April 4, 1967 R. C. ROLLAND 3,312,026

COVERING FOR BUILDINGS

Filed March 10, 1964 2 Sheets-Sheet 1

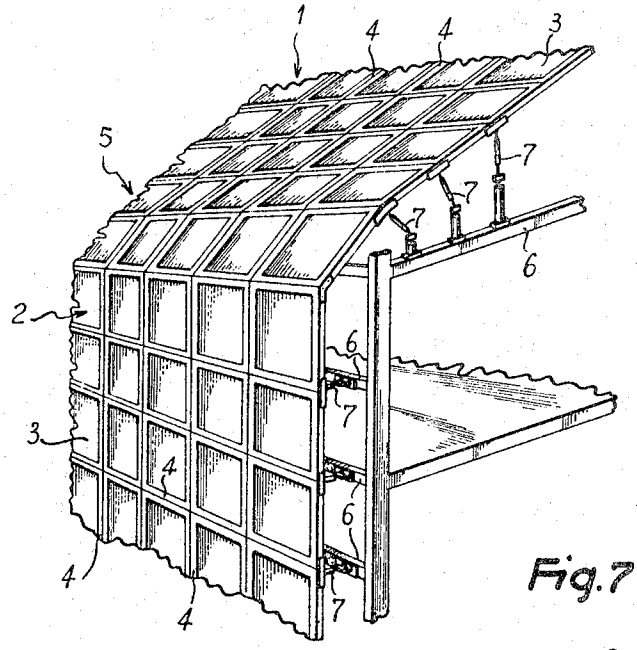


Fig. 1

Fig. 7

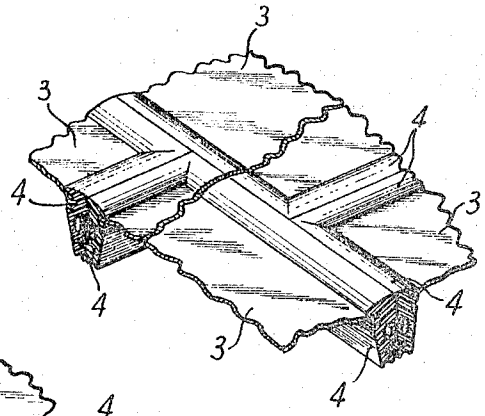
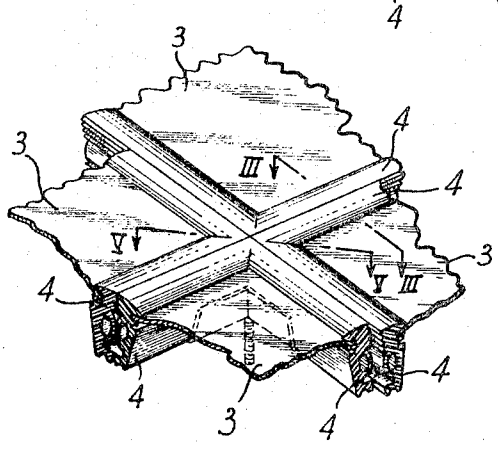


Fig. 2



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Fig.3

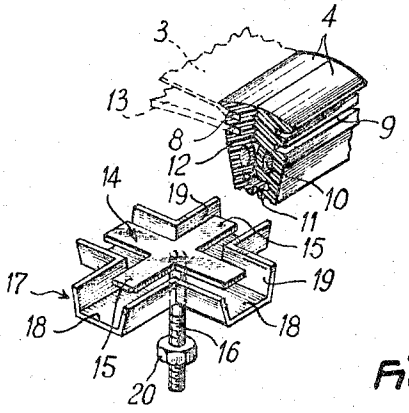


Fig.5

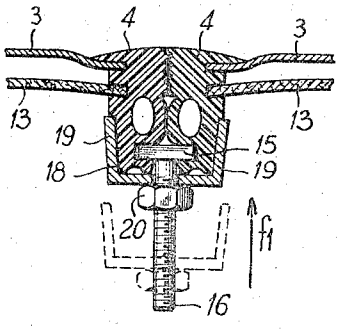


Fig.8

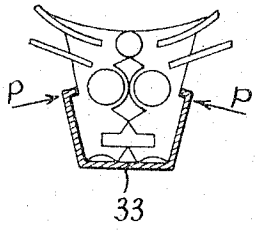


Fig.4

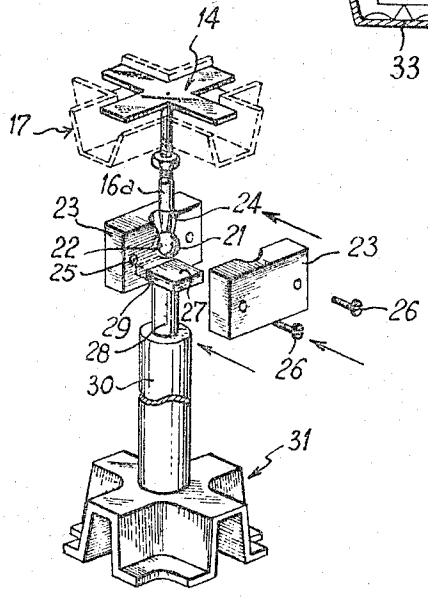
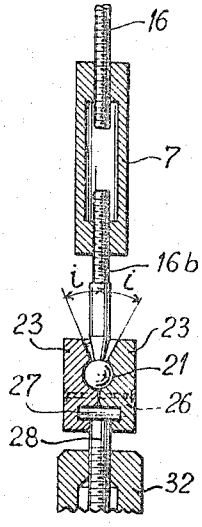


Fig.6



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3,312,026

COVERING FOR BUILDINGS

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5 Claims. (Cl. 52—403)

This invention relates to improved covering structure for the outer surfaces of buildings, including both wall and roof covering for protection against weather conditions.

Conventional roof coverings, including slates, tiles and the like, generally comprise partially overlapping elements. The protection afforded by such overlap against atmospheric agents is imperfect, especially in cases where the slope of the surface to be covered is variable. Moreover, the means for supporting and securing the roofing elements to the underlying frame of the building are complicated, heavyweight and expensive. It has heretofore been proposed to provide covering structure in the form of contiguous panels provided along their edges with mating seal strips. However the assembly and erection of such known panelling involves considerable costs in labour, especially in the case of roof structures having irregular or complex shapes with portions of varying slope.

Objects of this invention include the provision of improved covering structure for roofs and other outer surfaces of buildings in the form of contiguous panels with mating edge sealing strips, which will be simple and easy to assemble and ever in reliably sealed relation, and easy and simple to tie to the underlying frame structure regardless of the slope in the area considered and with only a minimum of labour and equipment. Other objects will appear.

According to the invention, covering structure for the outer surface of a building comprises a multiplicity of plates or panels provided with sealing strips along their side edges and assembled contiguously with said sealing strips interengageable along mating side surfaces of adjacent panels. According to a feature of the invention, means are provided for retaining the panels and strips in assembly preferably at the joints at which the ends of a plurality of (e.g. four) pairs of sealing strips meet, and such retaining means may comprise cross- or star-shaped outer retainer members having radially projecting arms seatable in complementary recesses formed in the mating surfaces of the sealing strips. The retainer means further include cross- or star-shaped inner retainer members of similar general configuration as that of the outer members and adapted to underlie the same, said inner members having channel-shaped arms each adapted for clamping engagement about the under side of a pair of interengaging sealing strips pertaining to adjacent panels. According to another feature of the invention, the star- or cross-shaped outer retainer members are secured to the outer ends of strut members, which may advantageously include threaded turnbuckle tensioning means therein, said strut members being supportable by way of ball-and-socket swivels or equivalent universal joint means, from columns, purlins or other frame members of the building structure.

The above and further features and advantages of the invention will appear from the ensuing description of examplary embodiments, given by way of illustration but not of limitation, and wherein:

FIG. 1 is a perspective view of part of a roof and wall of a building provided with the improved covering means of the invention;

FIG. 2 is a perspective view of part of the covering means, on an enlarged scale;

FIG. 3 is an exploded perspective view of means for retaining adjacent covering panels in assembly, with such panels being shown in section on line III—III of FIG. 2;

FIG. 4 is a similar view showing the means for connecting the retaining means of FIG. 3 to an underlying structural frame member;

FIG. 5 illustrates the retainer means of FIG. 3 in section in assembled condition;

FIG. 6 is an axial sectional view of turnbuckle connecting means;

FIG. 7 is a view similar to FIG. 2, but relating to a modified form of roof covering according to the invention; and

FIG. 8 is a vertical sectional view of a spring clip member.

The structure shown partly in FIG. 1 includes a sloping roof 1 connected to a vertical outer wall 2, both the roof and wall being covered with juxtaposed panels 3 provided with sealing strips or beads 4 along their mating edges. As shown, the roof 1 and wall 2 are connected by way of a single horizontal row 5 of border panels similar to the panels comprising the covering of the roof and wall, but of a slope greater than that of the roof panels, it will be noted that the panels constituting the covering of the roof and wall are connected to structural members, such as 6, of the underlying frame of the building by way of struts 7 which as later described include universal swivel joints and tensioning means, so that said struts can be selectively angled as may be required, inter alia, to allow for the varying slope between different areas of the surface to be covered.

The covering means shown in FIG. 1 employ rectangular, e.g. square, panel elements 3, so that as shown to an enlarged scale in FIG. 2 the sealing strips 4 of four adjacent panels meet to provide a cross-like joint. It is at such cross-like junctions that the invention preferably provides retainer and connecting means, which will later be described. As shown in e.g. in FIGS. 3 and 5, the two interengaging seal strips 4 have mating surfaces on their one sides, while their opposite sides are each formed with two vertically-spaced horizontal grooves 8 and 9. The upper groove 8 is adapted to receive an edge portion of a related cover panel 3, which may be made of any suitable lightweight material selected and/or treated to be impervious to atmospheric agents. The lower groove 9 preferably similarly receives an edge of an inner panel 13 spaced from the outer panel 3 and having suitable isolating characteristics.

Internally each of the seal strips 4 is shown as including a recess or chamber 10 serving to increase the natural elasticity of the material from which the strip is made. The side surfaces of the strips 4 which mate with each other are serrated in an upper portion 12, to provide tight interengagement between them. In their lower portions, which as shown project normally to the panels 3 inward of the building said mating surfaces are formed with registering recesses or slots 11 extending from the free ends of the strips for a purpose presently described.

The retaining means serving to retain the end portions of four adjacent pairs of strips 4 pertaining to four contiguous panels 3 in mutual assembly include an upper or outer retainer member 14, in the shape of a cross, e.g. metallic, having four strip-like arms 15 each of which is insertable into the end recess defined by the cooperating slots 11 of a related pair of mating strips. Secured to and extending downwardly from the center of the upper retainer member 14 is a rod 16, and a lower or inner retainer member 17, also cross-shaped in this embodiment, has a central hole passing freely around the rod 16. The

od 16 moreover is screw threaded and has a nut 20 hreaded on it. The inner cross-shaped retainer member 7 has its four arms 18 channel-shaped so as to be clamp-ble about the inner end and side surfaces of the projecting portions of the pairs of mating strips 4, with the side langes 19 of the channel arms 18 tightly engaging the ides of said projecting portions, as shown especially in FIG. 5. It will be readily understood that with the arms of the upper cross member 14 inserted into the mating slots 11 of the four pairs of strips 4, and the channel arms of the lower cross member 17 fitted clampingly around the under surfaces of said pairs of strips 4, the nut 20 can be screwed home into tight engagement with he under surface of the lower member 17, as shown in FIG. 5, to provide a firm assembly at the junction between four adjacent cover panels 3.

To connect the junction thus provided to an underlying structural member of the building frame, as previously noted, there is used a strut assembly which will be described with reference to FIGS. 4 and 6. In this assembly, a threaded rod 16*a* corresponding to the rod 16 mentioned above as extending from the center of an outer retainer member 14, has a ball member 22 secured to its lower end. The ball 22 is adapted to be movably received in a spherical socket formed partly in each of two mating, identical, socket members 23, secured to each other on opposite sides of the ball 22 with screws 26 extending through holes 25 in the members 23. The semi-spherical sockets formed in the members 23 communicate with the flat upper surfaces of said members through upwardly flared semi-conical recesses 24, so that with the socket members 23 screwed in place around the ball 22, the rod 16*a* will be capable of a substantial amount of angling movement with respect thereto. The socketted members 23 are further formed with mating slots 29 below the semi-spherical sockets, for receiving the opposite sides of a rectangular head 27 secured to the top of a rod 28 projecting from the upper end of a column 30, shown broken off, and projecting in turn from a footing or base member 31. The connector strut assembly thus described with reference to FIG. 4 provides a means of connecting a joint at the meeting point of four adjacent covering panels, to an underlying frame member such as the column 30. Clearly the frame member to which the joint is connected may be other than a column.

Preferably, a strut assembly of the type just described includes tensioning means, advantageously in the form of the turnbuckle arrangement shown in FIG. 6. As there shown, the rod 16 is threaded into the upper threaded hole of a sleeve 7, which has a lower threaded hole axially aligned with the upper hole, and formed with a screw thread of opposite pitch therefrom. Into this lower hole is screwed a complementarily threaded rod 16*b* which, similar to the rod 16*a* of FIG. 4 has a ball member 21 secured to its lower end and swivellingly seated in a pair of socket members 23 to provide a universal joint arrangement entirely similar to the one shown in FIG. 4. The rod 28 extending downwards from the pair of socketted members 23 is shown screwed into a base member 32 which may be fixedly secured to any desired member of the frame structure.

To erect a roof (or other covering surface) of the kind described above, adjacent panels 3 having sealing strips 4 fitted around their side edges can be assembled two at a time by first inserting each arm 15 of an upper retainer member 14 into the registering slots 11 of a related pair of mating strips 4 while the nut 20 is backed off on rod 16 so that the lower retainer member 17 is eased to a position as shown in broken lines in FIG. 5, then lifting the member 17 to encase each pair of mating strips 4 by means of a related one of the channel arms 18, and screwing up the nut 20 tight against the under surface of the member 17, as shown in full lines in FIG. 5. To connect the assembled cover plates to the frame structure each of all or selected ones of the retainer

members are fitted with a strut device as shown in FIG. 4 or 6, which can be secured at its lower end to any convenient point of a column, purlin or other element of the frame structure of the building. The swivel joint provided by the ball 21 and socket 22, coupled where required to the turnbuckle tensioning device 7, makes it possible quickly and easily to secure a joint of the covering assembly in a firmly and adjustably tensioned manner to the frame, regardless of the particular slope of the roof or other surface to be covered at each point; for this purpose it is simply necessary to rotate the turnbuckle sleeve 7 relative to the threaded rods 16 and 16*b* (FIG. 6) in one or the other direction to adjust the effective length of the connecting leg between the ball member 21 and the retainer assembly comprising the cross members 14 and 17, as required by the slope of the surface at the particular area considered, as will be evident from FIG. 1. Complex roofings, including domes, warped and other surfaces can thus be erected with a minimum amount of time and trouble, without elaborate scaffolding and hoisting equipment.

An important advantage of the tensionable strut-like connecting means disclosed according to the invention is that such means provide a highly efficient anchorage of the cover panels to the underlying frame structure opposing any tendency of the panels to be torn out of position by the strong suction effects liable to be generated by wind vortices. This advantage is especially marked in case where the panels of the structure of the invention are made from thin and/or lightweight material as may often be found desirable.

FIG. 8 illustrates a resilient clip 33, in the form of a channel with flanged arms, which may advantageously be provided at certain points of the covering assembly intermediate the length of the mating strips 4 where the strips might otherwise tend to open out at their inner ends. As shown, the flanges of the resilient arms of the channel-shaped clip member 33 may engage around shoulders formed on the opposite sides of the strips 4, and exert forces such as P to retain the strips in their engaging relation.

A large number of modifications may be made within the scope of the invention. The panels 3 with their strips 4 need not necessarily define the simple chequered pattern shown in FIGS. 1 and 2. Thus, still using rectangular panels 3, a surface pattern similar to that shown in FIG. 7 may be used, wherein adjacent rows of panels are offset with respect to one another, say by a length equal to one half a side of a panel. In this case, the retainer members 14 and 17, instead of being cross-shaped with four arms, would be T-shaped. Moreover, panels 3 of special dimensioning would have to be used at the borders of the surface.

Instead of rectangular panels, other polygonal shapes may be used, e.g. equilateral triangles or hexagons. The retainer members 14 and 17 would of course in each case be provided with the requisite number of radially projecting arms spaced by the suitable angles, e.g. six or three arms regularly arranged.

It would also be quite conceivable to provide retainer members which are L-shaped rather than star or cross-shaped as shown. Thus two right-angled L-shaped retainer means may be suitably combined at the junction between four rectangular panels so as to define together a cross-shaped retainer means of the type shown in FIGS. 3 and 4.

It is also entirely within the scope of this invention to provide retainer means of the general type disclosed at intermediate points along the length of mating sealing strips of adjacent panels rather than or in addition to the junction points at which three, four or more panels meet. In such case of course the outer and inner retainer members such as 14 and 17 would each have only two diametrically opposed radial arms instead of the four

shown. In other words the outer retainer member **14** would then be in the simple form of a straight strip with the rod **16** projecting from a point thereof and similarly the inner retainer member **17** would be a straight channel member formed with a hole in its web for the passing of the rod **16**.

According to a further possible modification the sealing strips **4** may be made integral with the panels **3**, as beads extending along the side edges of panels made e.g. from suitable plastic material.

Further, the outer retainer member such as **14**, regardless of the number of radial arms with which it is provided, may have a cross sectional shape other than that of a flat horizontal strip as here shown.

Various other possible modifications may be conceived.

What I claim is:

1. Covering structure for a building which comprises polygonal panels positionable in edge to edge relation over an outer surface of the building and having sealing elements extending along the edges of the panels, each of said sealing elements including a resiliently flexible portion presenting a side surface which is engageable with a mating side surface of the contiguous sealing element of an adjacent panel, said portions of the contiguous sealing elements of adjacent panels projecting normally to the respective panels in the direction inward of the building and having complementary recesses opening at the mating side surfaces thereof; and retainer means for the contiguous sealing elements of adjacent panels including an outer retainer member having a head portion seatable in said complementary recesses of the contiguous sealing elements, an inner retainer member of channel-shaped, outwardly opening cross-section dimensioned to have said projecting portions of the contiguous sealing elements wedged therein upon drawing of said projecting portions into said channel-shaped inner retainer member, and means connecting said inner and outer retainer members and being operative to displace said outer retainer member, when engaged in said complementary recesses, relative to said inner retainer member in the direction to draw said projecting portions of the contiguous sealing elements into said inner retainer member, whereby said resiliently flexible portions are deformed against each other to ensure tight sealing engagement therebetween at said mating side surfaces.

2. A covering structure according to claim **1**; wherein said resiliently flexible portion of each sealing element has a cavity extending longitudinally therein to increase its deformability for ensuring tight sealing engagement at said mating surfaces of contiguous sealing elements of adjacent panels irrespective of the planar relationship of the latter.

3. A covering structure according to claim **1**; wherein said means connecting the inner and outer retainer members includes a threaded rod extending from said outer retainer member and passing inwardly through said inner retainer member, and nut means threaded on said rod to act outwardly against said inner retainer member for drawing said outer retainer member inwardly with respect to said inner retainer member.

4. A covering structure according to claim **3**; further comprising means to fasten said covering structure on a building framework by way of said rod of each retainer means and including swivel joint means at the inner end of said rod.

5. A covering structure according to claim **1**; wherein said head portion of the outer retainer member has at least three angularly spaced, radial arms to engage simultaneously in the complementary recesses of the sealing elements of the same number of adjacent panels, and said inner retainer member also has arms of said channel-shaped, outwardly opening cross-section equal in number and in angular spacing to said arms of said outer retainer member.

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