July 12, 1938. L. D. MORTON 2,123,761

BUILDING INSULATION

Filed Sept. 25, 1936 2 Sheets-Sheet 1

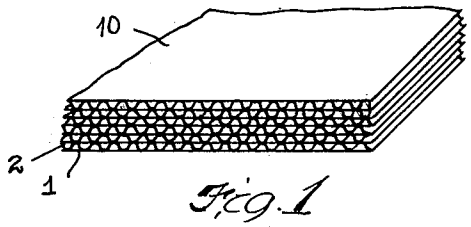

Fig. 1

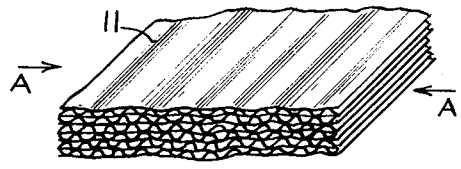

Fig. 2

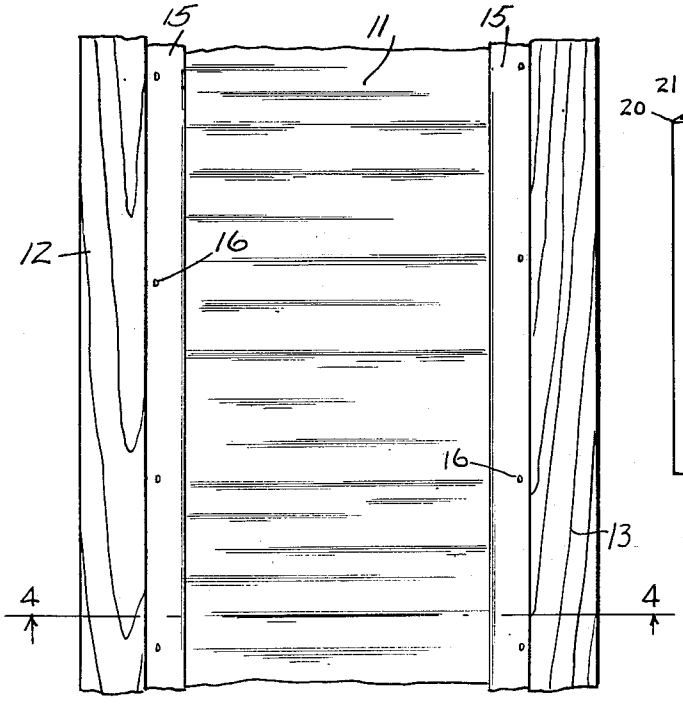

Fig. 3

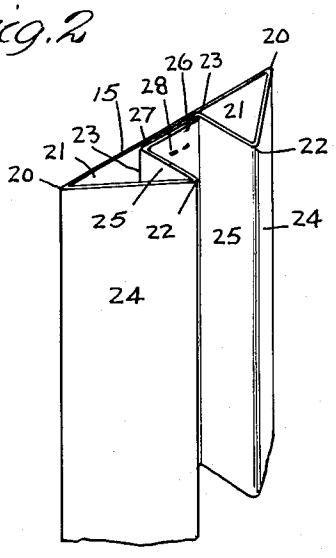

Fig. 5

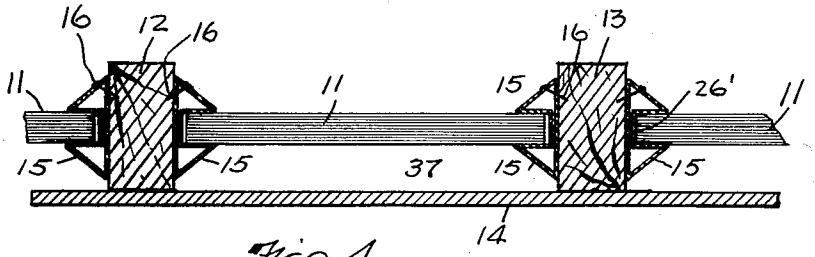

Fig. 4

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BUILDING INSULATION

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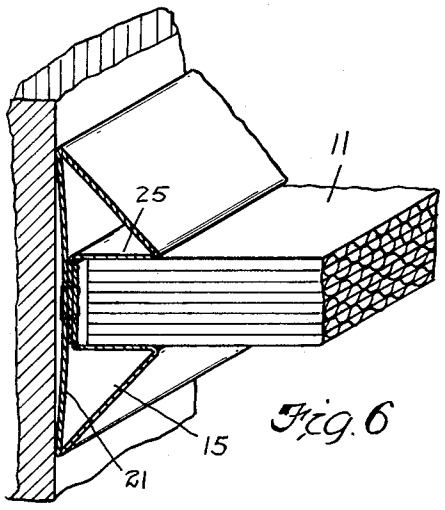

Fig. 6

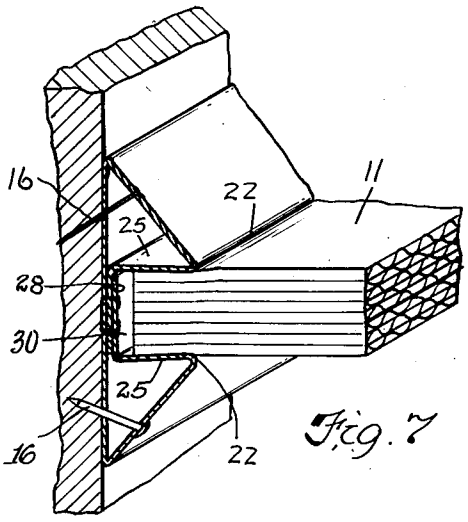

Fig. 7

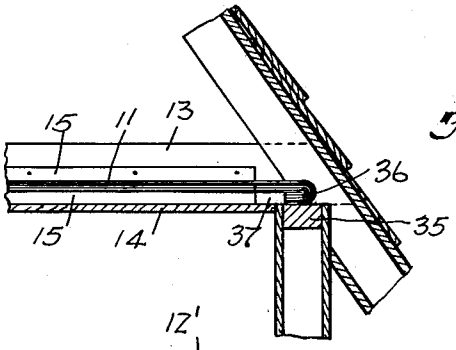

Fig. 8

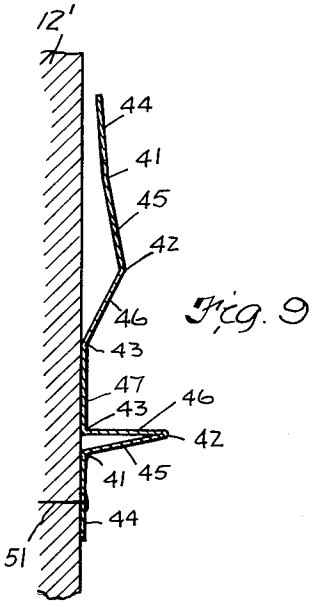

Fig. 9

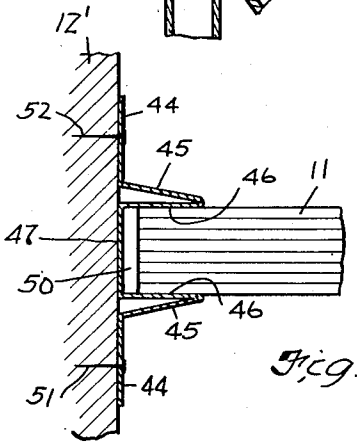

Fig. 10

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Patented July 12, 1938 2,123,761

UNITED STATES PATENT OFFICE

2,123,761

BUILDING INSULATION

Lawrence D. Morton, Sandusky, Ohio, assignor to The Hinde and Dauch Paper Company, Sandusky, Ohio, a corporation of Ohio

Application September 25, 1936, Serial No. 102,522

7 Claims. (Cl. 20—4)

This invention relates to thermal insulating means particularly adapted for the insulating of dwelling houses, and having features which lend it especially to convenient and economical application either in an already completed house or during construction. The invention also relates to means for applying such insulation and maintaining it in place in such a way as to combine facility of application, security after being installed, avoidance of loss of heat around fastenings, sides, ends and so on. Other purposes include the retention of flexibility and elasticity during handling and after installation, reduction of the effective size of air cells with respect to the dimensions of corrugations, and prevention of shrinkage in use.

This invention is especially adapted for employment of the blanket or mat material which forms the subject matter of my Patent No. 2,018,800, issued October 29, 1935, for "Fireproof thermal insulator". Reference is made to that patent for such points as are not covered in detail here, including particularly the exact construction whereby the fire resistant properties which characterize my insulation are attained. As there fully described, the mat is built up of several sheets of smooth and corrugated paper, laid in alternate succession, fastened together by adhesive, and usually employing thinner paper stock and finer corrugations than for box making board. Although it may be used in smooth condition for the purposes of the present invention, it is preferably employed therein after certain modifications which produce greater flexibility and elasticity, as described hereafter.

To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawings and the following description set forth in detail certain structure embodying the invention, such disclosed means constituting, however, but one of various structural forms in which the principle of the invention may be used.

In the accompanying drawings:

Fig. 1 illustrates a portion of the insulating sheet or blanket which constitutes the major part of the material used in my present invention;

Fig. 2 illustrates the material of Fig. 1 as it may be modified for the present purpose;

Fig. 3 is a plan view of a horizontal installation of my improved insulator, or may be considered as a face view of a vertical installation;

Fig. 4 is a section on the plane 4—4 of Fig. 3, but extending further laterally so as to illustrate a plurality of insulated bays;

Fig. 5 is a perspective view of a fastening strip;

Fig. 6 corresponds to Fig. 5, showing a fastening strip with an insulating mat placed therein but with the strip not attached and the mat not clamped;

Fig. 7 is a corresponding view showing the fastening strip secured to the house framing and the mat clamped in the strip;

Fig. 8 is a vertical section showing a way of finishing off the end of a section of a mat at the stud plate of a dwelling house;

Fig. 9 is a transverse vertical section illustrating a fastening strip alternative to the form shown in Fig. 5, ready to receive the mat; and

Fig. 10 is a view corresponding to Fig. 9 showing the insulating mat in place and the strip permanently fastened.

Present Fig. 1 corresponds to Fig. 1 of my Patent No. 2,018,800 and illustrates the insulating mat 10 as initially manufactured. It is next modified as shown in Fig. 2 by slightly crumpling or compressing transversely to the length of the corrugations, that is, in the direction of the arrows A. The mat so treated is designated by reference character 11. The crumpling effect is shown by shading across the mat in Fig. 3. Figs. 3 and 4 show that the mat comes in indefinite lengths, and in widths to fit usual building spaces. Obviously it may also be cut to size at time of installation.

As explained in Patent No. 2,018,800, my mat or blanket 10 comprises a plurality of flat sheets 1 and corrugated sheets 2 of thin close textured tough paper, preferably kraft. These sheets are secured along contacting lines by a fireproof cement such as sodium silicate, thus forming the entire pile of sheets into a cellular mat containing a minimum quantity of the solid material, paper, and a great number of individually small air cells in the corrugations.

Although the mat in its smooth form, Fig. 1, is capable of application to houses or other structures for thermal insulation, its value for such purpose is improved by crumpling into the condition of Fig. 2, which has the several effects of shortening the mat, making it more flexible, more elastic, more resistant to transmission of thermal differences, and more resistant to fire.

By shortening the mat during manufacture subsequent shrinkage is eliminated; for example, if a strip several feet long is installed, any shrinking tendency of the flat sheets 1 is compensated for locally by the excess paper in the wrinkles, and

does not affect the overall length nor cause gaps at the ends. Similarly, expansion in such a strip will only deepen the wrinkles rather than cause extensive bulging.

Again, the wrinkling of the initially smooth sheets imparts a flexibility and springiness similar to that of the corrugated sheets, lessening the stiffness of the mat, whereby it can be more readily handled, bent, fitted to irregular surfaces and the like, and among other advantages maintains a tighter fit at ends and junctions or in such places as **36**, Fig. 8.

The crumpling affects both the corrugated and smooth sheets and makes the air cell walls irregular, thus increasing frictional resistance to any convection currents within the cells, with the consequent effect of still further inhibiting transmission of temperature changes or of currents of air and gas from combustion. This enhances the fire resistant effect, which effect is discussed in my Patent No. 2,018,800.

These mats **11** are fastened to joists or studding by fastening strips which prevent air circulation at the mat edges, which support and preferably clamp the mat in place along the entire edge, and which can themselves be applied and have the mat fastened therein, by access from one side only of a ceiling or wall surface, for example by working from above in Fig. 4. The typical installation in a completed house is that in an unfloored attic, and Figs. 3 and 4 may be taken either as representing such an installation or as showing the installation in a wall, one side of which is open. In those figures the joists are indicated at **12** and **13**, and the ceiling of the room below is indicated at **14** in Fig. 4.

Fastening strips **15**, Fig. 5, are applied along both edges of a mat strip **11**, in the manner shown in Fig. 6. Such mat strip with fastening strips applied is placed in a bay between two joists, the strip **11** of course being of suitable width for the purpose. Obviously in the situation of Fig. 4, access can be had only from the top and the fastening strip is accordingly secured to the joist by means of nails **16** driven from above. On account of the peculiar construction of this strip, these nails are sufficient both to secure the strip and mat permanently in position and also to clamp the strip upon the mat as shown in Fig. 7.

The strip is so constructed that driving nails into approximately the position shown, or applying pressure against the bottom of the strip groove causes the clamping. The most desirable form of strip, as indicated in Fig. 5, consists of a single piece of tough springy fiber board, which had best not be of corrugated material. Such strips come in lengths convenient for handling, for example, three or four feet, and are constructed by folding a long narrow flat sheet lengthwise inward acutely to form the edges **20**, thus defining a central portion **21** which becomes the back of the finished strip **15**. Further lengthwise folds at **22** and **23** form a deep groove supported outwardly by sloping shoulders **24** and having inner side walls **25** and lapped bottom **26**, **27**, against the inner face of the back **21**. The fastening strip is held together by appropriate means, such as staples **28** at intervals.

As shown in Fig. 6, some camber or bend inwardly is given to the bottom **21**, and the result is that when the bottom is flattened out, the sides **25** converge slightly, thus pinching the mat **11** along the edges **22**. It will be observed that the application of nails such as **16** either on one side as in Fig. 4 or on both sides, as in Fig. 7, or placing a mat of such width that it presses against the bottom **26** of the groove (as indicated at **26'**, Fig. 4) will cause this clamping effect, which prevents sliding and sagging of the mat **11**. Such clamping is also advantageous as completely inhibiting all circulation of air to and around the edge of a mat, especially where there is some vacant space such as **30**, Fig. 7, between the edge of the mat and the bottom **26** of the groove.

To finish off the end of a strip between two attic joists, the mat **11** is carried over the stud plate **35** and folded back beneath itself a short distance as at **36**, thus stopping circulation of air in the space **37** between the mat **11** and the ceiling **14** below; see Fig. 8

An alternative form of fastening strip is illustrated in Figs. 9 and 10. This strip consists of the same sort of material as would be used for the strip **15**, but initially made flat with creases at **41**, **42** and **43**, running lengthwise, thus defining long parallel areas **44**, **45**, **46** and **47**. These creases are alternately in opposite faces of the strip, thus predisposing the strip to fold upon itself as in the lower part of Fig. 9 and in Fig. 10, forming a groove **50** in which the edge of the mat **11** will be held. To apply this strip to a joist such as **12'**, Figs. 9 and 10, it is put on flat, and the bottom section **44** nailed as at **51** to the joist. The strip is then partially folded as shown in Fig. 9 to establish the lower section **46** as a shelf upon which the edge of the mat **11** can be laid, while the upper portions **46** and **45** are still kept flat, or nearly so, and up out of the way. These upper sections are then folded down as in Fig. 10 and nailed as at **52**.

From the foregoing it will be seen that I have provided an insulation of the mat type, including means for fastening it in place, which is readily appreciable either to old or new construction, is cheaply manufactured and easily applied, which lends itself readily to being so placed in service as to cut off convection currents of air and maintain dead air spaces not only within itself but between itself and adjacent surfaces of the building. My invention has the further advantages of being inexpensive to manufacture and apply, of being light in weight, of being held in position by its fastening means so as not to sag or settle, and of being fire resistant.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the structure herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:

1. Insulating means comprising a flexible mat of cellulose sheet material containing a large number of small air spaces, and securing means for the edge of said mat, said securing means comprising a flange-and-groove element, said groove being adapted to receive the edge of said mat, said groove having top edges adapted to bear on the mat faces, and a flange adapted to be secured to a supporting structure.

2. Insulating means comprising a flexible corrugated paper mat and supporting strips for the edges of said mat, said supporting strips each including a cambered surface generally opposed and parallel to the edge of the mat and surfaces opposed and parallel to the faces of the mat near the edges, said last-named surfaces being spaced mat thickness apart, outer edges terminating said last-named surfaces and adapt-

ed to engage faces of the mat and to be brought toward one another by pressure upon the first-named surface, thereby clamping the mat between said edges.

3. A fastening strip for an insulating mat, said strip comprising an elongated resilient structure consisting of side elements of triangular cross section, and a bottom between said side elements, the diagonals of said side elements being connected to the outer portions of said bottom, and a flat part of said side elements being connected to said bottom, and another flat portion of said side elements being connected to said bottom and to each other thereby forming a groove adapted to receive the edge of the mat.

4. A fastening element of the character described, comprising an elongated strip of resilient material, a plurality of longitudinal grooves therein, defining longitudinal areas symmetrically disposed on each side of a longitudinal axis, the outermost of said areas being adapted to be permanently secured to a supporting structure, the middle of said areas being adapted to lie in the plane of said outer areas, and the intermediate areas being adapted, when the strip is transversely folded, to form respectively upper and lower shelves and upper and lower braces for said shelves, said shelves forming sides of the groove whereof the middle area forms the bottom.

5. Insulating means comprising a mat of less width than the inter-joist space in which it is adapted to be placed, said mat having air passages therein open towards the joists, and means for supporting the edge of said mat along a joist, a dead air space at the ends of said passages formed by said supporting means, and a closure between said mat and joist also formed by said supporting means.

6. Insulating means comprising the combination of a flexible mat of less width than the inter-joist space in which it is adapted to be placed, said mat having transverse air passages therein, and separate means adapted to be disposed to extend across and engage both mat faces near the edges, thereby closing said air passages, said means also being adapted to secure the mat to the adjacent joist.

7. The method of making an insulating mat of many sheets of alternately varying character which comprises assembling and interadhering such sheets alternately flat and corrugated into a unitary article, with the corrugations all extending in the same direction, followed by shortening said sheet in a direction transverse to the corrugations, thereby wrinkling the flat sheets, but to a degree not sufficient to close the corrugations.

LAWRENCE D. MORTON.