March 18, 1941. A. WENZEL 2,235,542

BUILDING INSULATION

Original Filed Dec. 6, 1929

Fig. 1.

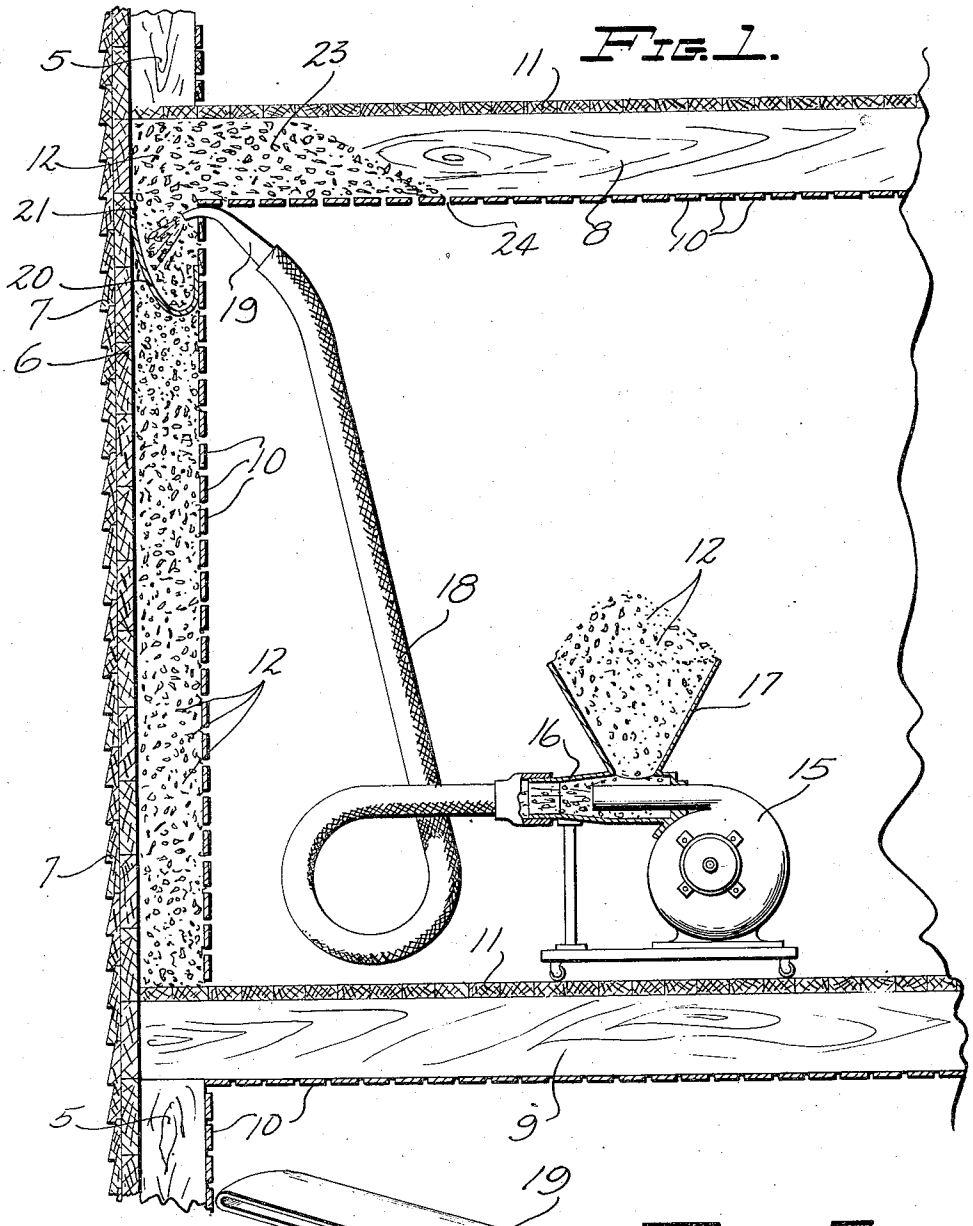


Fig. 3.

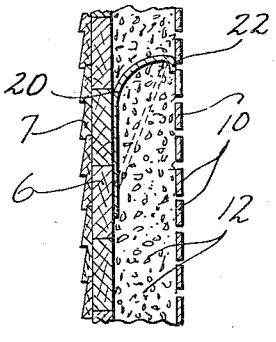
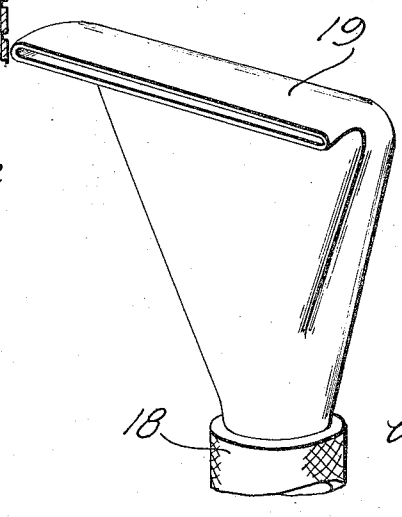


Fig. 2.



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BUILDING INSULATION

Amanda Wenzel, Fox Point, Wis.

Continuation of application Serial No. 412,057, December 6, 1929. This application August 24, 1937, Serial No. 160,649

3 Claims. (Cl. 72—16)

This invention relates to building insulation and to the method of forming the same.

The present application is a continuation of my abandoned copending application Serial No. 412,057, filed December 6, 1929.

One object of the present invention is to provide within the wall and/or ceiling spaces of buildings an insulating blanket so composed as to resist to a maximum degree passage of heat therethrough.

This I have accomplished by preparing or selecting a mass of insulating material which is readily separable into fragments, preferably of rather light weight and irregular form, and introducing the separated fragments thereof promiscuously into a wall or ceiling space in such manner that the fragments are individually free to move as they will and to spontaneously find individual points of ultimate lodgement within the space. When thus introduced, the individual fragments ultimately recombine within the space to form a rather loosely knit mass or blanket of highly desirable uniform texture in which the interlocked or interengaged fragments coact to form innumerable minute dead-air cells substantially uniformly distributed throughout the mass.

It has been found that the cellular structure thus formed, together with the lack of intimate or solid union beween the fragments within the mass, give to the mass an insulating value greater than that of the material contained in the mass. That is explainable by the fact that the innumerable minute dead-air cells between the fragments offer greater resistance to transmission of heat by conduction than does the substance of the fragments itself and the lack of intimate or solid union between the fragments effectively discourages transmission of heat from one fragment to the next, and yet the close association of the interlocking or interengaging fragments is such as to resist to a high degree transmission of heat by convection through the mass.

Although various methods and means may be employed to separate the fragments from the original mass and to introduce them into the wall or ceiling space in a manner to obtain the effect above described, I have obtained best results by using an air blast or air stream in a manner to be later described in more detail. The air stream is preferably continuously maintained and the insulating material admitted thereto a little at a time, either continuously or otherwise. Under the action of the air stream, the admitted material is broken up into fragments which, suspended in the stream, are conducted and projected thereby into the wall or ceiling space to be insulated.

In addition to its function as a conveying medium for the individual fragments of insulating material, the air blast also serves to project, disperse and/or scatter the fragments within the space to be insulated. When applied to a confined space in a wall or ceiling, the entering air blast sets up currents and eddies within the space which function to maintain some of the fragments in a state of agitation or suspension within the space until the space is filled and to cause them to float or drift about within the space, and to enter otherwise inaccessible nooks, corners, or extensions thereof, and to avoid bridging over pipes, conduits, wires, or other obstructions in the space. Also the entering air in seeking an outlet seeps through the confining wall portions so as to carry suspended fragments with it to and against the internal surfaces enclosing the space thereby tending to seal the same and to form an intimate union between the finished insulating blanket and contiguous surfaces of the wall or ceiling.

As a means for confining and directing the fragment-laden air stream, an air-tight flexible hose is preferably employed which may be conveniently led from an appropriate material receiving station to any selected points of entry into the wall or ceiling spaces to be insulated. The fragments of insulating material are of course of a size to permit free suspension thereof within the air stream passing through the hose so as to assure clear passage therethrough without danger of clogging.

Other more specific objects and advantages of the present invention will appear, expressed or implied, from the following description of apparatus capable of carrying out the method above outlined.

In the accompanying drawing:

Figure 1 is a view, more or less diagrammatic, of a type of apparatus which I have successfully employed in carrying out my improved insulating method, and illustrating an application of my method to a typical building construction.

Fig. 2 is a perspective view on a larger scale of the nozzle shown in Fig. 1.

Fig. 3 is a fragmentary detail section of the building structure illustrating a modified form of seal.

The building structure shown is conventional. It includes the usual framework comprising upright studs 5 and horizontal joists 8 and 9. The building is closed by the usual sheathing 6 and

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exterior siding 7 and finished on the interior by plaster applied to the customary laths 10 attached to the inner sides of the studs 5 and to the under sides of the joists 8 and 9, the latter being covered by conventional flooring 11.

To insulate the building structure shown, in accordance with the present invention, the wall spaces confined by and between the successive studs 5, sheathing 6, and laths 10 are each filled by a loosely knit blanket or mass of dry insulating material, comprising individual fragments 12 interlocked or interengaged to form innumerable minute dead-air cells uniformly distributed throughout the mass, contiguous fragments being so related as to avoid intimate or solid union therebetween. Similar masses of insulating material may be applied to the ceiling spaces confined by and between the successive joists 8, flooring 11, and laths 10.

In order to form a blanket of substantially uniform texture possessing the desirable characteristics above described, the insulating material is introduced into the spaces in the form of separated fragments having freedom of individual movement and capable of spontaneously finding their individual points of ultimate lodgement within the spaces. This is accomplished preferably by suspending the individual fragments in an air blast or air stream which functions to conduct them to and liberate them in the spaces to be filled. The air stream entering the spaces also functions to set up currents and eddies therein which serve to maintain some of the fragments in agitation or suspension within each space until that space is filled, permitting them to float or drift into otherwise inaccessible nooks, corners, or extensions of the space, and the air seeking escape through the walls carries some of the fragments thereagainst to seal the same and to effect insulating contact of the finished blanket against the walls.

In the apparatus shown, an air blast is developed by an appropriate pump or blower 15 which discharges through a feed pipe 16 into and through an air-tight flexible hose 18 by which the air blast or air stream is directed to the space to be filled. In this instance the insulating material is applied to the air blast from an appropriate hopper 17 from which it is fed a little at a time into the feed pipe 16 under the influence of gravity and under the influence of the suction effect induced by the air blast. As the insulating material enters the air blast it is broken up by the blast into separate fragments which are picked up and suspended in the air stream and carried thereby through and beyond the hose.

Entry of the material into the wall and ceiling spaces may of course be effected in various ways, but in this instance an opening between adjacent laths is utilized for that purpose and the hose 18 shown is equipped with a wide flat nozzle 19 adapted to enter between the laths. Entry of the material through the side of the wall permits it to be projected by the air stream against the opposite side of the space or upward or downward within the space, and the flat divergent form of nozzle, shown particularly in Fig. 2, is particularly adapted to the production of a widely divergent spray and a consequent desirable wide separation of the fragments as they enter the wall space.

Insulating materials of varioius kinds may be employed, although any mass of material employed should be readily separable into irregular fragments of sizes capable of free passage with the air stream through the hose and substantially free from moisture or other ingredients such as would cause undesirable packing or solid union of the fragments within the wall or fill or otherwise destroy or prevent the formation of the highly desirable minute air cells within the finished insulating blanket or mass. The use of dry flaky or fibrous materials is preferred, although light granular materials may be employed or included if of a size to readily pass with the air stream through the hose and yet not so small as to fill or prevent the formation of the insulating air cells.

For example, good results have been obtained by the use of paper cut, chopped, or torn into flaky fragments. Vegetable stems, stalks, wood, leaves, and husks may also be used in fragments. And in order to render the material fire resistant, fibrous minerals, such as fragments of asbestos or asbestos paper may be mixed with any of the materials above named, or used as a substitute therefor. A dry mixture of comminuted paper and comminuted asbestos has been found ideally suited for the purpose, such a mixture being light and downy or fluffy and containing separable fragments capable of floating and settling lightly in the wall space.

In order to compensate for settling of the finished blanket or mass of insulating material within the wall spaces and to thus maintain the insulation as effective as possible, I prefer to use at the top of each wall space a self-adjusting web or insulating curtain 20 fastened only at its upper margin to one side or the other of the wall space. In Fig. 1 I have shown the self-adjusting curtain 20 anchored at 21 on the outer side of the wall space and bowed or flexed downwardly by the insulating material applied above it; while in Fig. 3 I have shown it fastened at 22 on the inner side of the wall space and bowed or flexed upwardly by the insulating material projected upwardly beneath it. In either case the material used for this curtain is preferably in the nature of an insulating blanket such, for example, as is well known on the market in the form of a woolly product of wood fiber or flexible straw.

The curtain 20 is adjusted initially to extend across the wall space into contact with the opposite side from which it is fastened and it is left with plenty of slack so that as the material in the wall space settles the web or curtain will settle with it and at all times maintain an insulating seal across the top of the wall space. Additional material may be projected into the wall space above the curtain whenever the construction makes it possible to do this. In Fig. 1 I have shown the nozzle employed to fill the space above curtain 20, and the space 23 between joists and above the wall space under discussion may be filled if desired by inserting the nozzle 19 between the ceiling lath at some convenient point such as that indicated at 24.

One advantage in the use of wood or lath as a plaster base in a wall to be insulated in accordance with this invention lies in the fact that the light material used keys and supports itself to minimize packing and settling by engaging the lath or the rough plaster projecting therethrough. Another advantage in the case of wood lath lies in ease of access with the flat nozzle illustrated.

Various changes may be made in the method or apparatus above specifically described without

departing from or sacrificing the invention as defined in the appended claims.

I claim:

1. A building structural unit having an internal space substantially completely filled with a loose, uncompacted mass of dry irregular fragments of insulating material, an insulating blanket extending across said space above a portion of said material and having sufficient slack to retain its position across such space while resting upon said fragments as said fragments settle within the wall.

2. A building structural unit having an internal space substantially completely filled with a loose, uncompacted mass of dry irregular fragments of insulating material, an insulating blanket extending across said space above a portion of said material and having sufficient slack to retain its position across such space while resting upon said fragments as said fragments settle within the wall, said blanket being connected to said unit at one side of said space only.

3. The method of insulating walls, ceilings and the like which consists in forming a mixture of comminuted paper and asbestos, blowing said mixture without moisture into the space therein, and floating the particles of said mixture into light mutual contact to form a loose non-compacted mass substantially filling said space.

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