July 3, 1934. C. S. SMALLISH 1,964,964

PROCESS OF FABRICATING HEAT INSULATING MATERIAL

Filed June 29, 1931 2 Sheets-Sheet 1

Fig. 1

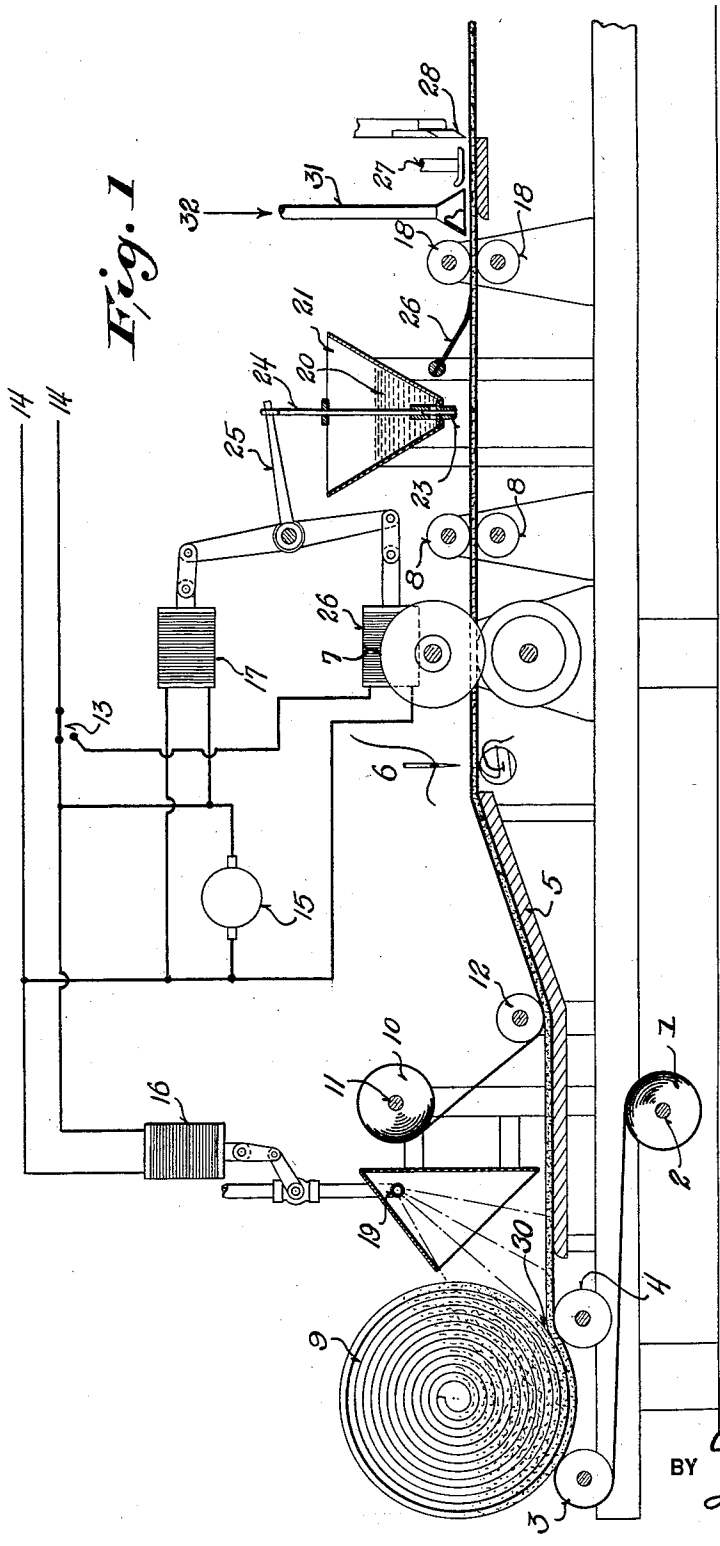
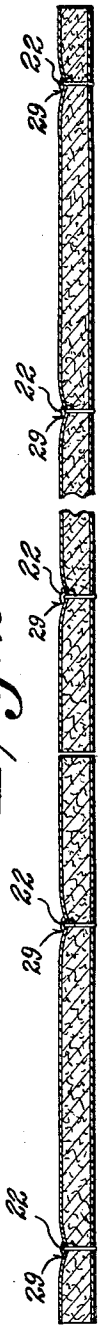


Fig. 2



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Fig. 3

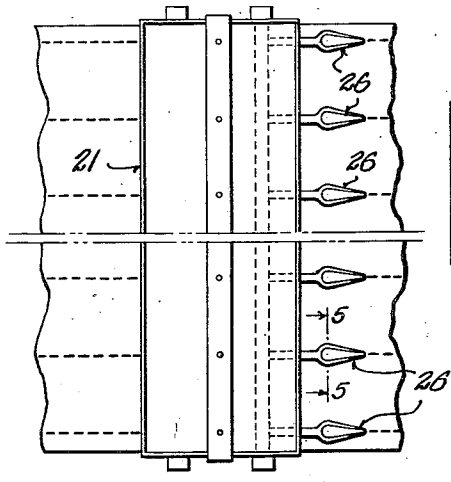


Fig. 4

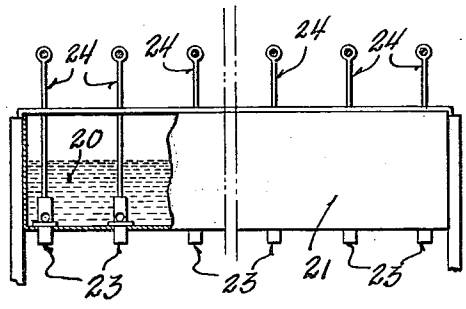
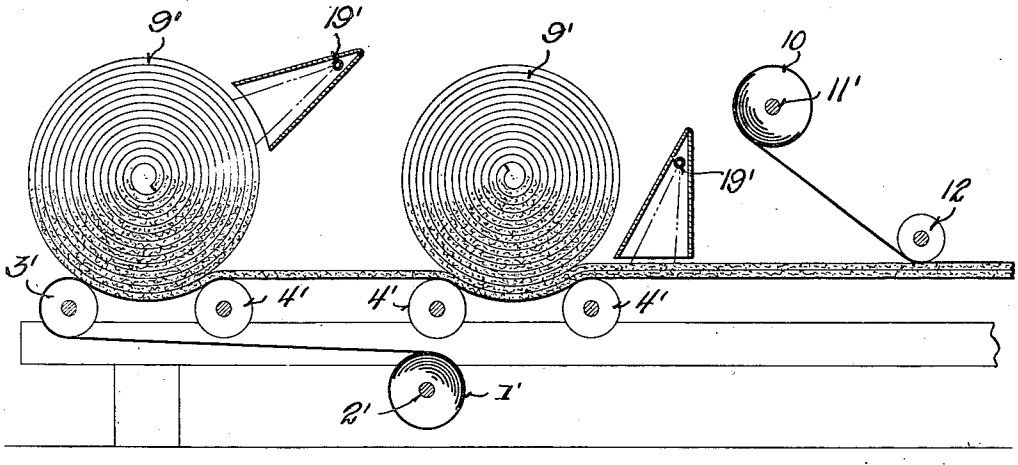


Fig. 5



Fig. 6



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UNITED STATES PATENT OFFICE

1,964,964

PROCESS OF FABRICATING HEAT INSULATING MATERIAL

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Application June 29, 1931, Serial No. 547,527

4 Claims. (Cl. 154—28)

The invention relates to a process for fabricating a quilted, lamellar structure composed of light, soft fibers supported and held in place between layers of strong, thin, pliable, relatively air-impervious sheet material by means of threads traversing the lamellar structure at spaced intervals, the perforations in one of the air-impervious sheets through which the threads pass being effectively sealed to prevent air infiltration.

In the design and construction of dwelling places and similar structures wherein comfortable living temperatures are maintained in spite of external climatic conditions, the use of materials to retard the escape of heat can materially reduce the amount of fuel required. Although the conservation of fuel resources is generally recognized as being of great importance, the supply of fuel is so abundant that there is little encouragement toward the use of heat-retaining means unless the same can be incorporated in the structure with a negligible expenditure of labor and material. Attempts to meet this condition have met with a limited measure of success and a general adoption of heat-retaining means such as would materially assist in the conservation of fuel resources has not been obtained.

From the standpoint of material expenditure, certain very soft, fluffy fibers are ideal for the purpose. Several factors interfere with the adoption of these fibers. The fibers are weakly coherent and when used in mass have practically no self-supporting mechanical strength. The fibers in this condition can usually only be utilized by the construction of retaining members with a prohibitive expenditure of labor.

The soft, inexpensive fibers which are ideally adapted to impede the traverse of heat energy must be used in conjunction with some means to supply the lacking mechanical strength and also in conjunction with a sealing means which will prevent the infiltration of air. Some have employed the structural portions of the building to provide mechanical strength and have attached the fiber thereto by some such means as an adhesive. Others have quilted the fiber between sheets of flexible material and have thus supplied the necessary mechanical strength and partially cut down the infiltration of air. However, this quilted material has heretofore only been produced at considerable expense and is imperfect in that the perforations for the quilting stitches allow an undesirable amount of air infiltration.

The purpose of this invention is to form from very soft fibers a quilted material of reasonable mechanical strength which can be produced and installed at an insignficant expenditure of labor and material and which will be free of the objectionable features of quilted materials formerly produced, such as air infiltration, etc. This invention makes possible the simple, continuous, economical production of a material without the above objectionable features, in a size and form which will permit its installation in a structure with a minimum expenditure of labor.

The invention consists in forming soft fiber into bats with the aid of conventional Garnett machines or other machines of special form. The formation of these bats is familiar in the art. The bats are formed in the conventional manner in spiral rolls and are unrolled in a special manner which permits the application of a flameproofing spray to the opposite sides of the bat in a single operation. As the bat is unrolled the fiber is passed continuously between two sheets of strong, flexible material, such as paper, and the whole united by quilting or stitching at spaced intervals, the material passing continuously through a stitching machine at the same rate of speed that the bat is unrolled. The sheet as it emerges from the stitching machine is divided into convenient widths by appropriate cutting means. The material is then rendered substantially air-tight by sealing the perforations produced by the stitching machine. This is accomplished by applying a sealing compound continuously to each row of stitches in the moving material and, if desired, drying the sealing compound with a blast of drying gas. The completed material emerges from the process in form ready for use.

The process of this invention is best described with reference to the accompanying drawings, in which:

Fig. 1 is a diagrammatic showing of the united steps of the process of this invention;

Fig. 2 is a section of the material produced;

Fig. 3 is a detail showing of the device used in the sealing step of the process;

Fig. 4 is another detail of the device used in the sealing step of the process of this invention;

Fig. 5 is a section of a device which completes the sealing step of the process of this invention;

Fig. 6 shows a special arrangement to be employed when more than one bat is used.

To start the operation a roll of sheet material 1 is supported upon spindle 2. Sheet material from roll 1 is drawn off and passed around roll-

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er 3, over roller 4 and across bed 5, through stitching device 6 and cutting device 7 to feed-rolls 8. A bat 9 is then placed in position above and between rolls 3 and 4. A roll of sheet material 10 is then placed upon spindle 11 and sheet material from roll 10 is drawn under presser roll 12, through stitching device 6 and cutting means 7 to feed-rolls 8. The bat 10 is then opened by spreading the free end of the roll upon the sheet material on bed 5. The process may then be started by closing switch 13 in energy supply lines 14—14, energizing the motivating device 15 and valve-actuating devices 16 and 17. Motivating device 15 is cooperatively connected with drive rolls 8—8 and 18—18 to drive the same. The aforesaid connection is not indicated in the drawings. When switch 13 is closed as aforesaid there simultaneously occurs five principle operations, first; a feeding through the machine of the material being treated; second, a spraying of both sides of the fiber by means of the spray 19, third; a quilting of the material, fourth; dividing the material into convenient widths by means of the cutting device 7, and fifth; an application of a sealing compound 20, contained in the hopper 21, to the stitch perforations.

The process above described for treating and combining materials produces an almost ideal material for heat insulating purposes. The process permits the employment of the most easily available materials and combines them in a direct, continuous manner, which is so simple and effective that the cost of the finished material is very low. The importance of producing material at a low cost has been outlined above. The finished product also meets the requirements of being relatively flameproof, impervious to air infiltration, well adapted to impede the flow of heat, and it also is in a convenient, easily handled form. The latter property of the material is of great importance. The material may be made in such dimensions that it may be tucked in place in spaces normally a part of conventional building construction. The material is light, strong and flexible, and can be put into place and fastened with negligible labor, thus completing the requirement of low cost as installed.

The operation of the process of this invention is indicated in one form in Fig. 1, wherein the fiber employed is introduced by unrolling a single bat. In this case an atomizer spray 19 is directed into the cleft 30 in the unrolling bat. This relation of parts permits the application of the spray to both sides of the bat with the use of only one spray. The spray compound is one imparting flameproofing properties, such as a dilute solution of sodium silicate. Certain animal fibers are relatively flameproof and the use of the spray is not necessary in such a case.

At times it is desirable to employ a greater thickness of fiber than may be conveniently provided in a single bat, in which case the type of construction shown in Fig. 6 is employed, wherein two bats 9'—9' are used. With this type of construction sprays 19'—19' are employed and the remainder of the process is as described where one bat is employed.

The application of the sealing compound to the perforations is accomplished by adjusting the tension of the stitching device so that the stitches 22, as shown in Fig. 2, cause furrows 29 in the material. These furrows pass beneath a reservoir or hopper 21 which is filled with sealing compound, protected with a floating layer of oil, if desired. Detailed views of the hopper 21 are shown in Figs. 3 and 4. Above each of the traveling furrows 29 is a valve, especially constructed from a centrally bored cylindrical body 23 inserted in the bottom of the hopper with an intersecting bore in the cylindrical body above the bottom of the hopper. Slidably mounted in the central bore is a valve plunger 24. Actuating means 17 is connected therewith by means of a bell-crank 25.

When the process is motionless, actuating means 17 is released and return means 26 is energized, causing valve plunger 24 to descend positively until its lower extremity is exposed below the bottom of the cylindrical body 23. This construction reduces the possibility of plugging and caking of the valve and ensures an immediate supply of sealing compound whenever the process is started.

The most effective sealing compounds are rather dense, viscous fluids, and when dropped upon material moving at high speed do not adhere with sufficient rapidity. For this reason the process employs spreaders 26, which are resilient members of arched construction, as shown in Fig. 5, which press the sealing compound into the furrows, substantially sealing each individual stitch. To assist in the sealing operation a blast of drying gas 32 may be introduced through drying hood 31.

The local application of the sealing compound to the stitches and their perforations only, is one feature of this invention. If the sealing compound were to be spread over a substantial area of the sheet the pliability and strength of the material would be greatly impaired.

It is possible to operate the process of this invention by dispensing with the cutting means 7 and manufacture the material directly in the desired width. However, it is desirable to fabricate the material in greater widths and to employ cutting means 7. It is also possible to vary the location of the feed rolls 8—8 and 18—18. It is also possible to employ a greater or lesser number of feed rolls or to incorporate them in the construction of the cutting device 7 or the stitching device 6, all of which combinations are contemplated in this invention. The bats may also be fed directly from the apron of a Garnett machine onto the lower strip of sheet material, obviating the necessity of the rolling and unrolling operations.

Indicated at 27 in Fig. 1 is a presser foot which may be momentarily depressed, stopping the flow of the material and permitting a shear 28 to part the material, if so desired.

The sheet material employed in this invention may be of many different varieties. A good grade of roofing paper treated with asphalt of ordinary properties can be employed. The sealing substance may also take a wide variety of forms. One which is quite satisfactory is a concentrated solution of sodium silicate with or without additions of small amounts of other substances.

The process of this invention has been fully described as practiced in one specific manner with minor variations. The description is specific and it is not intended that the protection of Letters Patent be limited strictly thereto, but that protection be given to the full spirit of this invention as represented by the scope of the appended claims.

What I claim as my invention is:

1. The process of fabricating heat insulating material which consists in unrolling a spiral bat

of fiber to form a rolled and unrolled portion with a cleft therebetween, spraying a flameproofing material into said cleft to cover both sides of the unrolled bat, enclosing said sprayed fiber between two layers of sheet material to form an enclosure, stitching the enclosure in spaced apart parallel rows, and applying a sealing compound to said stitches.

2. The process of fabricating heat insulating material which consists in unrolling a spiral bat of fiber, thereby forming a rolled and unrolled portion with a cleft therebetween, spraying a flameproofing material into said cleft to cover both sides of the unrolled bat, enclosing said sprayed fiber between two layers of sheet material to form an enclosure, stitching the enclosure in spaced apart parallel rows, parting the enclosure into strips of predetermined width, and applying a sealing compound to said stitches.

3. The process of forming a quilted material which consists in placing a spiral bat of fiber upon a moving strip of asphalt paper, allowing said bat to unroll upon said moving strip to form a rotating rolled portion and a translationally moving unrolled portion with a cleft therebetween, spraying a flameproofing material into said cleft to cover both sides of said unrolled portion, covering said moving unrolled portion with a second moving strip of asphalt paper to form a paper-faced lamella of fiber, stitching said paper-faced lamella in spaced apart parallel rows, parting said paper-faced lamella into strips of predetermined widths, and applying a sealing compound to said stitches, all while said paper-faced lamella is moving.

4. The process of fabricating heat insulating material which consists in unrolling a spiral bat of fiber upon a moving strip of asphalt paper to form a rotating rolled portion and a translationally moving unrolled portion, spraying the outer periphery of said rolled portion, unrolling a second spiral bat upon said first mentioned bat to form a translationally moving double layer of fiber, spraying the upper surface of said double layer, covering said double layer with a second moving sheet of asphalt paper to form a paper-faced lamella of fiber, stitching said lamella in spaced apart parallel rows, parting said lamella into predetermined widths, and applying a sealing compound to said stitches, all while said lamella is moving.

CLARENCE S. SMALLISH.