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(54) **ROOF PANEL FOR A SUN ROOM**

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(76) Inventors: **Robert A. Walz**, Shelby Township, MI (US); **Barry F. Mahon**, Eastpointe, MI (US)

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Correspondence Address:

Steven L. Permut
REISING, ETHINGTON, BARNES,
KISSELLE, LEARMAN & MCCULLOCH, P.C.
P.O. BOX 4390
TROY, MI 48099-4390 (US)

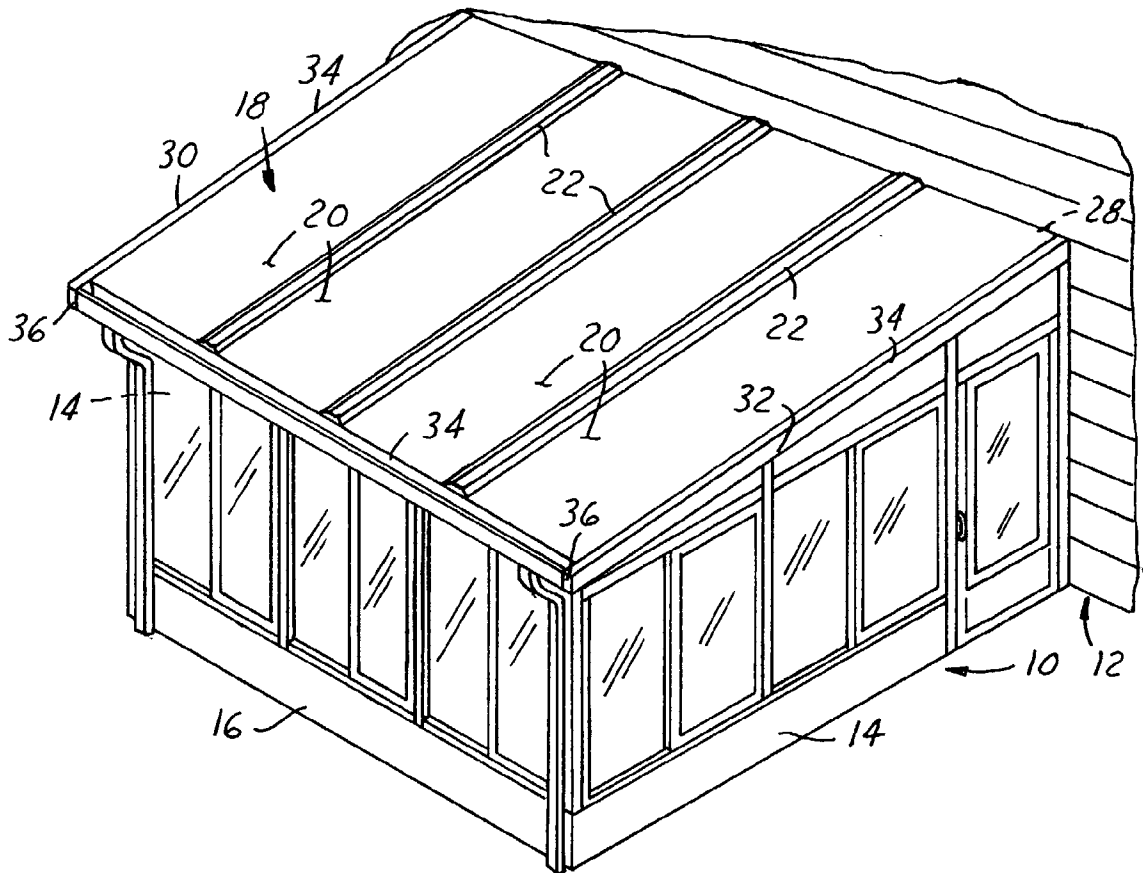
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ABSTRACT

A roof panel (20) for a sun room has a polystyrene foam core (40) and two aluminum covers (42) and (44) adhered to the top (41) and bottom (43) of the foam core. At least one groove (46) is cut into the foam core and a rib (56) is laterally fitted into the groove. The rib has its minor axis vertically oriented and its major axis running longitudinally with or parallel to the longitudinal axis of the panel to provide significant increase in strength to the panel.

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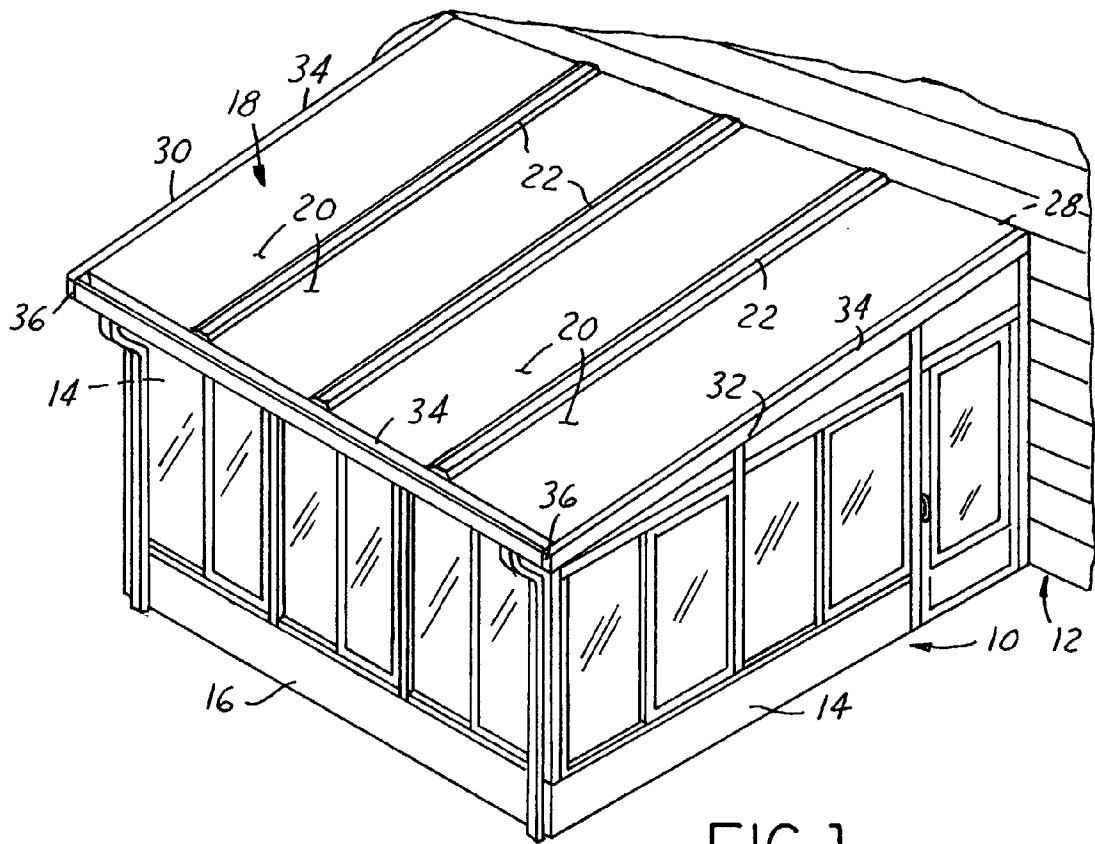


FIG. 1

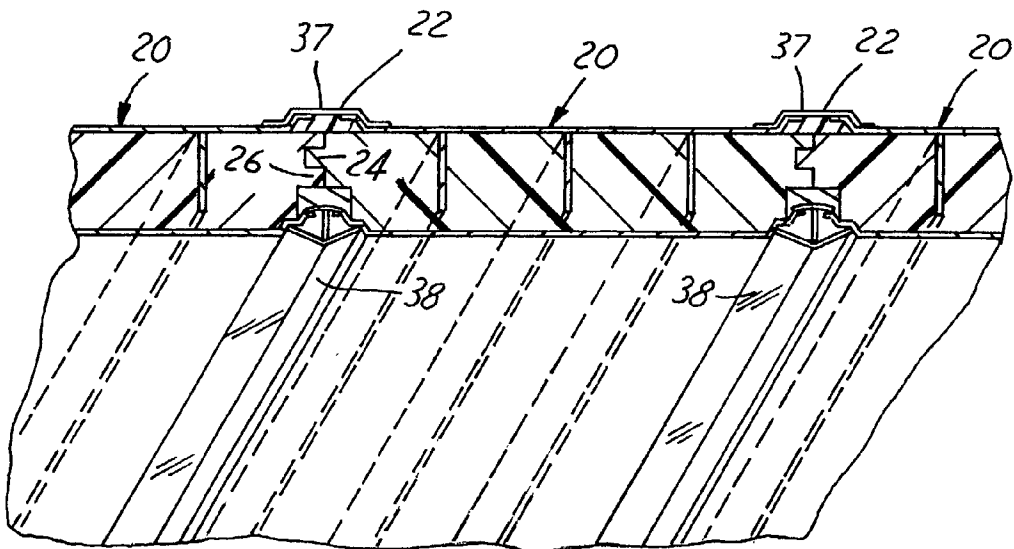
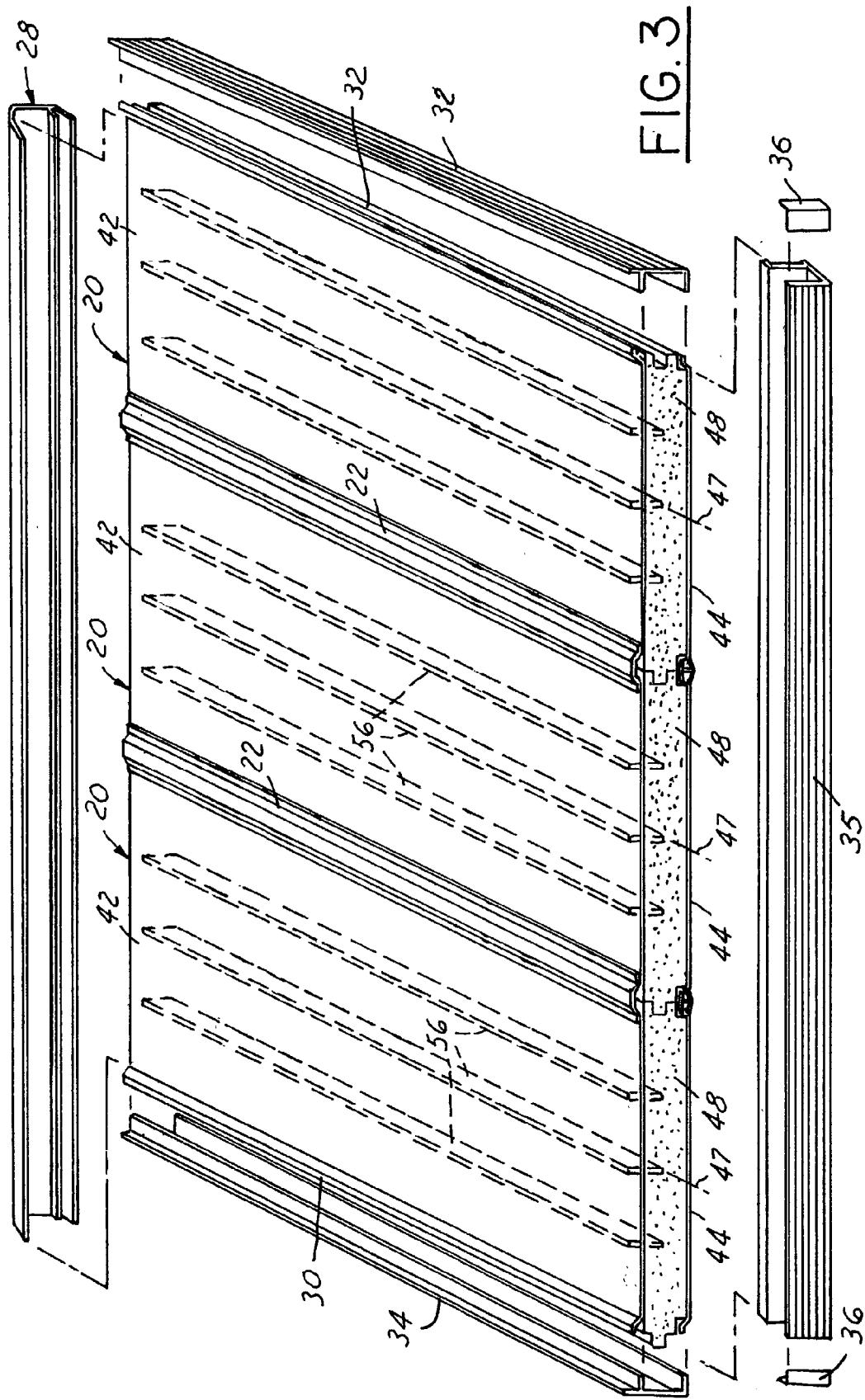
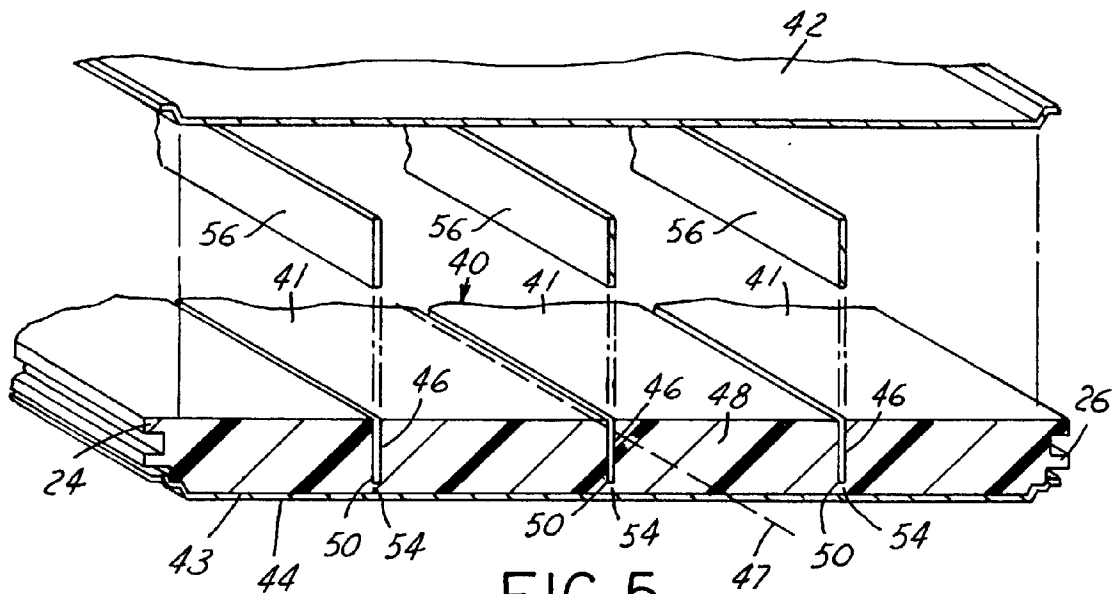
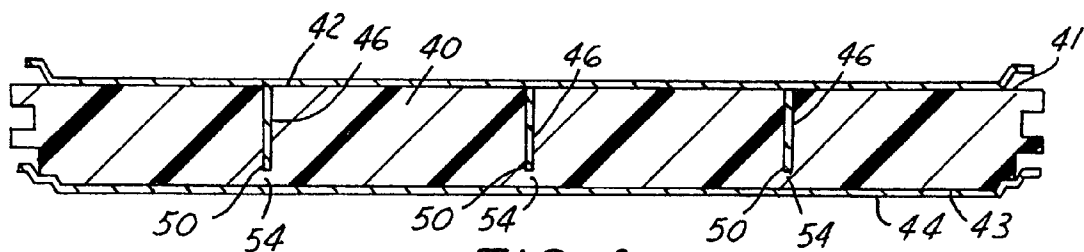


FIG. 2





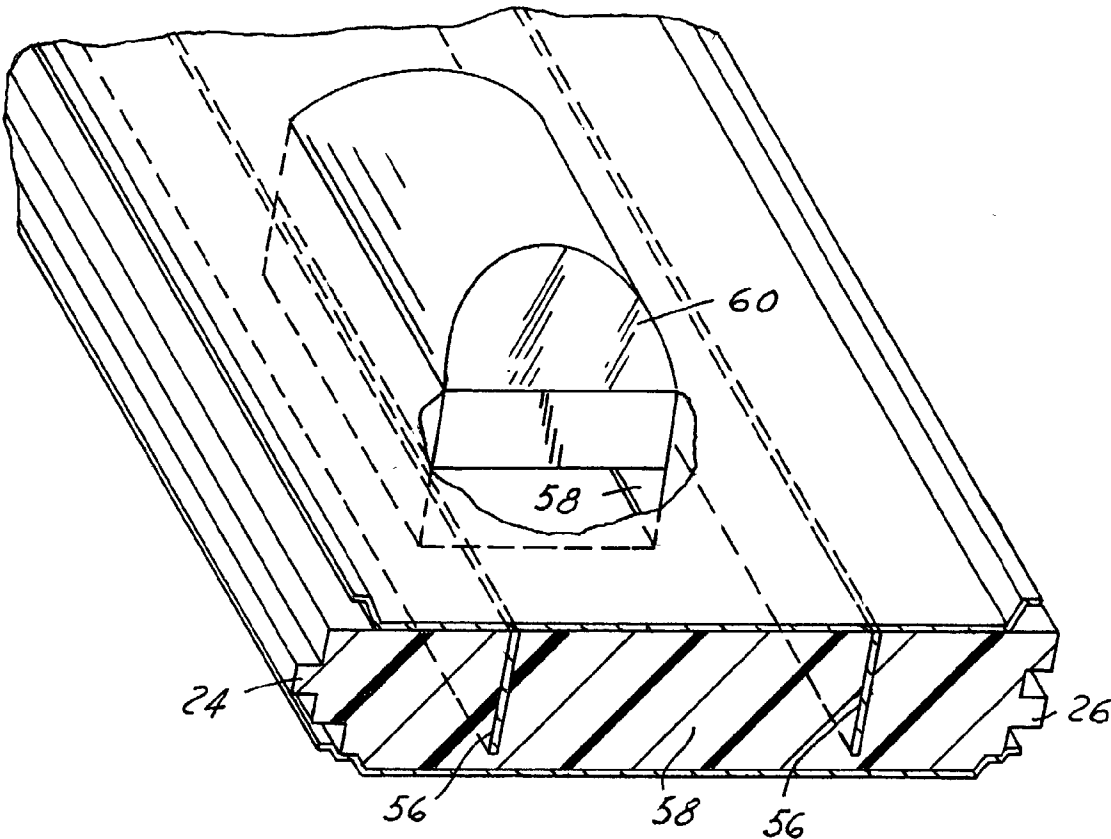


FIG. 6

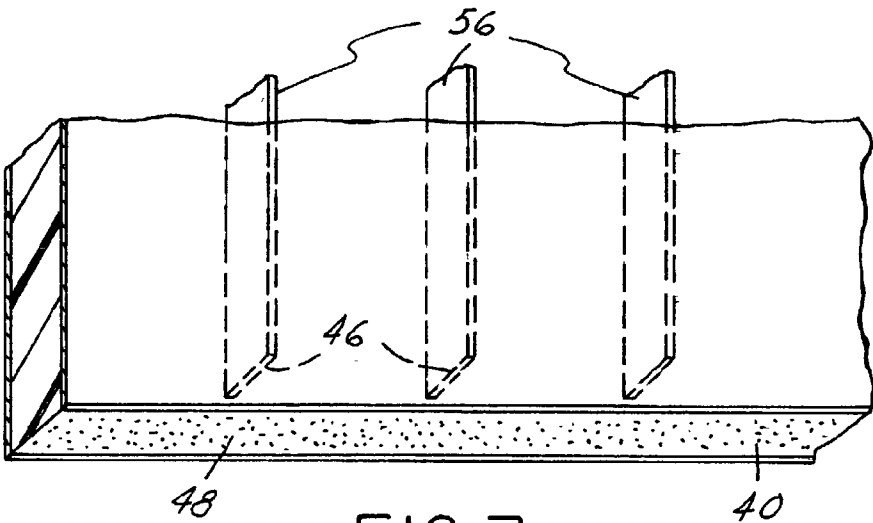


FIG. 7

ROOF PANEL FOR A SUN ROOM

TECHNICAL FIELD

[0001] The field of this invention relates to sun room roofs and more particularly to a roof panel for a sun room roof.

BACKGROUND OF THE DISCLOSURE

[0002] Sun rooms have long been popular as a common way to extend the spring and fall seasons for a deck or patio. Sun rooms are also referred to as patio enclosures, Florida rooms, conservatories, sun porches, porch enclosures, solariums and sun spaces. The American Architectural Manufacturers Association (AAMA) sets for the specific definitions for many of these terms. However, in this document the term "sun rooms" shall be considered generic and to incorporate all of the above terms.

[0003] Most building codes take sun rooms into account. Most building codes relax the energy conservation requirements and also relax the construction requirements relative to the remainder of a residential home. For example, the codes often eliminate the requirement for drywall and stud construction. The relaxation of the energy requirement makes sun rooms possible because of the large amount of glass that is used in most sunrooms.

[0004] On the other hand, many codes mandate that sun rooms are not to be heated or cooled. In addition in many codes, the main building should maintain or have a closeable exterior door leading to the sun room. Furthermore, the roof needs to meet certain load requirements for snow loads and for structural support. A common load requirement is set at thirty pounds per square foot. In the past, this load requirement was often met through the use of 3" thick panels made from a core of polystyrene foam having a density ranging from 1-2 lbs./cubic foot. The core is adhered to lower and upper aluminum covers having a thickness of 0.019", 0.024" or 0.032" depending on the strength and specifications. A urethane adhesive is commonly used to bond the aluminum covers to the polystyrene core. The individual panels are oriented to have their longitudinal axis extend substantially transverse from the edge of a main building. Each panel has a side connected to another using one of a variety of joining methods to seal against leakage. The aluminum covers and polystyrene core assembly provides sufficient strength to meet the thirty pound load test up to lengths of thirteen feet. The outer end of each panel is supported by an outer wall of the sun room.

[0005] As such, most sun rooms have been limited to extend from the main building to a maximum of thirteen feet to the outer wall. If a person wanted a larger sun room over thirteen feet to sixteen feet, the required roof strength was accomplished by use of a thicker polystyrene core having a minimum thickness of 4¼". Six inch thick polystyrene cores are also used depending on the specifications and load requirement. In addition, a structural beam needs to be used for achieving sun room widths being over sixteen feet

[0006] Besides the added weight and expense of the additional polystyrene, the thicker panels mandate the use of wider and more expensive trim pieces for covering the edges of the roofs. Furthermore, if the roof is lined with a gutter, wider and more expensive 4¼" and six inch gutters must also be used. The use of the thicker polystyrene, wider trim

pieces, and gutters add significant costs for only a slightly larger sun room. As a result, many people settle for a smaller than desirable sun room due to the great differential in price for the more desirable size.

[0007] In addition, thinner roofs with thinner and narrower trim pieces and gutters are often cosmetically and aesthetically desirable over the necessary thicker roof lines for larger sun rooms.

[0008] However the desire for an increase in size for a sun room remains for several important reasons. When one takes into account the furniture in the sun room, the slight increase in the overall dimensions of the sun room provides for a great increase of the free aisle and play space in the sun room. This great increase of free space and play space becomes more apparent when one takes into account the fixed amount of space used by the furniture such as tables, sofas and chairs.

[0009] What is needed is an inexpensive sun roof panel that maintains the standard 3" thickness but can provide for added strength and achieve lengths of 16 feet and still meet roof load requirements. The roof loads are set by local governments. The building codes establish a minimum of 20 pounds per square foot. Greater loads are set by the local jurisdiction, e.g., thirty pounds per square foot.

SUMMARY OF THE DISCLOSURE

[0010] In accordance with one aspect of the invention, a panel for a sun room roof includes a structural foam core member having a thickness with a top and bottom. At least one groove longitudinally extends therein and intercepts either the top or bottom of the foam core member. A planar structural support member is mounted in a respective groove. A top and bottom structural cover member is adhered onto the respective top and bottom of the foam core.

[0011] Preferably, each groove extends from the top of the foam core member and ends a distance from the bottom of the foam core member such that the foam core member has at least one bridging span section under each groove that is thick enough to retain the foam core member as a single unitary member during normal handling in the manufacturing process. Consequently, the bottom structural cover member on the bottom of the foam core member does not touch any planar structural support member or any groove.

[0012] It is also desirable that each groove and planar structural support member both extend substantially the entire length of the panel. In one embodiment, there are two grooves and planar structural support members with each being spaced from a longitudinal centerline of the panel. A centered sky light hole is cut in the foam core member between the two planar structural supports. A skylight is mounted in the centered hole between the grooves and planar support members.

[0013] In another embodiment, there are three grooves and planar structural support members with one of the grooves and one of the planar structural support members aligned along a longitudinal centerline and the others are spaced between the longitudinal centerline and a lateral side of the panel.

[0014] It is desirable that each planar structural member is made from aluminum and having a thickness of approximately 0.065."

[0015] In accordance with another aspect of the invention, a sun room has side walls and a roof having a set of connecting roof panels. Each roof panel has each end supported by a wall. Each roof panel has a structural first foam core member having a thickness with a top and bottom and at least one groove longitudinally extending therein. A planar structural support member is mounted in each groove. A top and bottom structural cover member is adhered onto a respective top and bottom of the foam core. Preferably, the structural first core member is made from a structural foamed plastic material.

[0016] In accordance with a further aspect of the invention, a sun room roof assembly includes a set of panels sealingly joined together with one end supported by a panel rail on a wall and a second end supported by a sun room wall. Each of the panels has a structural foam core member having at least one groove longitudinally extending therein. At least one rib has a minor axis that is vertically oriented and a major axis running along the length of the panel and is mounted in the at least one groove. A top and bottom structural cover member is adhered onto a respective top and bottom of the panel foam core member. Preferably, at least one panel has two grooves and two ribs with each being spaced from a longitudinal centerline of the panel. A centered sky light hole cut in said foam core member between the two ribs and grooves. A skylight is mounted in the centered hole between the grooves and ribs.

[0017] In one embodiment the panel has three grooves and ribs. One of each groove and rib is aligned along a longitudinal centerline and the other two grooves and ribs are spaced between the longitudinal centerline and a lateral side of the panel.

[0018] It is preferred that the groove is formed by a saw blade for cutting into the top or bottom of the foam core member and the rib is laterally positioned into the respective groove from the top or bottom. Other manufacturing systems such as the use of a multiple router head assembly can also form the grooves.

BRIEF DESCRIPTION OF THE DRAWINGS

[0019] Reference now is made to the accompanying drawings in which:

[0020] FIG. 1 is a top perspective view of a sun room incorporating an embodiment of the invention.

[0021] FIG. 2 is a fragmentary lower perspective view of the sun roof assembly shown in FIG. 1;

[0022] FIG. 3 is a top perspective and exploded view of the sun roof assembly;

[0023] FIG. 4 is a front elevational view of an individual roof panel shown in FIG. 2;

[0024] FIG. 5 is an exploded fragmentary view of the panel shown in FIG. 4;

[0025] FIG. 6 is a top perspective and partially exploded view showing a modified embodiment of the invention incorporating a skylight;

[0026] FIG. 7 is a top perspective view of another embodiment of a foam core for use in the invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0027] Referring now to FIG. 1, a sun room 10 extends from a main building 12 with two opposing side walls 14 and a third outer wall 16. A sun roof 18 extends from the main building to entirely cover the sun room. As shown in FIGS. 2 and 3, the roof is made from a series of panels 20 that are joined together via a tongue and groove joint 22 along the sequential panel edges 24 and 26. Each panel extends from the roof hanging rail 28 mounted on the main building 12 to the top of the outer wall 18. The outer side edges 30 and 32 of the roof 18 is finished off with a c-fascia 34 and a gutter 35 along with two corner trim pieces 36. Top cleat 37 and bottom cleat 38 both hide the joint 22 and seal the roof panels 20 against leakage.

[0028] The construction of each panel 20 is shown more clearly in FIGS. 4-5. Panel 20 is approximately 4 feet in width and has a polystyrene core 40 made from a conventional medium density polystyrene foam having a density of about 2 lbs./cubic foot. Other densities as light as 1 lb./cubic foot are also suitable. The foam panel is approximately 3 inches thick, however, thicker panels up to 6 inches thickness for more strength are also foreseen.

[0029] The foam core 40 has a top surface 41 covered by a painted aluminum cover or skin 42 and a bottom surface 43 similarly covered by a bottom painted aluminum cover or skin 44. Each cover 42 and 44 has a thickness of approximately 0.019". Other thicknesses of 0.024" and 0.032" are also suitable for added strength. Each cover 42 and 44 is bonded to the core with an application of a commercially available and known urethane adhesive. Each cover 42 and 44 may have a cosmetic dimpled texture embossed therein.

[0030] The foam core has three grooves 46 formed therein at approximately one foot increments with a center groove extending along the longitudinal centerline or axis 47 of the panel 20. Each groove 46 extends fully between the two opposite longitudinal ends 48 of the foam core member 40. The grooves 46 however do not extend all the way down through the foam core member thickness or height. Each groove 46 has a bottom 50 that is spaced from the bottom surface 43 such that a bridging span 54 in the foam core 40 is formed and has a sufficient thickness of about 1/2" to maintain the foam core member's structural integrity during normal production handling while the remainder of the panel is assembled together. The groove can be formed simply by running a rotary saw blade or routed longitudinally along the foam along its top surface 41.

[0031] The groove 46 is dimensioned to snugly receive an aluminum rib 56 therein. The groove 46 is open at the top surface 41 such that the rib 56 can be fitted laterally into the groove from the top surface 41 rather than from the ends 48. The aluminum rib 56 is approximately 0.065" thick and extends the entire length of the groove 46 as well as substantially the entire height of the groove 46. Other rib thicknesses such as 0.032" are usable and found to have a benefit for support. Aluminum ribs as thin as 0.019" have been determined to provide added support to the panel.

[0032] The rib can be a planar support member with its minor axis vertically oriented and its major axis running longitudinally along or parallel to the length or axis 47 of panel 20.

[0033] The panel 20 is assembled by first forming the foam core and then cutting the three grooves 46 therein. The ribs 56 are then placed in the grooves and then the urethane adhesive is placed on the top and bottom surfaces of the foam core and the covers are placed thereon and bonded thereto. The tongue and groove edges 24 and 26 are then properly formed to finish each panel 20.

[0034] It has been found that the addition of the three ribs as shown in FIG. 3-5 increases a 13 foot long panel's resistance against structural failure from just above the 30 lbs/sq. ft load to approximately a 68 lb./sq. ft load. This increase in structural integrity is achieved without any changes in the overall thickness of the panel.

[0035] A second embodiment is shown in FIG. 6 which reduces the number of grooves 46 and ribs 56 to two and repositions them such that the middle section 58 of the foam core member 40 has an 18" width and the two existing grooves 46 and ribs 56 are positioned 15" from each side edge 24 and 26. In this fashion, there is enough width in the middle to cut a hole 58 to accommodate a skylight 60 without the need for cutting into any rib 56. The two ribs having a thickness of 0.065" produces a significant increase in the structural integrity of the panel against gravitational loads, even with the skylight mounted therein.

[0036] A further modified foam core member is shown in FIG. 7 where the grooves do not extend all the way to each end 48. The ribs 56 are also correspondingly shortened to fit within the grooves 46. In this embodiment the ribs are concealed from the ends 48 such that upon full assembly of the panel 20, the panel 20 has the outward appearance of a conventional panel with no ribs.

[0037] Because of the increased structural strength of the panels 20, they may be lengthened from the present maximum 13 feet up to 16 feet in length or greater. This increase of three feet is accomplished without increasing the overall thickness of the panel 20. As such, conventional 3" trim facias 34, gutters 35 and corner trim pieces 36 can still be used with a much larger sun room.

[0038] It should also be noted that the panel 20 is oriented such that intermediate spanning section 54 is at the bottom surface of the foam core such that the bottom cover 44 remains free from contact with the ribs. If there is any interference with the ribs 56 and the cover 44, any undesirable shadowing takes place at the exterior of the sun room which is less critical than on the interior ceiling of the sun room.

[0039] It is also foreseen that the ribs can be made from steel, other structural metal or structural plastic. The thickness of the ribs is accordingly modified to accommodate the specific strength characteristics of the steel, metal or structural plastic used in accordance with standard engineering practices to render the equivalent strength of the previously described aluminum ribs. Furthermore, it is foreseen that the cover or skin 42 & 44 can also be a thin gauged steel or some later developed sheeting from other material.

[0040] Other variations and modifications are possible without departing from the scope and spirit of the present invention as defined by the appended claims.

The embodiments in which an exclusive property or privilege is claimed are defined as follow:

1. A panel for a sun room roof comprising;

a structural foam core member having a thickness with a top and bottom and at least one groove longitudinally extending therein and intercepts and is open to one of the top or bottom;

a planar structural support member mounted in a respective one of said at least one groove;

a top and bottom structural cover member adhered onto the respective top and bottom of the foam core.

2. A roof panel as defined in claim 1 further comprising:

said at least one groove extending from the top of the foam core member and ending a distance from the bottom of the foam core member such that said foam core member has at least one bridging span section under said at least one groove that is thick enough to retain the foam core member as a single unitary member; and

said bottom structural cover member on the bottom of said foam core member does not touch any planar structural support member or any groove.

3. A roof panel as defined in claim 2 further comprising:

said at least one respective groove and planar structural support member both extend substantially the entire length of said panel.

4. A roof panel as defined in claim 3 further comprising:

said at least one respective groove and planar structural support member each being two in number with each being spaced from a longitudinal centerline of said panel;

a centered sky light hole cut in said foam core member between said two structural supports;

a skylight mounted in said center hole between said grooves and planar support members.

5. A roof panel as defined in claim 3 further comprising:

said at least one respective groove and planar structural support member each being three in number with one of said grooves and one of said planar structural support members aligned along a longitudinal centerline and the other two grooves and planar structural support members being spaced between the longitudinal centerline and a lateral side of said panel.

6. A roof panel as defined in claim 5 further comprising:

each planar structural member being made from aluminum and having a thickness of approximately 0.065."

7. A roof panel as defined in claim 4 further comprising:

each planar structural member being made from aluminum and having a thickness of approximately 0.065."

8. A roof panel as defined in claim 3 further comprising:

each planar structural member being made from aluminum and having a thickness of approximately 0.065."

9. A roof panel as defined in claim 1 further comprising:

said at least one respective groove and planar structural support member each being two in number with each being spaced from a longitudinal centerline of said panel;

- a centered sky light hole cut in said foam core member between said two structural supports;
- a skylight mounted in said center hole between said grooves and ribs.
- 10.** A roof panel as defined in claim 1 further comprising:
- said at least one respective groove and planar structural support member each being three in number with one of said grooves and one of said planar structural support members aligned along a longitudinal centerline and the other two grooves and planar structural support members being spaced between the longitudinal centerline and a lateral side of said panel.
- 11.** A sun room having side walls and a roof having a set of connecting roof panels;
- said panels have each end supported by a side wall, said sun room comprising:
- each roof panel having a structural first foam core member having a thickness with a top and bottom at least one groove longitudinally extending therein;
- at least one planar structural support member mounted in said at least one groove;
- a top and bottom structural cover member adhered onto a respective top and bottom of the foam core.
- 12.** A sun room as defined in claim 11 further comprising:
- said structural first core member being a structural foamed plastic material.
- 13.** A sun room as defined in claim 12 further comprising:
- said at least one groove extending from one of the top or bottom of the foam core member and ending a distance from the other of the bottom or top of the foam core member such that said foam core member has at least one bridging span section that is thick enough to retain the foam core member as a single unitary member; and
- one of said structural cover members of said roof panel does not touch any planar structural support member or any groove.
- 14.** A sun room as defined in claim 13 further comprising:
- at least one respective groove and planar structural support member both extending substantially the entire length of said panel.
- 15.** A sun room as defined in claim 13 further comprising:
- said at least one respective groove and planar structural support member each being two in number with each being spaced from a longitudinal centerline of said panel;
- a centered sky light hole cut in said foam core member between said two structural supports;
- a skylight mounted in said center hole between said grooves and ribs.
- 16.** A sun room as defined in claim 13 further comprising:
- said at least one groove and planar structural support member each being three in number with one of said grooves and one of said planar structural support member aligned along a longitudinal centerline and the other two grooves and planar structural support member being spaced between the longitudinal centerline and a side wall of said panel.
- 17.** A sun room as defined in claim 16 further comprising:
- each planar structural member being made from aluminum and having a thickness of approximately 0.065."
- 18.** A sun room as defined in claim 14 further comprising:
- each planar structural member being made from aluminum and having a thickness of approximately 0.065."
- 19.** A sun room as defined in claim 13 further comprising:
- each planar structural member being made from aluminum and having a thickness of approximately 0.065."
- 20.** A sun room as defined in claim 12 further comprising:
- said at least one respective groove and planar structural support member each being two in number with each being spaced from a longitudinal centerline of said panel;
- a centered sky light hole cut in said foam core member between said two structural supports;
- a skylight mounted in said center hole between said grooves and ribs.
- 21.** A sun room as defined in claim 12 further comprising:
- said at least one respective groove and planar structural support member each being three in number with one of said grooves and one of said planar structural support members aligned along a longitudinal centerline and the other two grooves and planar structural support members being spaced between the longitudinal centerline and a lateral side of said panel.
- 22.** A sun room roof assembly comprising:
- a set of panels sealingly joined together with one end supported by a panel rail on a wall and a second end supported by a sun room wall;
- each of said panels having a structural foam core member having at least one groove longitudinally extending therein;
- at least rib member having its minor axis vertically oriented and its major axis longitudinally extending along the length of said panel; said rib being mounted in said at least one groove;
- a top and bottom structural cover member adhered onto a respective top and bottom of the panel foam core member.
- 23.** A sun room roof assembly as defined in claim 22 wherein at least one panel has:
- said at least one respective groove and said rib each being two in number with each being spaced from a longitudinal centerline of said panel;
- a centered sky light hole cut in said foam core member between said two structural supports;
- a skylight mounted in said center hole between said grooves and ribs.
- 24.** A sun room roof assembly as defined in claim 22 wherein at least one panel has:
- said at least one respective groove and said rib each being three in number with one of said grooves and one of said ribs aligned along a longitudinal centerline and the other two grooves and ribs being spaced between the longitudinal centerline and a lateral side of said panel.

25. A sun room roof assembly as defined in claim 22 wherein at least one panel has:

said at least one groove being formed by a saw blade or router for cutting into the top or bottom of the foam

core member and said at least one rib laterally positioned into the respective groove from said top or bottom.

* * * * *