Nov. 25, 1952 G. SLAYTER 2,618,817

INSULATION MATERIAL

Filed Dec. 12, 1945 2 SHEETS—SHEET 1

FIG. 1.

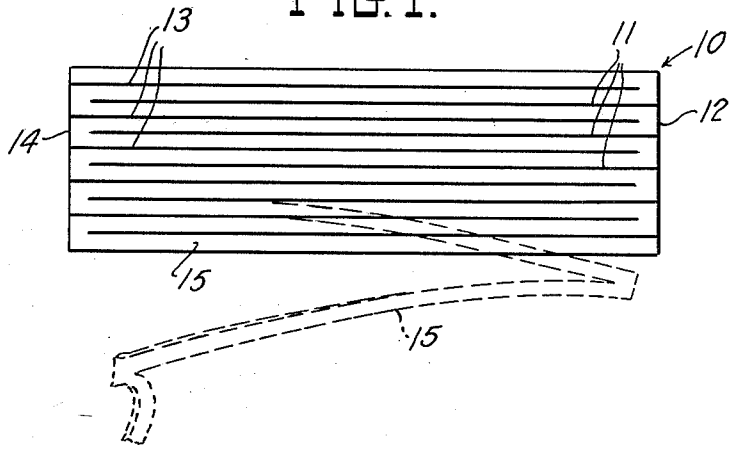

FIG. 2.

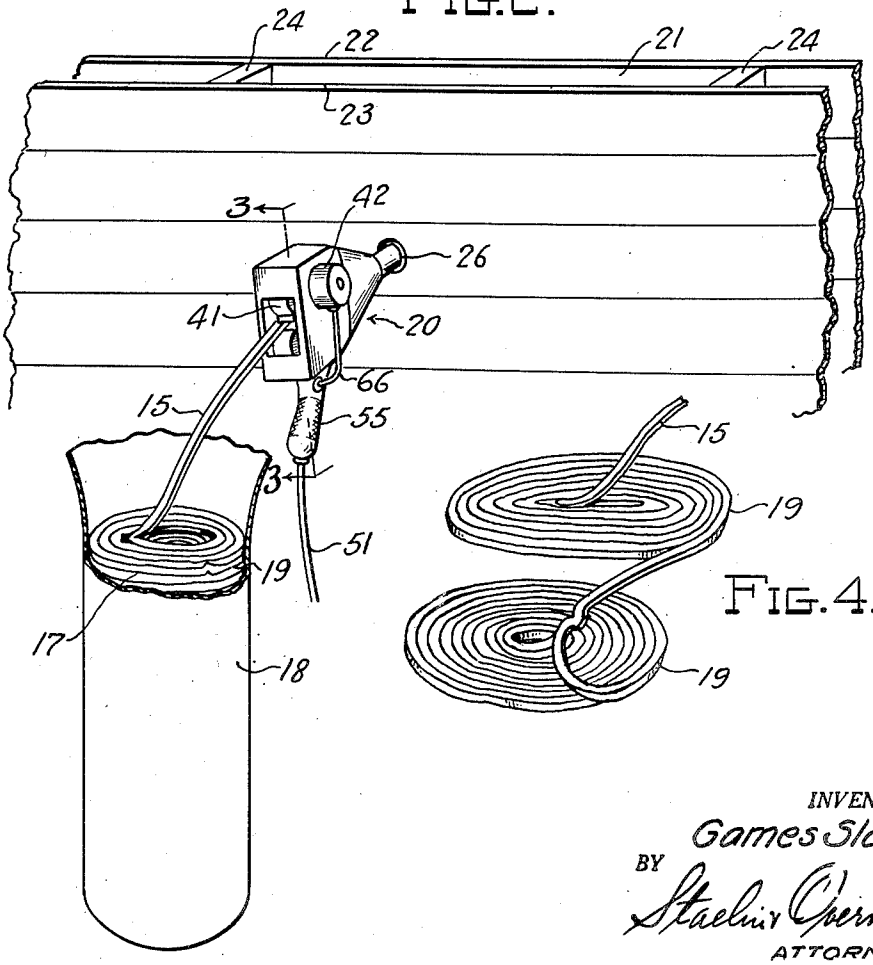

FIG. 4.

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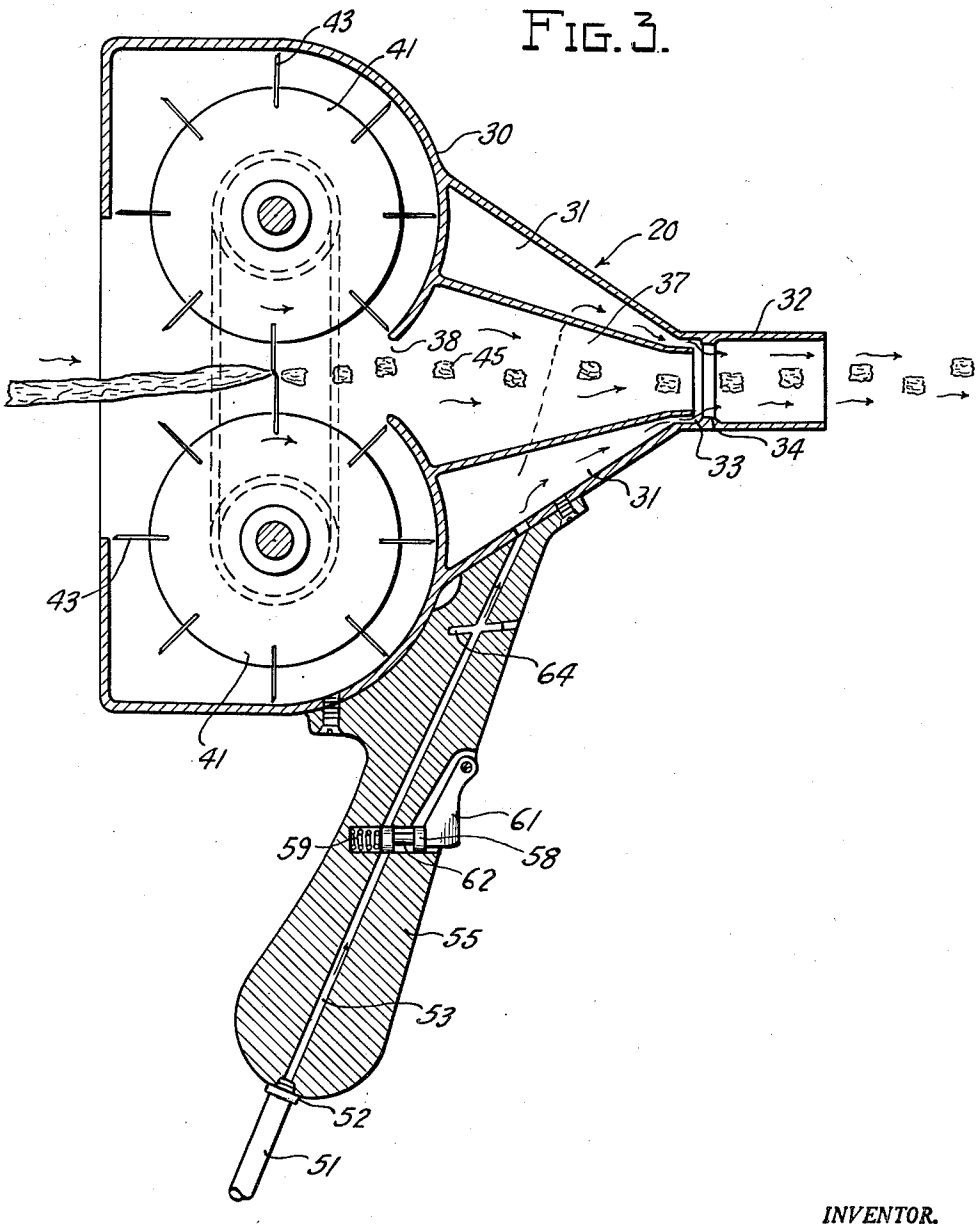
FIG. 3.



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UNITED STATES PATENT OFFICE

2,618,817

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5 Claims. (Cl. 19—161)

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This invention relates to the thermal insulation of buildings, storage compartments, and other structures, and more particularly to an approved insulating material and method of applying the same. The invention is concerned primarily with insulation formed of fibrous mineral material, especially fibrous glass.

It is an object of the invention to provide an improved method of filling spaces such as those between the inner and outer walls of buildings, cold storage compartments, refrigerators, and the like with insulating material.

It is another object of the invention to provide such a method requiring only simple light-weight equipment for the application of the insulating material to thereby dispense with the bulky apparatus including compressors, hoppers, large conduits through which the insulation material must pass, and the need to provide large openings in the walls of the structure to be insulated for accommodating the conduit or hose by means of which the insulation is introduced into the space to be insulated.

It is a further object of the invention to provide an insulating material that may be compactly packaged for transportation and storage, that may be easily taken directly from the package and applied to the structure to be insulated, and to provide material of which large quantities may be supplied in packages sufficiently small to be carried by the applicator when working from ladders or scaffolds.

The invention provides mineral fiber insulating material in the form of narrow substantially continuous strips of fibrous material of high compressibility. The insulating material is arranged in coils placed in superposed relation in a bag or carton with the strip extending continuously throughout all or a large number of the coils in the carton. The high compressibility of the material permits the coils to be greatly compacted in the bag or carton so that a relatively small package will contain sufficient insulating material to fill a large volume of the space into which the material is to be introduced.

The insulated material has a high degree of recovery after being compressed so that when applied it provides a low density light-weight body of insulation and it also has a high degree of integrity so that the strips of insulating material have sufficient tensile strength to be drawn from the package at a high rate of speed.

The strips of insulating material are formed of haphazardly arranged very fine glass fibers interbonded in haphazard relation by a suitable binding material, preferably a thermosetting resin. The fine fibers are of diameters less than about fifteen hundred-thousandths of an inch

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and preferably from about three to fifteen hundred-thousandths of an inch. Fibers of this size when interbonded in haphazard relation by means of a binding material that will remain rigid under varying conditions, for instance a thermosetting resin, provide a fibrous product that is about one-fourth to one pound per cubic foot density and that is highly compressible and that also has a complete recovery to substantially normal density when it has been compressed to many times its original density even for long periods of time.

It is a further object of the invention to provide an efficient process for feeding the insulating strip directly from its package into the space for the insulation.

While any suitable means may be employed for introducing the insulation into spaces therefor, it has been found preferable to engage the strip of insulation with a blast of air directed onto the strip of insulating material in a direction generally lengthwise of the strip and to engage the strip at a point adjacent the place where the insulating strip is introduced into the insulation space. In this way the long heavy conduits employed in the past for conveying an air-borne stream of subdivided insulating material is dispensed with, greatly facilitating the work of the operator in introducing the insulation into the space.

The foregoing as well as other objects will be made more apparent as this description proceeds, especially when considered in connection with the accompanying drawings, wherein:

Figure 1 is a plan view of a sheet of insulating material showing one way in which the insulation of the present invention may be produced;

Figure 2 is a diagrammatic perspective view showing the insulation of Figure 1 formed into a roll of insulation and confined in a package, the strip of insulation being withdrawn and fed into a space to be insulated by a blower; and

Figure 3 is a central vertical sectional view through an applicator for the insulating material;

Figure 4 is a perspective elevational view of two coils of the insulating material of the invention in assumed positions.

Referring to the drawing, the reference character 10 indicates a mineral wool mat preferably formed of fibrous glass bonded together with a small amount of a suitable rigid binding agent such as thermosetting resin. The fibers of the mat are very fine, ranging from about three to fifteen hundred-thousandths inch in diameter, and the mat has a normal density of less than one pound per cubic foot, usually one-fourth to one-half pound per cubic foot. This provides a light weight, fluffy mass of fibrous glass possessing

sufficient strength to permit handling and also having a very high degree of compressibility.

As shown in Figure 1 of the drawings, the mat 10 is slit along longitudinally extending, equally spaced lines 11 from the end 12 and is also slit intermediate the lines 11 along parallel lines 13 from the opposite end 14. The lines 11 terminate short of the end 14 of the mat and the lines 13 terminate short of the opposite end 12 of the mat. By this arrangement the slit mat may be opened out or extended to form a substantially continuous narrow strip 15 of insulation, as indicated by dotted lines in Figure 1 of the drawings.

The mat is preferably about one-half to one inch thick and the strip is of approximately the same dimension in width so as to be substantially square in cross-section although other sizes may be employed if desired.

Instead of slitting the mat in the manner described it may be entirely divided into separate strips and the strips tied or knotted end-to-end to provide a continuous strip. Alternatively, the mat may be first rolled and then cut into slices along parallel axially spaced lines and the outer end of the strip of each resulting coil of material tied or knotted to the inner end of the strip in the next adjacent coil.

When the mat is divided into strips in either of the two methods first described, before the strips of the mat are opened out, the mat is preferably rolled about a mandrel to form a roll 17 of the general type shown in Figure 2 of the drawings. During the rolling operation, the mat 10 is substantially compressed, so that the density of the mat is increased several times and the final diameter of the finished roll 17 is only a fraction of what it would be if the mat 10 were rolled without the application of pressure. The amount of pressure applied to the mandrel during rolling of the mat may be varied depending upon the degree of compacting desired and it has been found sufficient to roll the mat under the pressure that can be applied easily by one or two operators grasping the ends of the mandrel protruding from the roll.

The rolled slit mat is inserted into a package 18 in the form of a bag or carton having one end open, the mandrel being withdrawn after the rolled mat is received in the bag or carton. As the rolled mat is placed in the package 18, it is compressed axially and the open end of the package closed in any ordinary fashion. Accordingly, the space in the package occupied by the insulating material is very small in comparison to the volume of the insulating material at normal density. This not only permits storing a substantial quantity of insulating material in a relatively small space, but also greatly decreases the cost of transporting the insulating material.

It will further be noted that when the mat 10 is rolled up, the strip 15 forms a series of flat coils 19 arranged in juxtaposition to each other axially of the roll with the strip 15 extending continuously through all the coils in the package as illustrated in Figures 2 and 4. There are ordinarily hundreds of coils in a package with each coil containing one hundred to several hundred feet of insulation strip.

When the roll 17 of insulating material is to be taken from the bag or carton, one end of the strip 15 is rendered accessible by opening the adjacent end of the package and the entire body of insulating material may be withdrawn from the package in strip form by merely exerting a pulling force on the strip 15. As the highly resilient insulating material is removed from the package, the insulation tends to return quickly to its normal density.

In Figure 2 the strip of insulation 15 is illustrated as being withdrawn from the package 18 by means of an air gun 20 and fed into one of the spaces 21 defined by the inner and outer walls 22, 23 and the studs 24 of an ordinary building side wall structure. The strip of insulation passes through the air gun and is directed into the space 21 by inserting the out-feeding end of the gun into a hole 26 cut in the outer wall 23.

The package 18 may be placed on the platform of a scaffold or it may be hung from a ladder or, if desired, it may be rested on the ground and a strip of the insulation drawn from the package and fed into the space by the air gun even when the gun is being used at substantial distances above the ground. The relatively high tensile strength of the strip of fibrous material coupled with the very light weight of the insulating material permits this to be done without breaking the strip.

In Figure 3 of the drawings, I have illustrated a blower or air gun 20 that may be employed to withdraw the insulating material from the package and feed it to the space to be insulated. This air gun comprises a casing 30 having therein a pressure chamber 31 communicating at its delivery end with a nozzle 32. The chamber 31 is of annular shape in cross section and forms with the wall of the nozzle at the entry end thereof an annular orifice 33. An annular rib 34 may be provided on the inner wall of the nozzle adjacent the orifice 33 to deflect the air entering the nozzle toward the center of the nozzle.

As the air enters the nozzle 32 it creates an inspirator effect which draws air from a chamber 37 formed at the inside of the annular pressure chamber 31. The end of the chamber 37 removed from the nozzle is provided with an opening 38 so that the inspirator action results in atmospheric air being drawn into the chamber. This draft of atmospheric air passing into and through the chamber 37 and through the nozzle 32 will draw the strip 15 of insulating material from the package, carry it through the air gun and forceably project it from the nozzle into the space to be filled with insulation.

The air gun may be provided with means for dividing the strip of insulation into short lengths or slugs prior to entry of the strip into the chamber 37. Toward this end there may be supported in the casing 30 adjacent the receiving opening 38 of the chamber 37 a pair of rolls 41 driven in synchronism by any desired mechanism such as an air turbine 42 suitably connected in driving relation with the rolls as by having its shaft coupled to the shaft of the upper roll, the shafts of the rolls being interconnected by intermeshing gears on the shafts. In place of the air turbine an electric motor may be employed.

The rolls 41 are provided with cutter blades 43 set in the rolls at equally spaced points about the peripheries thereof. The cutters on the feed rolls coact with one another during revolution of the feed rolls to cut the strip of insulating material 15 into short pieces 45 about an inch or so in length. The slugs of insulating material are carried through the chamber 37 and are blown out of the nozzle 32 by the air under pressure admitted to the chamber 31. The pressure of the air acting upon the insulating material either in

the form of a strip 15 or in the form of the slugs 45 tends to fluff up the fibrous material and thereby assist it in rapid recovery of its normal density.

Air under pressure is supplied to the blower from a suitable source of compressed air such as a small portable compressor or a tank of compressed air through a hose 51 carrying a coupling 52 threaded into the outer end of a passage 53 extending through a hand grip 55 secured to or integral with the blower casing, the inner end of the passage 53 communicating with the chamber 31 of the blower.

Means for controlling the flow of air to the blower may comprise a valve plunger 58 sliding in a bore in the hand grip and urged by a spring 59 to a position where the body of the plunger closes the passage 53. Means in the form of a trigger 61 pivoted on the hand grip and engaging one end of the valve plunger is arranged when manipulated to urge the plunger against the action of the spring so that a reduced portion 62 of the body of the plunger is aligned with the passage 53 and permits flow of air to the pressure chamber 31 of the blower.

The valve plunger when forced inwardly may also open a passage such as the passage 64 leading through a conduit 66 to the air motor or turbine when employed for driving the rolls 41 or the trigger 61 may be connected to operate a switch for closing the circuit of an electric motor if such device is used to drive the rolls 41. The means for driving the rolls and the means for controlling operation of the driving means may be of any conventional form and, forming only an incidental part of the present invention, need not be further described herein.

The insulation of the present invention is readily packaged in considerable quantities of light density insulation in a relatively small space and is readily withdrawn from the package during use. If desired, the insulating strip is cut during the operation of withdrawing from the package to form slugs simulating nodulated mineral wool and the slugs are introduced directly into the air chamber of a blower for distribution through the nozzle or delivery conduit to the space provided therefor. The nozzle or delivery conduit may be considerably smaller than those required in the past to distribute nodulated mineral wool and the entrant opening into the space to be insulated may be correspondingly smaller. The invention makes it practical to blow insulation into relatively small spaces such as those encountered in certain types of stoves and refrigerators. It also simplifies installing insulation between the walls of buildings as it obviates the necessity of forming large openings in the building walls for receiving the discharge nozzle. Moreover, the size of the blower and associated equipment may be reduced, which is an especially desirable feature adding greatly to the mobility of the equipment required for applying the insulation.

Various modifications may be made within the spirit of the invention and the scope of the claims.

I claim:

1. The method of packaging mineral wool insulation including the steps of slitting a fluffy mat of fine glass fibers along parallel spaced lines; of terminating the alternate slits short of one edge of the mat and the remainder of the slits short of the other edge thereof providing elongated sections joined together alternately at opposite ends to form a continuous strip, and rolling the slit mat in the direction of the slits into a plurality of juxtapositioned coils formed of the sections.

2. The method of producing a package of mineral wool insulation comprising the steps of forming slits in a mat of fine mineral fibers along parallel spaced lines; of terminating the alternate ones of the slits short of one edge of the mat and the remainder of the slits short of the other edge thereof providing long relatively narrow sections of insulation joined together end to end to form a continuous strip, rolling the slit mate under compression and in the direction of the slits to form a series of coils arranged in juxtaposition, and inserting the roll of coils in a package adapted to be opened at one end to render the free end of the coil adjacent the end of the package accessible for withdrawing the insulation in strip form.

3. The method of packaging mineral wool insulation including slitting a mat of mineral fibers along laterally spaced lines; of terminating the alternate slits short of one edge of the mat and the remainder of the slits short of the opposite edge thereof providing elongated sections of insulation joined at adjacent ends to form a continuous strip, and simultaneously compressing and coiling the sections in the direction of the slits to form a compact roll of juxtapositioned coils.

4. The method of producing a package of mineral wool insulation including slitting a mat of mineral fibers along laterally spaced zones; of terminating the alternate slits short of one edge of the mat and the remainder of the slits short of the other edge thereof providing sections joined together end to end to form a continuous strip of insulation, rolling the sections while in mat form in the direction of the slits to provide a series of juxtapositioned coils, compressing the sections during rolling the latter to reduce the normal volume thereof, and confining the compressed coiled sections in a package in a manner to render the end of the coil adjacent an end of the package accessible for progressively withdrawing the sections in strip form.

5. The method of producing a package of insulation including the steps of slitting a mat of glass fibers along laterally spaced zones; of terminating the slits alternately short of opposite edges of the mat to form interconnected juxtaposed sections and rolling the juxtaposed sections in the direction of the slits to a cylindrical package whereby the sections provide a continuous strip of insulation capable of being progressively withdrawn from the package.

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