May 4, 1937. A. W. KENT 2,079,374

THERMAL INSULATION

Filed Nov. 5, 1935

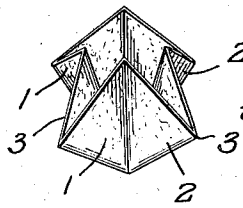

Fig. 1.

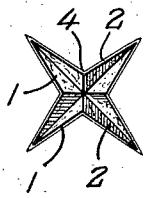

Fig. 2.

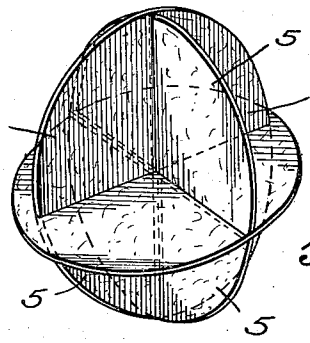

Fig. 3.

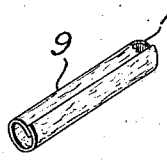

Fig. 6.

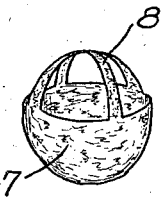

Fig. 4.

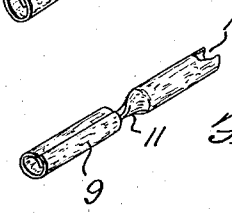

Fig. 7.

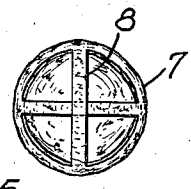

Fig. 5.

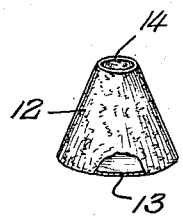

Fig. 8.

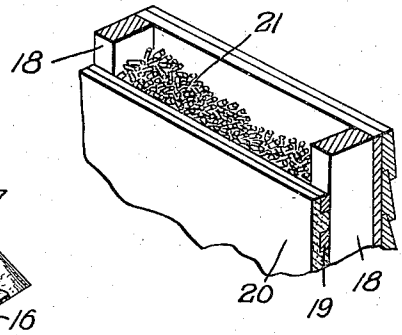

Fig. 10.

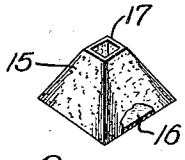

Fig. 9.

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Attorney

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2,079,374

THERMAL INSULATION

Archer Wilkins Kent, Washington, D. C.

Application November 5, 1935, Serial No. 48,437

6 Claims. (Cl. 154—44)

This invention relates to insulation and more particularly to an insulating material of the character wherein bright metal or other highly polished metallic surfaces are employed.

The use of highly polished metallic surfaces for heat insulating purposes has heretofore been proposed and considerable study has been made of its properties and manner of use as a thermal insulator. It is well known that heat may be transferred to or from a body by conduction, convection and radiation or by a combination of these agencies, making it extremely difficult to obtain a single homogeneous material which will serve as a commercially practical insulating medium for general application in connection with the thermal insulation of buildings.

The very high resistance offered by still air to the transfer of heat by conduction has long been recognized as well as the concomitant fact that heat can be transferred through an air space by convection and radiation. Since convection can be considerably reduced by dividing a given air space into small units of cells and radiation substantially eliminated by surrounding the unit air spaces with a material characterized by low thermal emissivity, the use of metal foil or metalized paper has been suggested, to bring about the desired conditions as regards elimination of the transfer of heat by radiation and/or convection through an air space.

Several different methods of applying the paper or metal foils to the walls, ceilings, roofs and the like of buildings, have been proposed. One arrangement comprises dividing the air space, for example, the space between the walls of a partition, by suspending sheets of metal foil therebetween or tacking the sheets to the studs and joists. In accordance with another method, the foil is crumpled before it is tacked or otherwise fixed to the supports. While the prior art arrangements are satisfactory from the standpoint of an insulating medium, they are open to serious objection due to inherent difficulties encountered with this type of construction.

One of the main problems incident to the use of metallized paper or metal foil is the limitation as to its availability in connection with the insulation of structures which have already been built and also the difficulty encountered in certain specific types of construction. For example, while not impossible, the use of the material in the form of sheets is not feasible in the insulation of walls and other parts of buildings which have already been constructed, and it is difficult of application to certain portions of buildings undergoing construction, particularly in sections which are not of convenient access. It will be further appreciated that metal foil or metallized paper is fragile and care must be exercised in handling so as not to tear or perforate it. Since the insulating material is introduced between the walls before they are surfaced on the interior, it frequently happens that those engaged in applying the sheets must keep ahead of others who cover up the insulation, with the result that time becomes an important factor in the application of the insulating material.

In accordance with the present invention, the air space between walls or other elements to be insulated, is divided by means of separate insulating units made up of metal foil or metallized paper, for example, aluminum foil, attached to a suitable paper backing. The units may be shaped in any convenient manner, the principal requirement being that whatever configuration is given to the insulating unit, that it comprise essentially a small cell surrounded or bounded by metal foil. By means of my improved insulators, the air space, for example the space between the walls of a partition, may be filled by blowing or raking the material into the partition. The units are constructed and arranged so that a maximum number of divisions are made of the given air space, that is, when the units are positioned within a partition, their surfaces are tangent one with the other, without however, appreciably decreasing the space between succeeding units.

An object of the invention is to provide an improved insulating unit of metal foil or metallized paper in the form of a separate individual cell.

Another object of the invention is to provide improved insulating means, made from metal foil or metallized paper, in the form of small cells surrounded or bounded by metal foil.

A further object of the invention is to provide an improved insulating medium comprising metal foil or metallized paper in cellular-like form, adapted to be blown, raked or otherwise introduced into the space between partitioned walls, ceilings, roofs and the like.

A still further object of the invention is to provide insulating units made from metal foil or metallized paper, constructed and arranged whereby a given air space, for example the space between the walls of a partition, is divided into a large number of parts, each part being bounded by metal foil.

Still another object of the invention is to provide metal foil or metallized paper in loose cellu-

lar form adapted for use in connection with the thermal insulation of containers, buildings, and the like.

With these and other objects in view, which may be incident to my improvements, the invention consists in the parts and combinations to be hereinafter set forth and claimed, with the understanding that the several necessary elements, comprising my invention may be varied in construction, proportions, and arrangement, without departing from the spirit and scope of the appended claims.

In order to make my invention more clearly understood, I have shown in the accompanying drawing means for carrying the same into practical effect, without limiting the improvements in their useful applications to the particular constructions, which for the purpose of explanation, have been made the subject of illustration.

In the drawing:

Figure 1 is a perspective view of one form of unit.

Fig. 2 is a plan view of the unit shown in Fig. 1.

Fig. 3 is a perspective view of another form of insulating unit.

Fig. 4 is a perspective view showing a modification of the form shown in Fig. 1.

Fig. 5 is a plan view of the unit shown in Fig. 4.

Fig. 6 is a perspective view of another form of insulating unit.

Fig. 7 is a perspective view of a modification of the arrangement shown in Fig. 1.

Fig. 8 is a perspective view of an insulating cell in the form of a frustum of a cone.

Fig. 9 is a perspective view of a modification of the unit shown in Fig. 8; and

Fig. 10 is a sectional view through a partition or wall showing the loose cellular metallized paper as applied to a partition.

Referring to the drawing and more particularly to Figures 1 and 2, I have shown an insulating unit made from metallized paper, comprising a plurality of faces 1 formed by bending and creasing a section of a metallized sheet along lines forming edges 2 of the unit. In making up a unit, a substantially rectangular section of metallized paper, having metal foil attached to both sides of the paper backing, is cut from a sheet, folded and creased along median and diagonal lines of the rectangle, after which the parts are folded into the form shown in Fig. 1. After the small rectangular sheet is folded as above indicated, the faces being formed by bending and creasing along the fold lines, the unit appears as a hollow cup-like member having four cusps 3, the edges of the cusps terminating at a point 4 forming the vertex of the unit.

I have found that when insulating units of this type are introduced into an air space between the walls of a partition, improved insulating results are obtained, over metallized paper used in sheet form. While no precise explanation or reason is herein offered for the improved results obtained by using individual cell-like units of metallized paper, I believe it is due not only to the specific shape of the units but also to their arrangement and organization whereby the given air space is divided into a large number of parts, each part comprising an air space in the form of a cell made up of a small unit of air space bounded by metal foil.

In this connection, when the units are blown into the space between the walls of the partition, they assume various positions, the edge of one unit being tangent to the face of another unit, however, the shape and configuration of the units is such that they cannot readily coincide or nest to form elongated elements of a plurality of thicknesses. The interfacial areas of the cusps or wings, interiorly and exteriorly of the unit, provide a large surface which offers resistance to the flow of heat and in addition, the design of the unit is such that any overlapping of units forms individual cells or air spaces bounded by metal foil.

The modification shown in Fig. 3, comprises a generally spherical shaped unit comprising a plurality of discs 5, intersecting each other at right angles and forming a quadrant 6 between adjacent discs. In this arrangement, the metallized paper, paper base with aluminum foil on both sides, is cut into discs of the required size, the discs then being assembled in the position shown. As a result of considerable research and experimentation, I have found that this particular type of insulating unit is very efficient. Due to its configuration, it lends itself very readily to the introduction between partition walls and the like by blowing and the radii of the discs and quadrants are such that nesting of the units is prevented. The interfacial areas of the cells formed by the discs are considerably increased and a comparatively rigid unit is obtained by arranging the discs in the manner indicated.

Referring to Figs. 4 and 5, a further modification is shown wherein the unit comprises a basket-like structure, designated generally by numeral 7, the upper periphery of the basket being provided with strap or handle portions 8. In this arrangement, as with the units already described, a hollow member is provided whereby the unit air space is surrounded by metal foil. The strap or handle portions 8 extending above the body of the basket, prevent the units from nesting and afford minimum contact area when they are positioned in an air space.

In Fig. 6, the unit is in the form of a cylinder 9, one end of which is closed as at 10, while in Fig. 7, the cylinders are joined in tandem by means of twisting the material as at 11 along the length of the cylinder.

The modifications shown in Figs. 8 and 9 comprise units in the form of frustums of a cylinder and a pyramid respectively. The lateral surface 12 of the cylinder is of sufficient area to provide good surface resistance to the flow of heat, the bottom of the frustum being closed at 13, the upper end 14 being open. The lateral faces 15 of the frustum of the pyramid are also designed to provide a large surface area, the base 16 of the frustum being closed while the upper end 17 is open. In both of these arrangements, it will be noted that a cell-like unit is provided, wherein the unit air space is bounded by metal foil.

Referring to Fig. 10, I have shown a section of a partition or wall comprising studs 18, lath 19 and suitable plastering material 20. The insulating units designated generally by numeral 21 are shown, filling the air space between the studs 18. It will be appreciated that the units, in whichever form used, may be readily raked or blown into the spaces between succeeding joists. For example, the interior facing of the wall, comprising laths 19 may be applied to a point near the top of the wall, after which the insulating units may be introduced.

It will now be appreciated that I have provided an improved insulating medium of general application in connection with thermal insula-

tion of buildings, which is easy to apply and possessing advantages not found in prior art arrangements wherein metal foil or metallized paper in sheet form are used. While I have described one application of the invention, namely, its use in connection with the insulation of a partition member, it will be understood that the units are intended and are adapted for use with cabinets, refrigerators and the like. It will be further understood that although reference has been made to the use of metallized paper, that the invention in its broadest aspect, comprehends the use of metal foil, without paper backing, in making up insulating units.

I claim:

1. A thermal insulating unit comprising a body portion formed with wing members terminating in a common vertex, the air space between said wing members interiorly of the body portion, being bounded by metal foil.

2. A thermal insulating unit made from a single piece of metal foil, comprising a body portion having wing members formed therewith, said wing members defining an air space interiorly of the unit, bounded by metal foil.

3. A thermal insulating unit made from a single piece of aluminum foil, comprising a body portion having wing members formed therewith, said wing members defining an air space interiorly of the unit, bounded by metal foil.

4. A thermal insulating unit made from a single piece of metallized paper, comprising a body portion having wing members formed therewith, said wing members defining an air space interiorly of the unit, bounded by metal foil.

5. A thermal insulating medium comprising a plurality of insulating units, adapted to be blown into the air space to be insulated, each of said units comprising a body portion having wing members formed therewith, said wing members defining an air space interiorly of the unit bounded by metal foil.

6. A thermal insulating medium comprising a plurality of insulating units, adapted to be blown into the air space to be insulated, each of said units being made from a single piece of metallized paper, comprising a body portion having wing members formed therewith, said wing members defining an air space interiorly of the unit bounded by metal foil.

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