into the compartment **35** where it moistens the contents of the envelope **10**, evaporates to cool the contents, and counteracts the effects of whatever heat reaches the compartment. Water vapor collecting in the compartment is released from the envelope into the atmosphere through the orifices **21** in the creases **18** and **19**. It is known that heat tends to concentrate at any pointed formation, such as the folds or creases **14**, **18** and **19**. The gradual emission of the water vapor from the compartment through these orifices **21** has a desirable cooling effect. If the temperature in the vapor releasing layer **62** reaches 199° F., two more molecules of water per each molecule of hydrated copper sulfate are released and so on until at 310° F., the last water molecule in each molecule of hydrated copper sulfate is released.

From the foregoing, it will be evident that an envelope has been provided which protects its combustible contents from the effects of excessively high temperatures which would normally immediately ignite and burn such contents. The envelope provides walls enclosing the compartment for the envelope which walls reflect heat, are poor conductors of heat, and which further release moisture into the compartment when temperatures of a predetermined level are reached. Still further, provision is made for circulation of water vapor through the compartment and out into the atmosphere through folded creases in the envelope so as to cool the creases and the compartment and to resist combustion of the envelope along the creases. In tests, it has been found that the described envelope of a wall thickness of five eighths of an inch will protect paper contents at a temperature of several hundred degrees F. for a protracted period. In fact it has protected paper contents at the maximum temperatures normally encountered in residential fires for periods exceeding that normally required to consume a residence.

Although the invention has been herein shown and described in what is conceived to be the most practical and preferred embodiment, it is recognized that departures may be made therefrom within the scope of the invention, which is not to be limited to the details disclosed herein but is to be accorded the full scope of the claims so as to embrace any and all equivalent devices and apparatus.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an envelope for protecting combustible contents from the adverse effects of excessive heat, wall means having an inner surface enclosing an internal compartment

adapted to contain such contents and an outer surface, said wall means including alternate lamina and layers of heat reflective and heat insulative material, respectively, and a layer of hydrated material positioned adjacent to said inner surface of said wall means adapted to release moisture at a predetermined temperature, said wall means providing moisture conducting passages from said hydrated layer to the compartment for moistening such contents when the temperature reaches said predetermined amount.

2. The envelope of claim 1 wherein said lamina are of metal foil.

3. The envelope of claim 1 wherein there is an outermost layer of heat insulative asbestos material and wherein there is an innermost layer of heat insulative glass fibre.

4. The envelope of claim 1 wherein the wall means provides a crease therein, said crease having an orifice extended through the wall means and establishing communication between the compartment and the atmosphere.

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