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INSULATING ELEMENT

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6 Claims. (Cl. 154-45)

This invention relates to insulation, it being the object of the invention to provide a new and unique form of insulating element or material of a very inexpensive and yet highly efficient form serving to insulate against heat and cold and transmission of sound waves to or from an enclosed space.

The invention is adaptable for use in many various structures as for instance in boxes where 10 it is desirable to heat insulate the same in which character of construction the insulation may be very light or flimsy and supported in place between outer and inner sustaining walls of cardboard like material or even of wood or it may

15 be used in a much heavier form as insulation for rooms of buildings.

A feature and object of the invention is to provide a corrugated sheet of material such as Cellophane or like substance with an aluminum foil

20 sheet upon the opposite sides of the corrugated sheet, which foil sheets may be adhesively secured to the corrugations in any desired manner and providing a construction in which the foil sheet may be spaced from the surface to be pro-

25 tected by the corrugated Cellophane. These and other various objects and novel features of the invention are hereinafter more fully lescribed and claimed, and the preferred form of construction of an insulating element embodying

 30 my invention is shown in the accompanying drawings in which-

Fig. 1 is a fragmentary sectional view of one form of insulating element.

Fig. 2 is a cross section thereof on an enlarged 35 scale taken on line 2-2 of Fig. 1.

Fig. 3 is a fragmentary perspective view of an alternative form of construction.

Fig. 4 is an edge elevation showing a sheet of Cellophane like material having the surface cov-40 ered with a foil or other form of heat reflecting material.

Fig. 5 is a view of a box broken away to show the position of my improved insulating element therein

45 Fig. 6 is a fragmentary sectional perspective of a building construction showing my improved insulation means in association therewith.

Fig. 7 is a sectional view showing another form of insulation which is of a character to 50 provide electrical insulation as well as insulation from sound, heat or cold.

Fig. 8 is a sectional view showing an alternative form of structure embodying my invention.

55 In its more commonly used form, the invention

consists of a corrugated sheet I as shown in Fig. 1, the corrugations being preferably of a triangular form in cross section but other forms of corrugations may be used within the spirit and scope of this invention. To opposite sides of the corrugated sheet is applied a sheet of metal foil, such as an aluminum foil indicated at 2. The foil sheet, as indicated at 3 in Fig. 2 and by dotted lines 3 in Fig. 1, is glued to the edges of the corrugations and this supports the corrugations 10from collapse or deformation and holds the foil sheets comparatively taut.

It is also posssible to use a sheet of paper or cardboard indicated at 4 in Fig. 4, the surface of which is coated with a light reflecting mate- 15 rial indicated at 5. This material may be of any character such as a very thin sheet of foil for instance, or may be covered with aluminum paint, it being within the spirit and scope of this invention to use any character of material for 20 coating the sheet 4 that will reflect heat waves. Thus it is possible to use either a sufficiently heavy foil sheet 2 as shown in Fig. 1 or a supported foil as indicated in Fig. 4.

To one of the side faces of the insulating ele- 25 ment for some purposes is secured a series of strips 6 in spaced relation transversely of the element as indicated in Fig. 6 for instance. This strip may be of paper and, depending upon the size of the insulating element, may be built to 30 a desired thickness to stiffen the element which is preferably made up in specific widths and of a desired length, for some purposes of a length permitting it to be rolled for transportation.

The function of the strip 6 is hereinafter more 35 fully described and these strips may be dispensed with in some instances of use of the invention.

An alternative form of construction is shown in Fig. 3 in which there are two sets of corrugated sheets 7 and 8 separated by a sheet 9 40 which may be a foil sheet and on each of the outer faces of these corrugated sheets 7 and 8 there is also a similar foil sheet 10 and 11. One face of this unit is also provided with the strip 6 heretofore mentioned.

The form shown in Fig. 3 has a greater insulation effect from heat or cold and resistance to transmission of sound than is secured by the form shown in Fig. 1. In fact it is possible to build up any desired thickness of insulation after 50 the manner as indicated in Fig. 3. The insulation material has a multitude of uses, only three of which are here illustrated.

In Fig. 5 is shown a box 12 of circular form and this box has an inner wall 13 which may be of 55

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paper or cardboard and an outer wall of sufficiently stiff material indicated at 14 which wall is spaced from the inner wall. In the said space is provided my improved insulating element which consists of the inner heat reflecting foll element 15, the similar external foil element 16 and the interposed corrugated sheet 17. The foil elements in this case may be secured directly to the outer face of the inner wall and the inner

- 10 face of the outer wall and the corrugated sheet placed therebetween and secured thereto in any manner that may be desired. In such construction illustrated in Fig. 5, the strips 6 are not required to be utilized but the form of insulation
- 15 shown in Fig. 1 may be utilized in the box construction in the place of that specifically shown in which cases there would be a spacing of the foil sheet to which the strips 6 are attached from the outer face of the inner wall 13 and providing 20 an air space between the inner foil sheet and

the inner wall. The double air space, by such construction, is

shown more clearly in Fig. 6 in which the outer wall of a building is indicated at 18 as being of

- 25 brick and the inner wall of the building is formed of sheathing 19, studding 20 and the plastered surface 21 forming the wall of the room. This wall 18 and sheathing 19 are spaced apart and my improved insulation of the form shown in
- 30 Fig. 1 is shown as filling the space therebetween. In the erection of a building, the insulation may be secured to the outer face of the sheathing 19 and the brick or other character of outer wall may be placed in close association with the 35 outer face of the insulating unit.

Figs. 5 and 6 are merely examples of the use of an insulation of the character herein described, and it is to be understood that other uses may be made as will occur to those familiar with insula-40 tion materials for sound-proofing and insulation against heat and cold.

Fig. 7 is a cross sectional view showing another type of insulation for insulating electrically as well as from transmission of sound, heat or cold.

- There are a great many uses of this material 45 shown in Fig. 7 as for instance, in sound-proofing the body of an airplane and in which it is desirable to electrically insulate the exterior metal body from the interior metal structure. No at-50 tempt has here been made to show such specific
- use.

I have, however, shown in Fig. 7 insulation as applied between two opposed pillars or posts 22 and 23. The insulation is preferably made in the 55 completed sheet as shown which consists of an outer fiber sheet 24 coated with an aluminum or other appropriate heat or light reflecting surface and a similar inner sheet 25 of the same character of material spaced one from another by a

- 60 corrugated sheet 26. The inner sheet is not necessarily formed of a dielectric material. For the specific purpose shown the sheet may be creased. adjacent each of its longitudinal edges at the points 27 and 28 on opposite side edges to permit
- 65 the turning of the edge 29 in one direction at a right angle to the body of the sheet and the other edge 30 in an opposite direction if desired. These turned edges provide what may be termed flanges for fastening the sheet directly to the posts 22
- 70 and 23. The fiber sheets are of an appropriate dielectric material and somewhat stiffer in character than paper sheets or metal foil covered sheets or the aluminum itself. This structure of Fig. 7 therefore is of greater strength as may be 75 required for many purposes particularly where

the material is mainly unsupported. The form of the structures shown in the other figures of the drawings should be supported by an enclosing wall.

Fig. 8 is an alternative form of the invention 5 in which there is a corrugated element 40 of any approved material to one face only of which is secured a sheet 41 which may be a sheet of foil or a sheet of material of any approved material having a heat reflecting surface preferably the 10 outer surface. The corrugated material may be of any approved form, a convenient material being the well known Cellophane of commerce which is impervious to air flow. The structure of Fig. 8 differs in respect to having one face 15 only of the corrugated sheet provided with the heat reflecting surface rather than both sides as is shown in Figs. 1 and 2. This is adaptable for use in many ways but is not quite as efficient an insulator as the form shown in Figs. 1 and 2. 20

The utility of Cellophane or the equivalent in the formation of the insulating element described resides in the fact that the Cellophane is a moisture resistant element, is non-cellular or nonfibrous and transparent or semi-transparent and 25 is inexpensive and light in weight. Applicant is aware that it has heretofore been suggested to mount a foil sheet upon a corrugated paper or cardboard member but in applicant's experience, the use of the paper material results in a struc- 30 ture that deteriorates by reason of absorption of moisture that may come in contact therewith, as by air flow. It being of a fibrous and consequently of a cellular nature tends to retain heat and not to transmit it and thus differs in these 35 characteristics from Cellophane or the equivalent. By use of a corrugated Cellophane sheet on which is mounted a metal foil sheet secured to the ridges of the corrugations, the corrugations are supported from relative displacement and 40 the foil sheet or sheets, if more than one be used, are held taut providing a smooth heat or cold reflecting surface. Where a single sheet of foil is utilized on one side of the corrugated Cellophane, the Cellophane provides a means 45 for spacing the foil sheet from the surface to be protected. Metal foil, if secured in surface contact to an element such as a sheet of paper for instance, will transfer heat to the sheet and thence to the space or to the article in contact 50 with the opposie side of the paper sheet but if the foil sheet be spaced from the surface which it is desired to protect from heat or cold, the foil will reflect the heat waves and prevent transmission to or from the protected surface. 66 In this arrangement, Cellophane therefore become important as heat waves pass through the same similar to transmission of light waves and thus does not function to absorb heat or cold. If there be a foil sheet secured on opposite sides 60 of the corrugated sheet as is also herein described, heat that is transmitted to the humps of adjacent corrugations due to its physical contact therewith is reflected by the exposed surface of the opposite foil sheet which bridges the gap be- 65 tween corrugations. Therefore, by the arrangement described, in the use of Cellophane or a Cellophane like material, I have secured an insulating element of long life having the characteristics of being moisture resistant and heat 70 or cold transmissive and thus not materially interfering with the reflection of heat waves by the foil sheet through the corrugated element. Thus if the corrugated Cellophane and foil element be used, cold is prevented from passing to 75

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the surface of an element protected and heat is prevented from passing from the element or vice versa, depending upon the particular instance of use. While there may be some transfer of

- 5 heat or cold by the foil sheet to the Cellophane due to the contact of the foil sheet with the humps of the corrugations, this is materially limited in respect to transfer of heat by a flat sheet of foil mounted on paper or other foundation and
- 10 where two sheets of foil are secured on opposite faces or a corrugated Cellophane sheet even such transmission of heat or cold waves is largely prevented.
- From the foregoing description, it is believed 15 evident that the structure is of very simple and inexpensive character; that it may be made in the form of panels or lengths to be rolled or manufactured and cut to the size required for a specific purpose as for instance in the provision
- 20 of insulation for a double walled box. It also may be made in large sheets of considerable width and long lengths where it is to be applied to large surfaces and the strength and thickness of the materials and the form of the corrugation of
- 25 the corrugated sheet may be varied widely. Having thus fully described my invention, its utility and mode of operation, what I claim and desire to secure by Letters Patent of the United States is—
- 30 1. An insulating unit comprising a corrugated sheet of Cellophane, a flat sheet of comparatively thin aluminum foil glued to the ridges of the corrugated sheet to sustain the corrugations in place and supporting the foil sheet in a plane provid-
- 35 ing substantially a uniform flat surface for reflecting the heat waves.

2. An insulating element comprising in a single unit, a corrugated sheet of Cellophane, a sheet of metal foil directly secured to each of the

40 opposite sides of the corrugated sheet, a second corrugated sheet of Cellophane secured to the outer face of one of the aforesaid foil sheets,

and a sheet of foil secured to the exposed face of the second corrugated sheet providing an insulating unit having two dead air spaces separated by a sheet of foil.

3. An insulating unit for the purpose described 5 comprising a corrugated sheet of Cellophane of the required thickness to provide the necessary strength, a metal foil secured to the opposite sides of the sheet in a manner to support corrugations of the corrugated sheet from displace-10 ment, and a series of strips secured to the outer face of one of the foil sheets for supporting the unit with a foil sheet in spaced relation with a surface to which the insulation unit may be applied. 15

4. An insulating element comprising in a unitary structure, a corrugated sheet of Cellophane, a thin sheet of metal foil on each of the opposite sides of the corrugated sheet and each secured at several points to the aplees of the corrugations 20 to support the same from displacement, the corrugations in turn supporting the foil sheets in parallel relation to provide flat heat reflecting surfaces facing the air space between the foil sheets as well as serving to reflect heat waves 25 outwardly from each of the opposite outer faces of the element.

5. An insulating unit comprising a corrugated sheet of Cellophane, a sheet of metal foil having the characteristic of reflecting heat waves di- 30 rectly applied to at least one face of the corrugated sheet, said foil covered corrugated sheet being constructed to permit bending at its two opposite edges to substantially a right angle to the plane of the sheet providing a means for 35 attaching the same to a supporting element.

6. An insulating element comprising a corrugated sheet of Cellophane, a sheet of metal foil secured to each of the opposite sides of the corrugated sheet in a manner to support the corrugations from relative displacement.

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