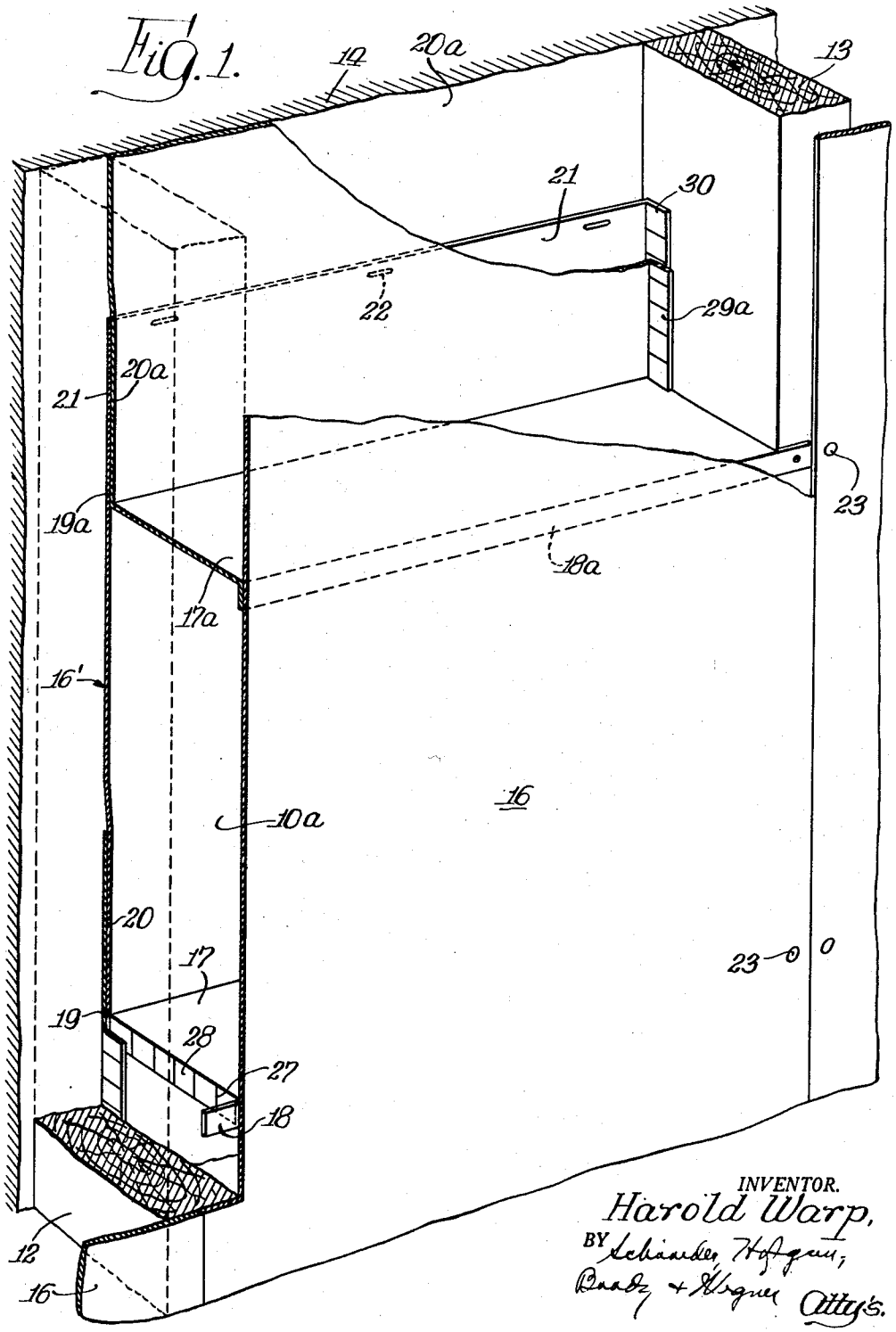
April 26, 1960 H. WARP 2,934,465

INSULATING MATERIAL

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Fig. 1.



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INSULATING MATERIAL

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Fig. 7.

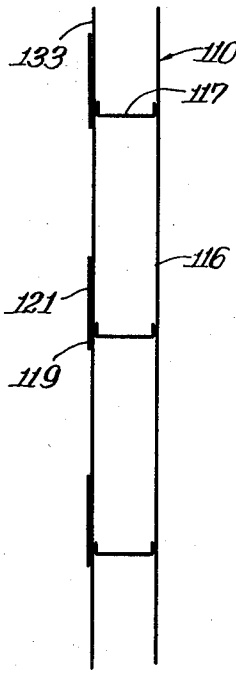


Fig. 8.

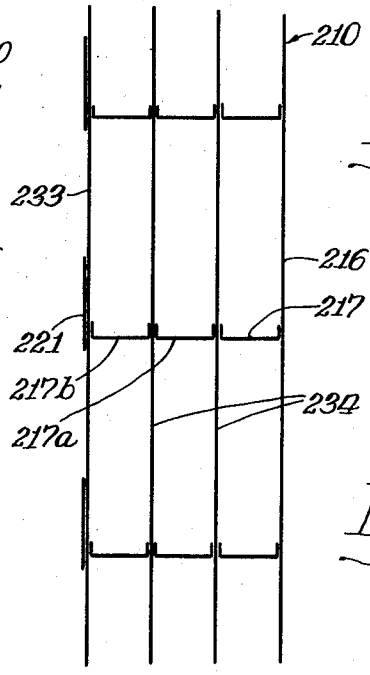


Fig. 9.

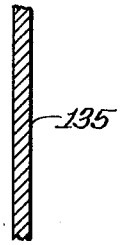


Fig. 10.

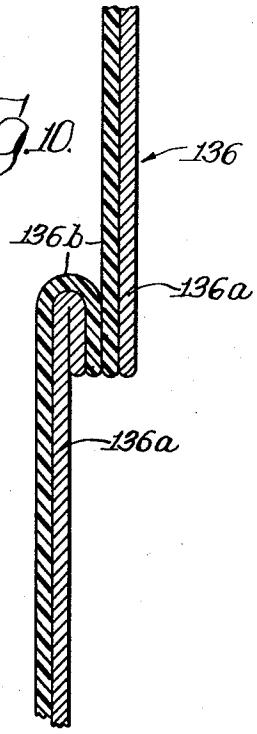


Fig. 11.

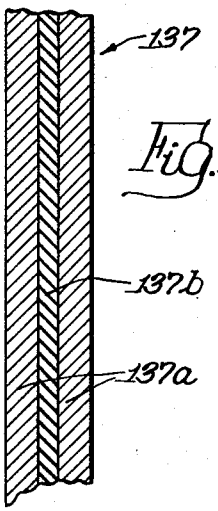
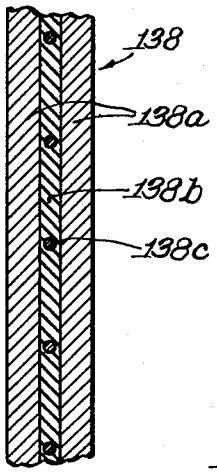


Fig. 12.

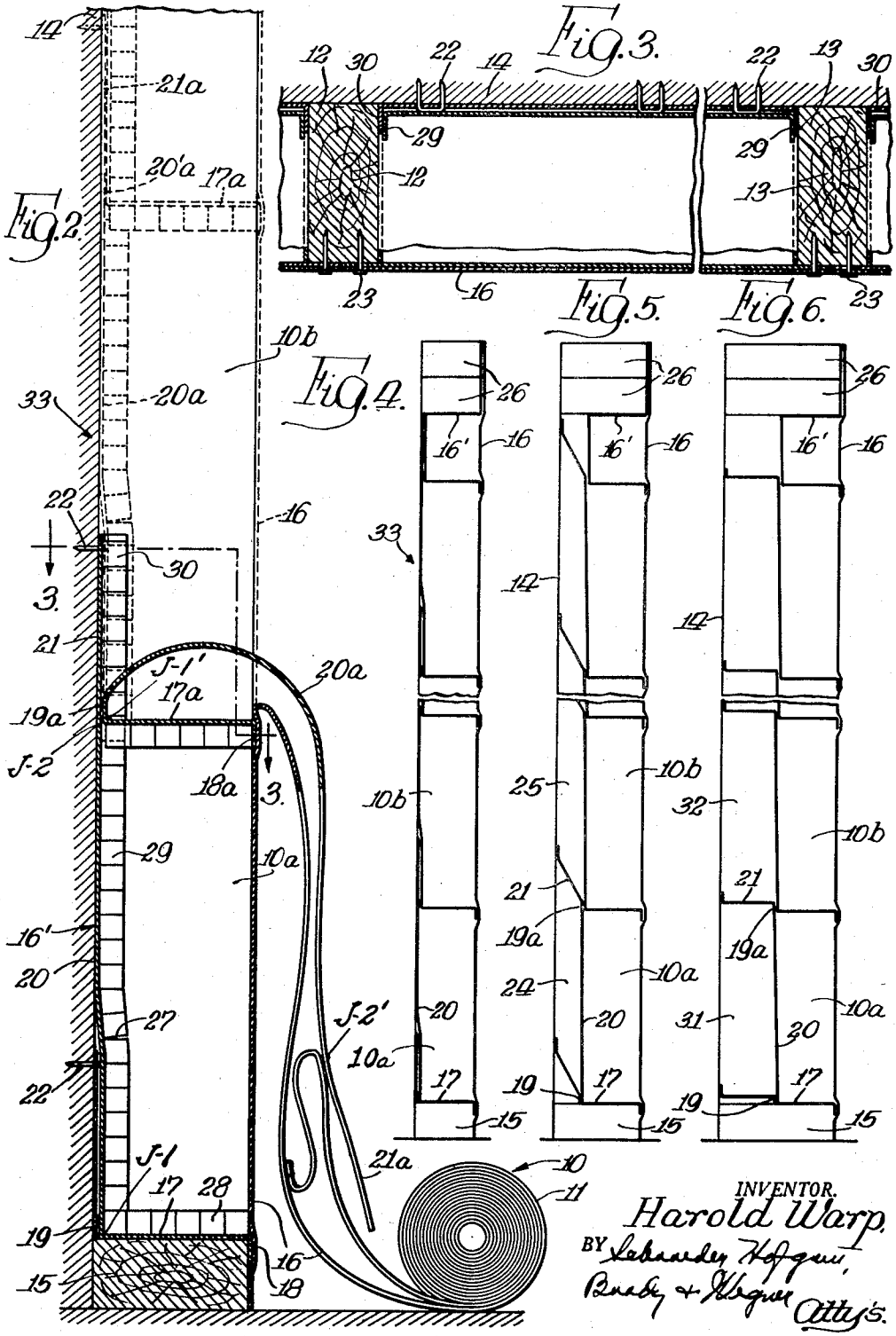


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April 26, 1960 H. WARP 2,934,465

INSULATING MATERIAL

Filed Sept. 19, 1955 3 Sheets-Sheet 3



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Patented Apr. 26, 1960

2,934,465

INSULATING MATERIAL

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Application September 19, 1955, Serial No. 535,017

6 Claims. (Cl. 154—45)

This invention relates to an insulating material and in particular to an insulating material for use in a building wall.

A typical construction of a building wall includes a bottom member, equally spaced, vertically extending studs, a top member and outer siding or sheathing. Material forming the interior wall surface is secured to the bottom and top members and studs on the inner side. Such construction results in the formation of a chimney-like space between the stud members. This hollow space, in cold weather, allows entrapped air to rise along the relatively warm interior wall surface and flow downwardly along the colder exterior siding thus forming a circulating air column which tends to transfer heat outwardly between the inner wall surface and the outer siding. In warm weather, a reverse flow occurs wherein heat is transferred undesirably inwardly. This air movement further tends to deposit dirt and foreign material on the interior wall surface. In some instances, fire stops comprising horizontal members extending between the vertical stud members at varying heights above the bottom member are used to limit such air movement. Normally, however, only a limited number of such fire stops are used as the use thereof is relatively costly.

To provide insulation between the exterior and interior wall elements, it is ordinarily the practice to install in the wall space a non-inflammable, insulating material having a porous or loose construction which provides a multiplicity of small air voids in lieu of the single large space or channel. Such material is costly and, further, tends to cause the transfer of moisture from the inner wall element to the outer siding causing blistering and other deformation of any protective coatings, as paint, placed on the outer surface of the siding.

It is therefore the principal object of my invention to provide a new and improved insulation material.

It is a further object of my invention to provide an improved insulating material affording a multiplicity of air chambers of medium small size as distinguished from the minute cells of conventional insulation.

Another object of the invention is to provide an insulating material which is easily manufactured of inexpensive material and requires only limited quantities of the material.

A further object of my invention is to provide an insulating material of the character described which can be easily installed during the construction of a building wall.

Still another object of the invention is to provide an insulating material which will also act to provide a substantial number of fire stops when installed in a building wall.

Yet another object of the invention is to provide an insulating material which can be conveniently merchandised, requiring minimum space when handled and yet which can be expanded to enclose a large volume.

A yet further object of my invention is to provide such insulating material which is adaptable to building walls of various thickness.

Other features and advantages of this invention will hereinafter become more fully apparent from the following description taken in connection with the accompanying drawings, wherein:

Figure 1 is a perspective view of an insulating material embodying the invention broken away in parts and shown installed in a building wall;

Fig. 2 is a vertical sectional view of the insulating material in the process of installation in a building wall;

Fig. 3 is a sectional view thereof taken approximately along the line 3—3 of Fig. 2;

Fig. 4 is a schematic representation of the insulating material installed in a wall having a minimum thickness;

Fig. 5 is a schematic representation of the insulating material installed in a wall having a somewhat greater thickness than that of Fig. 4;

Fig. 6 is a schematic representation of the insulating material installed in a wall having a greater thickness than that of Fig. 5;

Fig. 7 is a schematic representation of a modified form of the insulating material;

Fig. 8 is a schematic representation of another form of the insulating material;

Fig. 9 is an enlarged fragmentary sectional view of the insulating material;

Fig. 10 is an enlarged fragmentary sectional view of the insulating material having a different construction from that of Figure 9;

Fig. 11 is an enlarged fragmentary sectional view of the insulating material having still another construction; and

Fig. 12 is an enlarged fragmentary sectional view of the insulating material having yet another construction.

Referring now to the drawings, one exemplary embodiment of my invention is shown to comprise a roll **11** of flexible insulating material generally designated **10**, which when unrolled and spaced may be attached to the members comprising a building wall namely vertical studs **12** and **13**, siding **14**, horizontal base support **15**, and horizontal top members **26**. Insulating material **10**, when installed, comprises a plurality of horizontally spaced, vertically extending, planar elements or sheets having a series of interconnecting elements forming a series of chambers as **10***a* and **10***b* and dividing the space between the wall members into a plurality of smaller spaces. So that installation may be simple and economical, material **10** is made to accommodate any of the standard wall thicknesses and stud spacings.

As can best be seen in Figs. 1 to 6, the preferred embodiment of insulating material **10** comprises a continuous front sheet **16** to which are hingedly attached, at spaced intervals, a plurality of panels **16'**. As the structure of each panel is identical, the specific description will be drawn to one such panel only, numerals having letter suffixes being used to designate corresponding elements of the other panels shown.

Panel **16'** is provided with a connecting portion **17** attached to sheet **16** by a hinged connection **18**. At a distance of the depth of wall studs **12** and **13** from connection **18**, panel **16'** is hingedly secured as at **19**, to a preceding panel. A mid-portion **20** of panel **16'**, extending from connection **19**, is attached at **19***a* to a succeeding panel and forms a portion of the rear sheet or element **33**. An outer portion, or end, **21** extends hingedly from connection **19***a*. The width of insulating material **10** is made equal to the normal center-to-center spacing between wall studs. As the inside spacing between the studs is normally smaller by several inches than the center-to-center spacing, panel **16'** is provided with a series of slits **27** along its edges forming flaps **28** on connecting portion **17**, flaps **29** on mid-portion **20** and flaps **30** on end **21**, which may be folded at right angles

to the planes of the respective panel portions. To facilitate understanding of the structure of insulating material **10**, the junction between connecting portion **17** and mid-portion **20** of panel **16'** is identified in Fig. 2 as J–1 and the junction between the mid-portion **20** and end portion **21** is identified as J–2. The corresponding junction between connecting portion **17***a* and mid-portion **20***a* of the subsequent panel is identified as J–1' and the junction between mid-portion **20***a* and end portion **21***a* is identified as J–2'.

When insulating material **10** is installed in the wall section, it forms a series of air chambers typically as shown at **10***a* in Fig. 1. Chamber **10***a* is bounded laterally by the studs **12** and **13**. The front or inner wall portion is bounded by panel **16** which extends completely across the space between the studs. The bottom boundary is formed by connecting portions **17** extending generally horizontally from panel **16** across the thickness of the wall studs. The upper boundary is formed by the succeeding panel connecting portion **17***a* which is similarly extended between the studs. The rear or outer boundary of chamber **10***a* is formed by the mid-portion **20** of panel **16'** which extends generally parallel to front sheet **16**. Flaps **28**, **29** and **30** are folded over so as to have snug contact with studs **12** and **13**. Panel outer end **21** extends behind the succeeding panel and acts as a means for connecting the panel **16'** to the outer siding **14**.

The installation of insulating material **10** is extremely simple. The roll **11** of material **10** is placed adjacent the wall section wherein it is desired to install material **10**. The free end of the roll is then positioned so that connecting portion **17** rests on the upper surface of the horizontal base member **15** and with connection **19** adjacent the siding **14**. The panel outer end extending from connection **19** is then secured to the siding **14** as by a staple **22**. Additional material is unrolled from roll **11** to allow placement of panel **16'** against the siding **14** and the attachment of panel outer end **21** to siding **14** by staples **22**. As panel mid-portion **20** has the same length as the portion of front sheet **16** between connections **18** and **18***a*, from sheet **16** may now be secured to the inner or front surfaces of the studs **12** and **13** by suitable means such as tacks **23** with the resultant rectangular cross section chamber **10***a* being formed. It is not mandatory that front sheet **16** be secured to the studs at this time as the succeeding panel **16'** may be secured to the siding **14** by properly stapling end **21***a* to the siding in the manner described above whether or not the front sheet is secured to the studs. Thus the entire series of air chambers could be formed between the horizontal base member **15** and the horizontal top member **26** with all tacking of the front sheet **16** being performed subsequent to the attachment of all panels **16'**.

Front sheet **16** may be cut laterally just below connection **18** so that any excess insulating material can be removed at the bottom connection. In making the connection at the horizontal top member **26**, panel **16'** may be brought forwardly and secured to the top members together with front sheet **16** as seen in Figs. 4, 5, and 6.

Insulating material **10** is adapted for installation in building walls wherein variations in the wall size are had. To accommodate differences in the thickness of the wall the hinged connection of panel end **21** is utilized. Thus, by rotating end **21** the necessary amount about connection **19**, the end **21** may be connected to the siding **14** horizontally outwardly of mid-portion **20** as seen in Figs. 5 and 6. Thus, walls having a thickness of twice the normal wall thickness may be accommodated with my insulating material, the only change in installation thereof being the rotation of panel end **21** the requisite amount. Where the panel ends are thus rotated, additional air chambers such as chambers **24** and **25** in Fig. 5 and chambers **31** and **32** in Fig. 6 are formed similar to the chambers **10***a* and **10** formed between the panels **16'** and front sheet **16**.

It is unnecessary to cut the various sections of insulating material **10** before installation in the wall. The material may be merely unrolled from roll **11** and installed as indicated above, working upwardly to the ceiling where it may be cut. Where the spacing between the studs **12** and **13** is less than normal, one edge of the material **10** may be trimmed as it is unrolled and the necessary slots **27** cut into panel **16'** where desired.

By providing a plurality of small air chambers the effective insulating quality of my insulating material is made considerable. The material is easily installed by simple means such as staples and tacks and with a minimum of labor. Further, a relatively large number of fire stops are provided when insulating material **10** is installed as described above in a wall section.

The manufacture of insulating material **10** is extremely simple and economical. With front sheet **16** extended preferably horizontally, one panel **16'** is secured thereto at its end connection **18** and extended in an overlying relationship with the front sheet. The next preceding panel is then secured to the front sheet at its connection **18** at a distance equal to the length of mid-portion **20** from the point of attachment of the first panel to the sheet. This second panel is allowed to extend in overlying relationship to front sheet **16** and with its outer end **21** overlying the lower section of the first panel mid-portion **20**. The second panel is then secured to the first panel at connection **19**. This simple process is then repeated until the entire roll **11** has been manufactured.

In Figure 7 is shown a modified form of insulating material **110** which is similar to insulating material **10** except that a continuous rear sheet **133** is provided in lieu of the series of interconnected panel mid-portions **20**. Connecting elements **117** are arranged to extend between front sheet **110** and rear sheet **133** in the same manner as connecting portions **17** of the material **10**, and securing elements **121**, pivotally attached to rear sheet **133** at connections **119**, are provided for securing the insulating material **110** to the wall sheeting in the same manner as are panel outer ends **21**. The installation of insulating material **110** is similar in all respects to the installation of insulating material **10**.

In Figure 8 is shown an insulating material **210** which is similar to insulating material **110** except that between front sheet **216** and rear sheet **233** additional intermediate sheets **234** are provided which are interconnected one to the other by connecting elements **217**, **217***a*, **217***b*, to form a large number of compartments. As is obvious, the specific number of intermediate sheets **234** may be varied as desired. Securing elements **221** are provided which allow the installation of insulating material **210** in the same manner as that of insulating material **10**.

Each of the disclosed embodiments of my insulating material may be formed into rolls **11** of any suitable size commersurate with merchandising, stocking, and material handling requirements, the width of the roll, however, being determined, as described above, by the center-to-center spacing of the wall studs with which it is to be used. The insulating material may be formed of a suitable fire resistant, moisture impervious, flexible material, such as insulating paper **135** as shown in Figure 9. Another preferred material **136**, as seen in Figure 10, comprises aluminum foil **136***a* laminated to a thin sheet of base plastic **136***b* such as polyethylene or vinyl resin. In this form the insulating material has high heat reflective qualities and is highly tear resistant.

Another preferred material **137** is shown in Figure 11 wherein a sandwich of two sheets of insulating paper **137***a* with a layer **137***b* of asphalt or tar therebetween is provided. To improve the tear resistance of such a material, a modified form **138**, as seen in Fig. 12 wherein reinforcing members such as wires or strings **138***c* are imbedded in the tar or asphalt layer **138***b* sandwiched between layers of insulating paper **138***a*, may be used.

Any suitable means for making the connections, such

as connections 18, 19 and 19*a* may be used. I have found, however, that with the paper type insulating materials, such as materials 135, 137 and 138, glued connections are entirely satisfactory. Because of the ease with which polyethylene or vinyl resin plastics may be heat sealed, a very satisfactory connection may be obtained in material 136 by that method. Because of the high flexibility and relatively thin structure of the material 136, it may be readily folded over wherever necessary to permit the facial juxtaposition of the plastic portions of the sheets in making the heat sealed connections.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes, therefore, in the construction and arrangement may be made without departing from the spirit and scope of the invention as defined in the appended claims.

I claim:

1. An insulating material for use in a building wall having a pair of spaced, vertically extending studs and and outer siding extending transversely between said studs, said material comprising: an elongated front sheet of flexible material having a transverse extent greater than the spacing between said studs and having longitudinal edge portions extending in the plane of the sheet and adapted to be secured to said studs; and a plurality of elongated flexible panels having a width equal to the spacing between said studs and secured to said sheet at longitudinally spaced intervals, each panel having at least three longitudinally related portions including a connecting portion secured to said sheet for hinged movement about a line transversely of the sheet and to arrange the panel in longitudinal alignment with the front sheet, a mid-portion extending from said connecting portion and having a length comparable to the distance between the points of attachment to said sheet of successive panels, and an outer end hingedly secured to said mid-portion to extend freely therefrom and adapted to be secured to said siding, said connecting portion being joined to the mid-portion at a first junction and said mid-portion being joined to said end portion at a second junction adjacent panels being secured to each other by a hinged connection of the first junction of one panel to the second junction of a preceding panel, whereby each of said mid-portions extends parallel to said front sheet to form a continuous series of interconnected panel portions.

2. The insulating material of claim 1 wherein said connecting portion has a length substantially equal to the extension of said stud members from said siding.

3. Insulating material, of the character described, comprising: an elongated sheet of flexible insulating material adapted to be extended longitudinally vertically; a first panel having a connecting portion hingedly connected at one end to said sheet to extend in a horizontal plane transversely perpendicular to said sheet, a mid-portion having one end connected at a first junction to the other end of the connecting portion to extend longitudinally, vertically and parallel to said sheet, and an end portion having one end hingedly connected at a second junction to the other end of the mid-portion and extending freely therefrom; and a second panel similar to said first panel including a connecting portion having one end hingedly connected at one end to said sheet at a distance from said one end of the connecting portion of the first panel equal to the length of said mid-portion and to extend parallel to the first panel connecting portion, the other end of the second panel connecting portion being secured to the second junction of the first panel.

4. Insulating material of the character described, comprising: an elongated front sheet; a plurality of similar panels each including a longitudinally related connecting portion, mid-portion, and end portion, said connecting portion being joined to the mid-portion at a first junction and said mid-portion being joined to said end portion at a second junction; a connection hingedly joining the end of the connecting portion of each panel opposite said first junction to the front sheet to extend the panel in longitudinal alignment with the front sheet, the connection of each panel to the front sheet being spaced from the connection of the adjacent panels a distance equal to the length of the panel mid-portion; and a connector hingedly joining said first junction of each panel to the second junction of the immediately preceding panel, each end portion extending freely from said second junction, and the portion of the insulating material subsequent to each junction being extendible away from the end portion to permit the end portion to be accessible from the sheet side of the insulating material for seriatim securing thereof at intervals corresponding to the length of the mid-portion.

5. The insulating material of claim 4 wherein the sheet and panels are flexible to permit the portions of the insulating material subsequent to each junction to be extended away from the end portions.

6. Insulating material of the character described, comprising: means expandible to form a continuous row of joined compartments; and a plurality of securing elements connected to a rear face of said means at intervals spaced in the direction of the row, said means being flexible to permit seriatim access to each securing element by a flexing of the means forwardly away from each securing element.

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