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BUILDING INSULATION

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This invention relates to improvements in building insulation.

It is the primary object of the invention to provide a novel and improved form-sustaining bat which is readily handled, which provides a tight seal between the studs irrespective of minor deviations from standard spacing and which, notwithstanding the use of stitching for holding the bat in shape, maintains a vapor-tight seal which is substantially continuous throughout the entire surface insulated.

With respect to handling, it is desirable that the bat should have a compression fit between the studs and consequently lateral compressibility is desired; yet it is desirable that the bat should be so rigid or stiff in a longitudinal direction that it can readily be lifted and manipulated without folding or collapsing. The combination of longitudinal stiffness with lateral compressibility is an important objective of the present invention achieved by a longitudinal trussing effect produced by the construction hereinafter to be described.

In order to provide the desired lateral compressibility and assure the desired tight seal between the studs, I prefer to use no adhesive whatever in the fiber comprising the bat. Any adhesive or bonding agent in the fiber will either destroy its resilience or reduce its thermal insulating value or both. It is an important object of the present invention to provide a construction in which the bat is maintained in the desired form without the use of any adhesive or bonding agent in the fiber. In this connection I prefer to maintain the form of the bat by rows of stitching extending longitudinally thereof and traversing not only the bat but the plies of paper board above and below the bat, and it is an object to so form the paper board as to preserve lateral compressibility of the product while at the same time providing the necessary vapor seal and assuring longitudinal stiffness.

More specifically stated, other objects of the invention are: the provision of an insulating bat having a differential in stiffness as between its mounting face and its inner face, the mounting face being the more rigid whereby the mounting faces of successive bats may be overlapped to provide a continuous seal, the inner faces of the respective bats being sufficiently collapsible to permit of an overlap of the outer face despite the fact that the inner and outer faces are initially of the same dimensions; the provision of a bat of wedge-shaped form which is deformable to provide a close fit between studs which are either at insufficient spacing or at excessive

spacing; and particularly the provision of a bat in which the mechanical stitching of the insulation bat is accomplished independently of, and protected by, an impervious unstitched vapor-seal ply, or a plurality of such plies, which are of greater width than the bat proper, whereby to overlap the studs between which the bat is positioned.

A further object is generally to simplify and improve the construction, arrangement and operation for one or more of the purposes mentioned, and still other objects will be apparent from the specification.

In the drawing:

Fig. 1 is a fragmentary view in perspective showing building insulation embodying my invention.

Fig. 2 is an enlarged detail view in section through an insulating bat embodying the invention.

Fig. 3 is a view similar to Fig. 2 showing a modified embodiment of the invention.

Fig. 4 is a fragmentary detail view in vertical section showing the manner in which successive bats are overlapped in sealed relation.

Like parts are identified by the same reference characters throughout the several views.

The studding 5 and the sheathing 6 are conventional, the studs usually being approximately spaced on predetermined centers. However, the studs are sometimes slightly greater or less than standard distances between studs.

The bat proper 7, is preferably fibrous but a wide variety of insulating material may be used. For example, the bat 7 may consist of rock wool, glass fiber, asbestos, small paper flakes, wood fiber, hair, or cane fiber, etc. I have used to advantage a homogeneous mixture of fibers having resilience as well as cohesion, short fly fiber of wood or bark being mixed with asbestos or the like and later having long fibers of wood, bark, cotton, hair, or other material introduced into the mixture to provide resilience, while retaining the cohesion.

Preferably, I use a shredded redwood bark fiber either in its natural state (in which it is highly fire resistant) or with a fireproofing coating added. Since the invention as herein set forth is independent of the particular materials used, it will be understood that the materials above specified are merely illustrative.

The bat 7 is confined between a cover ply 8 and a channel ply which comprises a back 9, outwardly converging sides 10, and lateral flanges 11, the cover ply 8 and back 9 being united

through the bat by longitudinal rows of stitching at 12. The face ply 8 and the channel ply comprising the back 9, sides 10, and flanges 11, preferably comprise strong paper such as kraft paper, and I prefer to use about four rows of stitching 12 lengthwise of the standard bat.

The stitching is incorporated under sufficient tension to compress the bat slightly along the lines of stitching. The rows of stitching divide the channel and cover ply 8 into a series of pockets extending longitudinally of the device. Within these pockets the fibrous material of the bat is free for expansion and compression with its natural resilience virtually unimpeded. The back wall 9 of the channel will preferably bulge slightly between the side walls 10 and between the successive rows of stitching at 12, as clearly indicated in Fig. 2, and this bulging will be somewhat accentuated when the device is deformed for insertion between studs in the manner shown in Fig. 1. The slight initial bulging facilitates the lateral compression of the product.

The flanges 11 and the cover ply 8 are substantially in the same plane and are reinforced by an additional ply or plies constituting facing or mounting web and providing a vapor seal. These may constitute sheets 17 and 18 of kraft paper and an intervening ply of asphaltum as indicated at 19 in Fig. 2, or, alternatively, I may employ a single ply 18 of kraft paper and a thin coat of asphaltum (or aluminum foil, or plastic varnish, or other impervious material) at 20 as shown in Fig. 3, the impervious coat being protected within the outer ply 18 of paper. Regardless of whether the facing or mounting and vapor sealing plies are made in accordance with the disclosure of Fig. 2 or the disclosure of Fig. 3, they are in either case treated with ribbons of plastic adhesive, preferably of a waterproof nature, such as hot asphaltum, such ribbons being applied at 15 over each flange 11 and at 16 over each row of stitching 12 so that when the vapor seal ply or plies are assembled onto the bat and channel the bat will be encased in a strong envelope from the back of which vapor may escape but the front or mounting face of which will be substantially impervious to vapor. The ribbons of hot asphaltum could be applied directly to the flanges 11 and the cover ply 8, but in accordance with a method application hereinafter to be filed, I have found it advantageous to apply the asphaltum in the first instance to the facing or mounting web at such intervals as to overlie the areas to which adhesion of the mounting web is desired.

I have found that the combination of the mounting web and the cover ply 8 and the channel flanges 11, with intervening ribbons of asphaltum has a truss-like action contributing materially to the desired longitudinal stiffness, while permitting, due to the space between such ribbons, the desired lateral compressibility.

The ply 18, together with plies 17 and 19, or 20, as the case may be, are bonded by the adhesive ribbons 16 to the cover ply 8 of the bat and also to the flanges 11 of the channel within which the bat is confined. It is particularly noteworthy that the asphaltum or other adhesive used to constitute the ribbons 16 not only cements the various plies together, but also fills the perforations resulting from the stitching and cements the threads which provide the stitching at 12 whereby to distribute the stress of such thread upon the faces of the inner and outer paper plies

8 and 9 and to prevent any tearing or slipping of the threads. The bonding cementitious ribbons 15 and 16 are preferably carefully metered as to thickness to be of uniform thickness throughout so that the resulting product will be smooth and free of eccentric bulging and will be of uniform flexibility.

Asphaltum is an ideal adhesive for the purposes of the present invention since it is thermoplastic and may readily be conditioned for application in relatively thick ribbons to provide the desired truss effect in conjunction with the rows of stitching. After application, the adhesive becomes fairly rigid without being so rigid as to crack. In actual practice the asphaltum is subjected to very little bending. The product is relatively stiff in a longitudinal direction, requiring no bending longitudinally in normal application. Such yielding as is involved in the lateral compressibility is accommodated by the deformation of bat material which lies in the pockets between the stitching and between the rows of asphaltum.

The particular method and apparatus employed in the manufacture of the product are not pertinent to the present invention. While I have referred above to the fact that the asphaltum is preferably applied initially to the sealing ply or plies, it will be understood that so far as the present invention is concerned it might be applied in ribbons to the flange 11 and the cover ply 8. In practice the web of paper providing the channel is formed and filled with the bat in a continuous operation, in the course of which the cover ply 8 is applied over the bat and the stitching is done. As the assembled bat, channel, and cover ply advance in the course of such operation, the sealing ply or plies are treated with ribbons of hot asphaltum which remains plastic until bonded to the flanges of the channel and the cover ply of the bat.

In the construction shown in Fig. 3 the thin coat of asphaltum, aluminum foil or other impervious material is preferably applied by means of a roller to the web 18 under pressure, and thereafter the bonding ribbons are applied thereon at 15 and 16, preferably in a separate operation.

The channeled web within which the bat is confined is of such form, due to the convergence of its sides 10 toward its flanged margins, that the channel is relatively narrower adjacent the flanges 11 and is relatively wide at the rear, remote from such flanges. Adjacent flanges 11 the width of the channel is preferably slightly less than the conventional distance between studs 5, whereas at the rear of the channel the rear wall ply 9 is slightly greater than the conventional distance between studs.

To further enhance the truss effect and thereby contribute to longitudinal stiffness, the rear ply 9 is reinforced by a ply 21 which is preferably made of kraft paper bonded to the channel back ply 9 by means of strips or ribbons of adhesive 22 which, like the similar adhesive ribbon 16, may simply comprise layers of asphaltum. It is not essential to the invention that a vapor seal be provided at the rear face of the bat since the vapor seal provided at the front face is substantially impenetrable to vapor. The adhesive ribbons 22 anchor the threads used to provide the stitching at 12, as well as holding the reinforcing ply 21 in place. The reinforcing ply is preferably of materially less width than the rear ply 9 so as to leave the corner of the bat free for compression.

The fact that the bat, at its rear face, is materially wider than the conventional space between studs, assures a tight fit between the bat and the studs whether the studs are exactly at proper spacing or whether their spacing slightly exceeds standard. At the same time the fact that the bat is somewhat less wide than the conventional spacing between studs adjacent the flanges 15, ensures against any buckling of the bat when the flanges 11 are tacked or stapled to the studs, even though the studs may be somewhat closer together than is standard. It is important that the greatest width of the wedge-shaped structure is remote from the mounting flanges. If it were directly at the mounting flanges it could not yield appreciably without serious buckling of the webs. Being remote from the mounting flanges it can yield despite the fact that the flanges are stretched under tension by the operator in the course of their application to the studs.

Due to the multiple plies at the front of the bat, and particularly to the vapor-proofing comprising either the continuous asphaltum layer at 19 or the aluminum foil or asphaltum layer at 20, the front of the bat will have a considerably greater resistance to distortion than the rear of the bat. This differential in resistance to distortion is of advantage in the assembly of a plurality of consecutive bats in a single stud or joist space. Instead of merely abutting the ends of the consecutive bats, the end of one or both of the bats including the insulation 7, the side walls 10, the rear ply 9, and the rear reinforcing ply 21, may be slightly crumpled to an extent sufficient so that the insulation bats will be united under pressure while the several plies comprising the mounting web and including the flanges 11 and the plies 17, 18 and 19, will overlap as shown in Fig. 4, the face plies being substantially uncrumpled and flat in perfect face contact to provide a continuous vapor seal between the studs, while the insulation bats provide a substantially continuous thermal seal between the studs.

In practice, the assembly above described is noteworthy in the convenience with which it may be handled. It is readily cut but is adaptable to most conditions without requiring cutting. It is so reinforced by the combination of paper webs and bonding ribbons of asphaltum (or other impervious flexible adhesives) and by the use of stitching cemented by the adhesives that the resulting product is not flabby but is sufficiently form-sustaining to be unitarily handled with substantial rigidity, still retaining, however, lateral compressibility and requiring some pressure for the positioning of the bat between studs, thus assuring a firm and adequate contact and a satisfactory hermetic and vapor seal, as well as thermal insulation.

I claim:

1. Building insulation comprising a bat and an enclosure for said bat including a channel and a mounting web, the channel having lateral flanges affixed to said mounting web and having sides converging toward each other in the direction of said mounting web and flanges, said channel having an outer web materially greater in width than the portion of the mounting web intervening between said sides.

2. Thermal insulating comprising a bat of insulating material, a channel having a bottom and sides between which said bat is disposed, the sides of the channel being convergent toward each other away from said bottom, a cover ply

extending between the sides of the channel across said bat, stitching extending through the cover ply, the bat, and the bottom of the channel, a mounting web spanning the cover ply and channel, flange means projecting laterally from the channel and connected to the mounting web and channel, and a waterproof adhesive covering said stitching and joining said mounting web and cover ply.

3. Thermal insulation comprising the combination with a channel provided with a relatively broad base and side walls converging toward each other away from the base, of a bat of thermal insulation within said channel between said walls, a cover ply at least substantially spanning said bat adjacent those portions of said walls which are closest, flange means projecting laterally from said wall portions for positioning the insulation upon and between building studs, rows of stitching through the cover ply, the bat, and the base of the channel, adhesive means providing a vapor seal substantially continuously over said rows of stitching, a facing web to which said flanges are connected, and an extension of such adhesive between the facing web and the cover ply.

4. A thermal insulation device comprising an elongated bat of fibrous compressible insulating material, a channel having a base portion and sides converging toward each other away from said base portion, stitching connecting the bat to the channel, and a facing member having materially greater body than said channel and provided substantially continuously with a vapor sealing moisture-proof material spanning said bat and channel and covering said stitching and connected with the convergent side portions of said channel along lines remote from the base thereof, whereby said bat is completely enclosed save at its ends, the end portion of the channel being compressible more readily than said facing member whereby to permit the facing members of longitudinally successive devices to be overlapped when the ends of the channels of such devices are compressed into abutment.

5. The device of claim 4 wherein the marginal portions of the convergent sides of the channel are flanged outwardly and said facing member is extended over the outwardly flanged portions aforesaid and adhesively joined thereto.

6. An insulation device comprising the combination with a relatively heavy mounting member having margins so spaced as to be adapted to be secured to the studs of a standard building structure, of an insulating body carried by said mounting member between its margins and comprising a face remote from said member and sides divergent away from said mounting member, flanges on said sides, and means connecting said side flanges in general parallelism to said mounting member, the said face being materially wider than the portion of said mounting member intervening between said sides and the divergence of said sides being such that said sides at points remote from said mounting member are more widely separated than the normal distance between studs, while adjacent said mounting member said sides are at least as narrowly spaced as the normal distance between studs.

7. The device of claim 6 wherein the said body is provided with a space between its sides and a bat of insulating material fills such space, and rows of securing stitching pass through said bat and portions of said body, said rows of stitching being covered with water-resistant material in

adhesive connection with said mounting member.

8. The device of claim 6 wherein a cover web lies adjacent said mounting member; a bat of insulating material fills the space between the cover web, the sides, and the means connecting said sides; stitching extends through said cover web and bat and means, and an adhesive material bonds said cover web to said member and provides a vapor seal for the bat and said rows of stitching.

9. A thermal insulating device comprising the combination of means providing an elongated sheath and resilient fibrous bat means substantially filling the sheath, of laterally spaced rows of stitching extending longitudinally of the sheath and traversing said bat means, said stitching co-operating with the sheath to define pockets within which the bat means retains substantially full natural resilience, a mounting web associated with said sheath and provided with ribbons of adhesive overlying said rows of stitching and joining said mounting web to the portions of said sheath penetrated by said stitching, whereby to provide truss-like reinforcement longitudinally of said sheath while permitting said sheath to be compressed in a lateral direction between said rows of stitching and ribbons of adhesive.

10. An insulating device comprising the combination with an elongated bat of insulating material; of a sheath therefor comprising a channel having sides engaging the sides of the bat, a back engaging the back of the bat and flanges connected with said sides and projecting laterally from the face of the bat, a cover ply spanning the bat between the sides and flanges of the channel; stitching extending in longitudinal rows through the cover ply, the bat, and the back of the channel, the bat being confined between the rows of stitching and the channel in pockets wherein the bat retains substantially full natural resilience, a mounting web overlying the flanges and the cover ply, and means adhesively joining the mounting web to the flanges and cover ply, said means including longitudinal ribbons of adhesive overlying the rows of stitching and sealing the stitching while providing reinforcement longitudinally of said device.

11. An insulating device comprising the combination with a bath, of an elongated sheath enclosing the bath and comprising a channel having a back, sides, and lateral flanges projecting from said sides, and a cover ply spanning the bat between said sides and flanges, stitching in rows longitudinally of the bath and the channel traversing the cover ply, the bat, and the back of the channel, and a mounting web adhesively bonded to the flanges and the cover ply and providing a continuous vapor seal across said channel, the adhesive connection of the mounting web with the cover ply including ribbons of substantial thickness of adhesive overlying the rows of stitching and constituting means for longitudinally reinforcing the device.

12. The device of claim 11 wherein the back of the channel is provided with a backing ply having side margins well within the sides of the channel, said backing ply being connected to and spaced from the back of the channel by intervening ribbons of adhesive overlying the rows of stitching and constituting means contributing to the longitudinal stiffness of the device.

13. An insulation device comprising the combination with a mounting web including a vapor seal ply, a channel having a back portion approximately parallel to said mounting web and

spaced therefrom, and side portions extending from said back portion to said mounting web and connected therewith, a bat of insulating material within said channel and spanned by said vapor seal ply, a cover ply spanning said channel across said bat, stitching through the cover ply, the bat and the back of the channel, and vapor sealing means covering said stitching.

14. A thermal insulation device comprising a multiple ply backing web including a plurality of plies of sheet material and an intervening and substantially co-extensive vapor seal ply, together with a channel having a base portion spaced from said mounting web, and side portions extending from said base portion toward said mounting web and having marginal flanges bonded to the inner sheet material ply of said mounting web, an insulating bat within said channel between the sides thereof, a cover ply spanning said channel between said flanges, stitching through the cover ply of the bath and the base portion of said channel, and vapor seal means covering the stitching and bonding the cover ply to the inner sheet material ply of said mounting web.

15. Thermal insulation comprising an elongated bat of fibrous insulating material having substantially parallel faces and sides converging toward one of said faces, of a cover ply against the last mentioned face of said bat, a channel including a base and side portions embracing the other face and the sides of said bat, said channel including marginal flange portions projecting laterally from said cover ply, stitching through the cover ply of the bat and the base portion of the channel, a layer of adhesive vapor-sealing material spanning portions of said flanges said cover ply and said stitching, and a mounting web bonded by said material to said flanges and said cover ply.

16. Thermal insulation comprising the combination with an elongated bat having faces and sides, of enclosing means including wall portions disposed about said faces and sides, stitching extending through at least one of said wall portions and said bat and comprising means for positioning the material of said bat, a mounting web adhesively joined to said enclosure means and projecting laterally at each side of one of the faces of said bat and including a vapor seal extending substantially unbroken across said face, and additional vapor sealing material covering and bonded to said stitching.

17. Thermal insulation comprising an elongated bat of insulating material having opposing larger and smaller faces and sides converging toward the smaller face, a protective channel about the larger face and said converging sides and having lateral flanges adjacent the smaller face of the bat, a cover ply abutting said smaller face, stitching through the cover ply, the bat, and the channel, and a mounting web bonded to said flange and cover ply and provided with at least one layer of vapor sealing material substantially continuous across the bat, and additional vapor sealing material over said stitching.

18. Thermal insulation comprising the combination with an insulating bat having sides and opposing faces, of enclosing means comprising walls of sheet material across the sides and faces of the bat, stitching through the walls at the faces of the bat and through the intervening portion of the bat, vapor sealing adhesive material covering the stitching on both of said walls, and sheet material covering said vapor sealing ma-

terial and adhesively joined thereby to the respective last mentioned walls, the sheet material covering one of said last mentioned walls comprising a mounting web projecting laterally beyond the wall last mentioned and provided with additional thickness of vapor sealing material substantially continuous across said bat.

19. A device for the thermal insulation of buildings, comprising an insulating bat, a sheath of elongated form in which said bat is disposed, stitching extending through the sheath and the bat, vapor sealing means extending in ribbon form upon said sheath along said stitching, and a mounting web comprising a ply of foil bonded to said sheath by said vapor sealing means.

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20. A device for the thermal insulation of buildings, comprising the combination with a relatively rigid mounting web, of a sheath having side wall portions connected to said web and a back wall portion spaced from said web, and an insulating bat mounted within said sheath, the portion of said bat adjacent the back wall portion of the sheath being materially wider than the portion of the bat adjacent the mounting web and the portions of said bat and sheath remote from said web being laterally compressible independently of said web.

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