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(54) **FRAMING SYSTEM AND COMPONENTS WITH BUILT-IN THERMAL BREAK**

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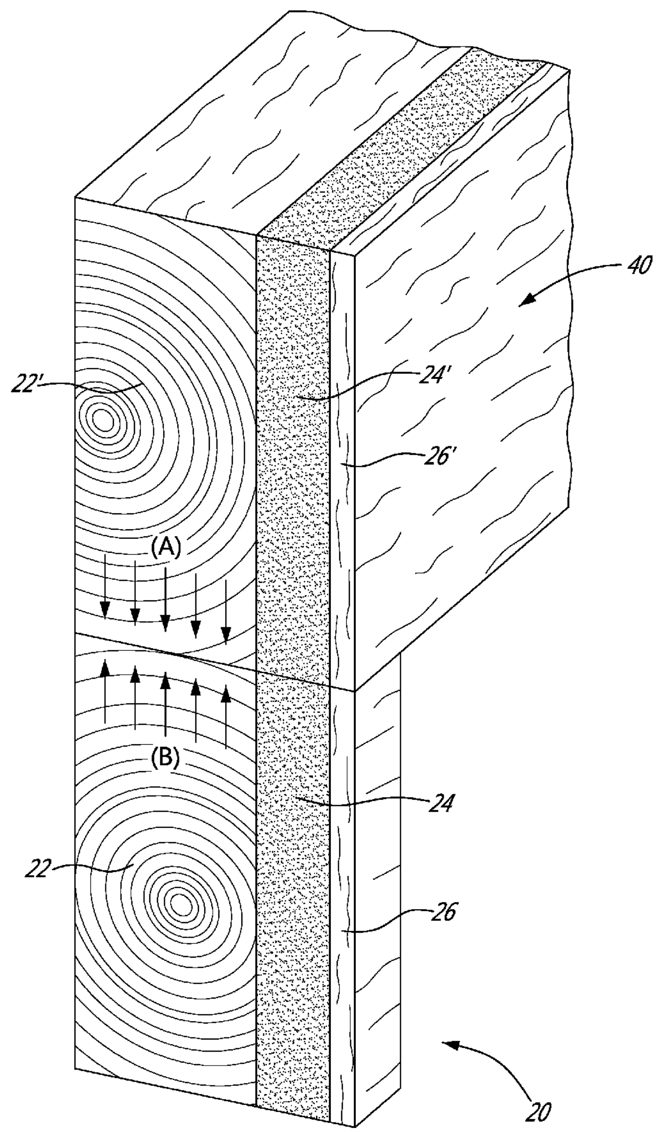
(57) **ABSTRACT**

Framing component with built-in-thermal break, comprising a structural member and an insulation member secured to the structural member on an inside of a building, the structural member being made in wood, the insulation member being made in a thermal break material; the structural member and the insulation member forming a one-piece insulated framing component, a bearing depth of the component being smaller than a bearing depth of the wall.



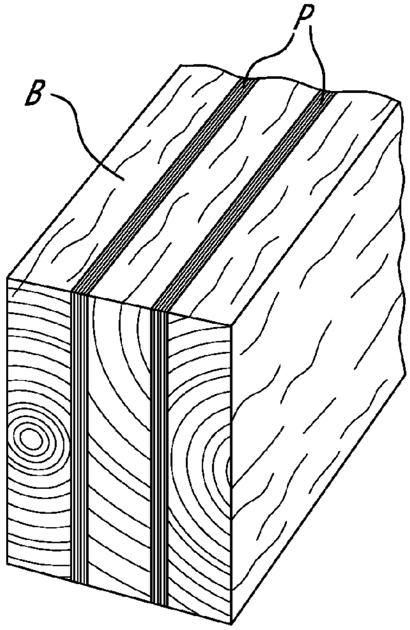


FIG. 1a (PRIOR ART)

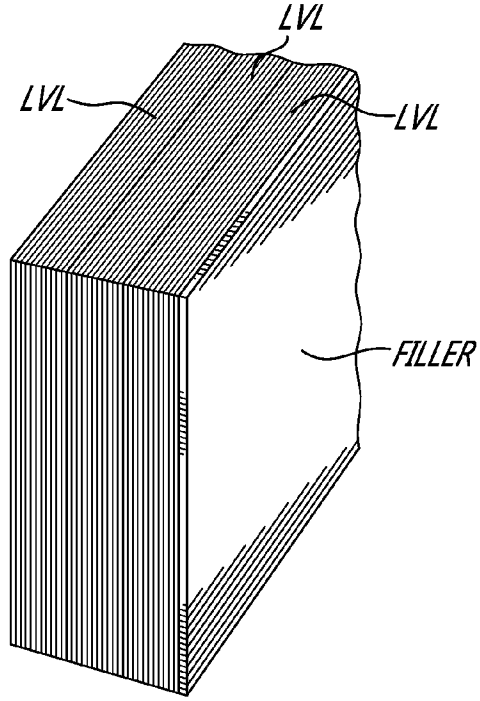


FIG. 1b (PRIOR ART)

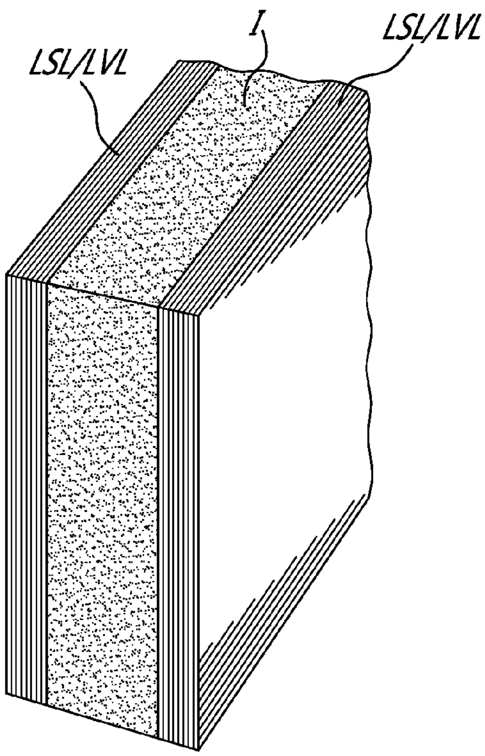


FIG. 1c (PRIOR ART)

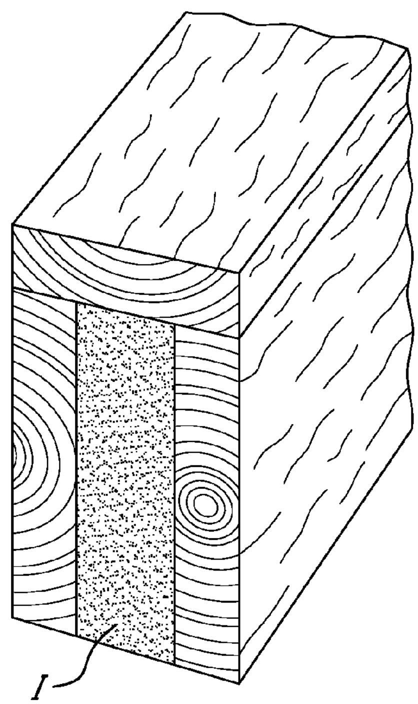


FIG. 1d (PRIOR ART)

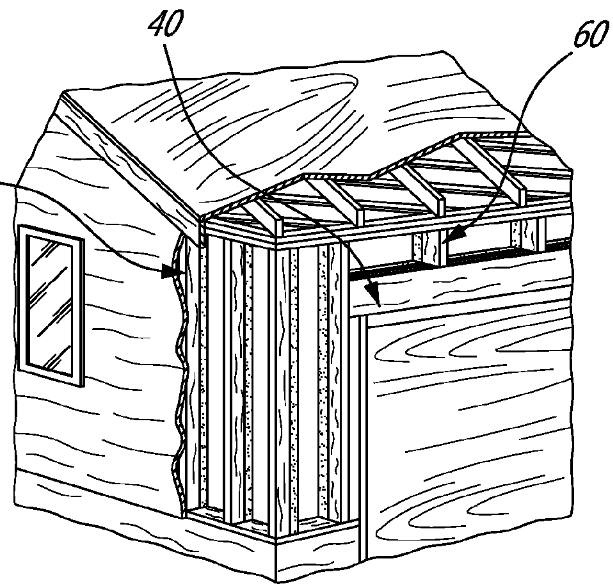


FIG. 2a

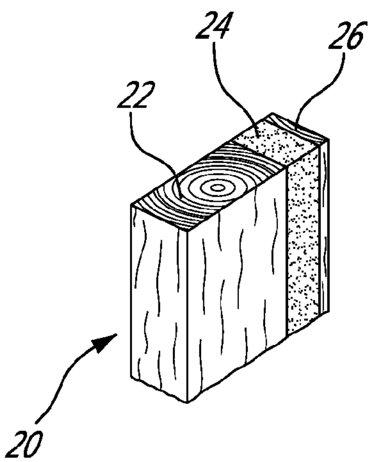


FIG. 2b

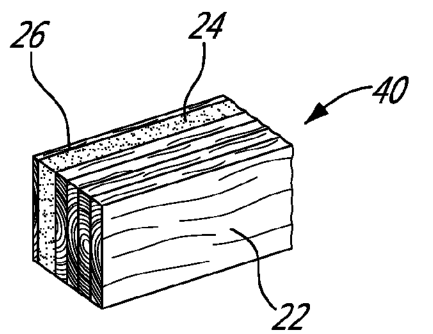


FIG. 2c

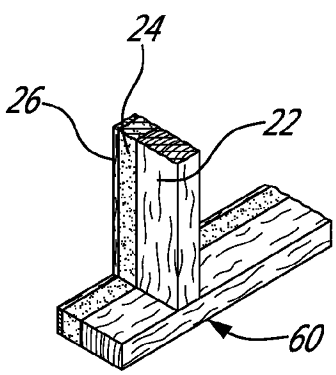


FIG. 2d

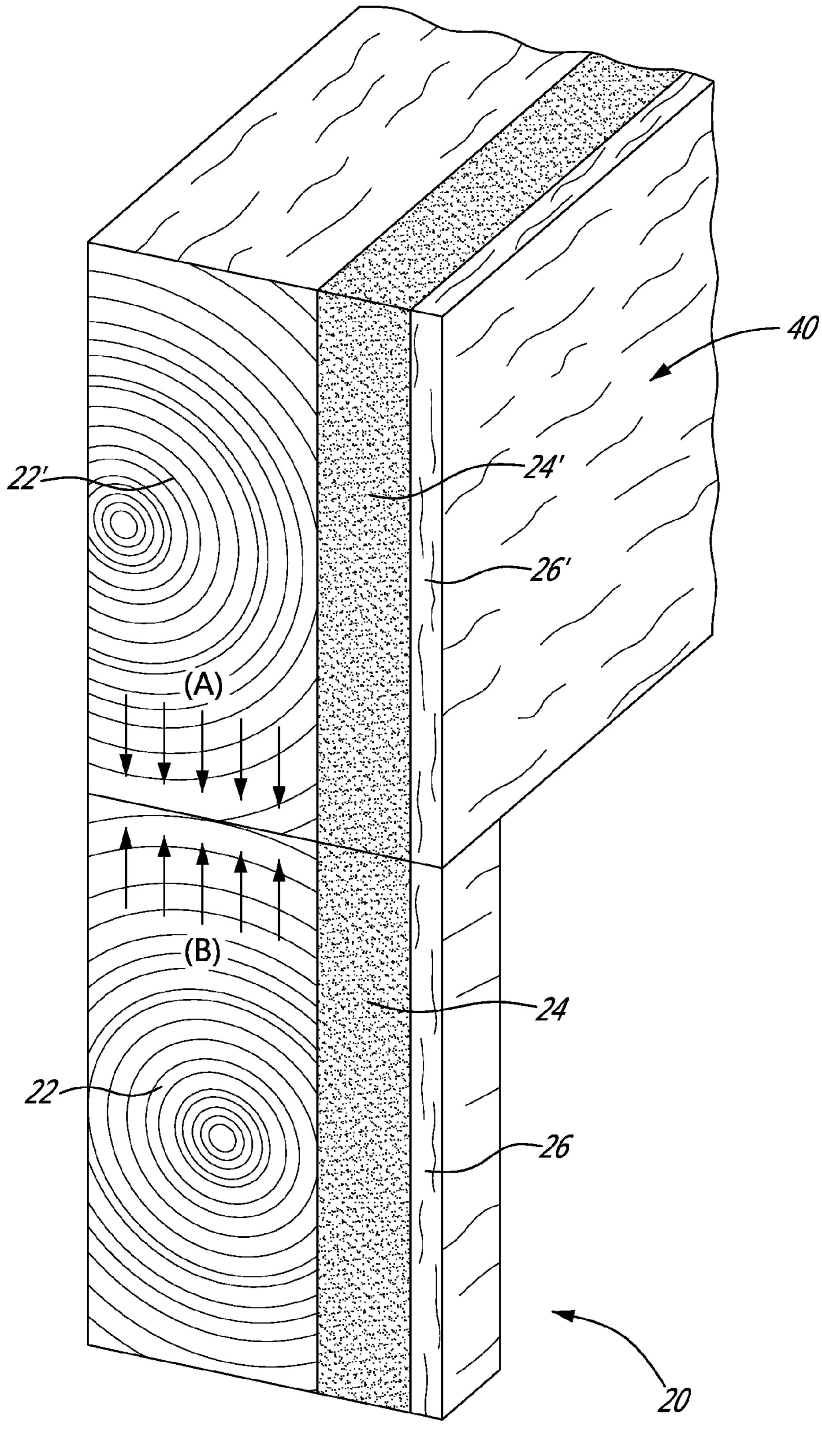


FIG. 3

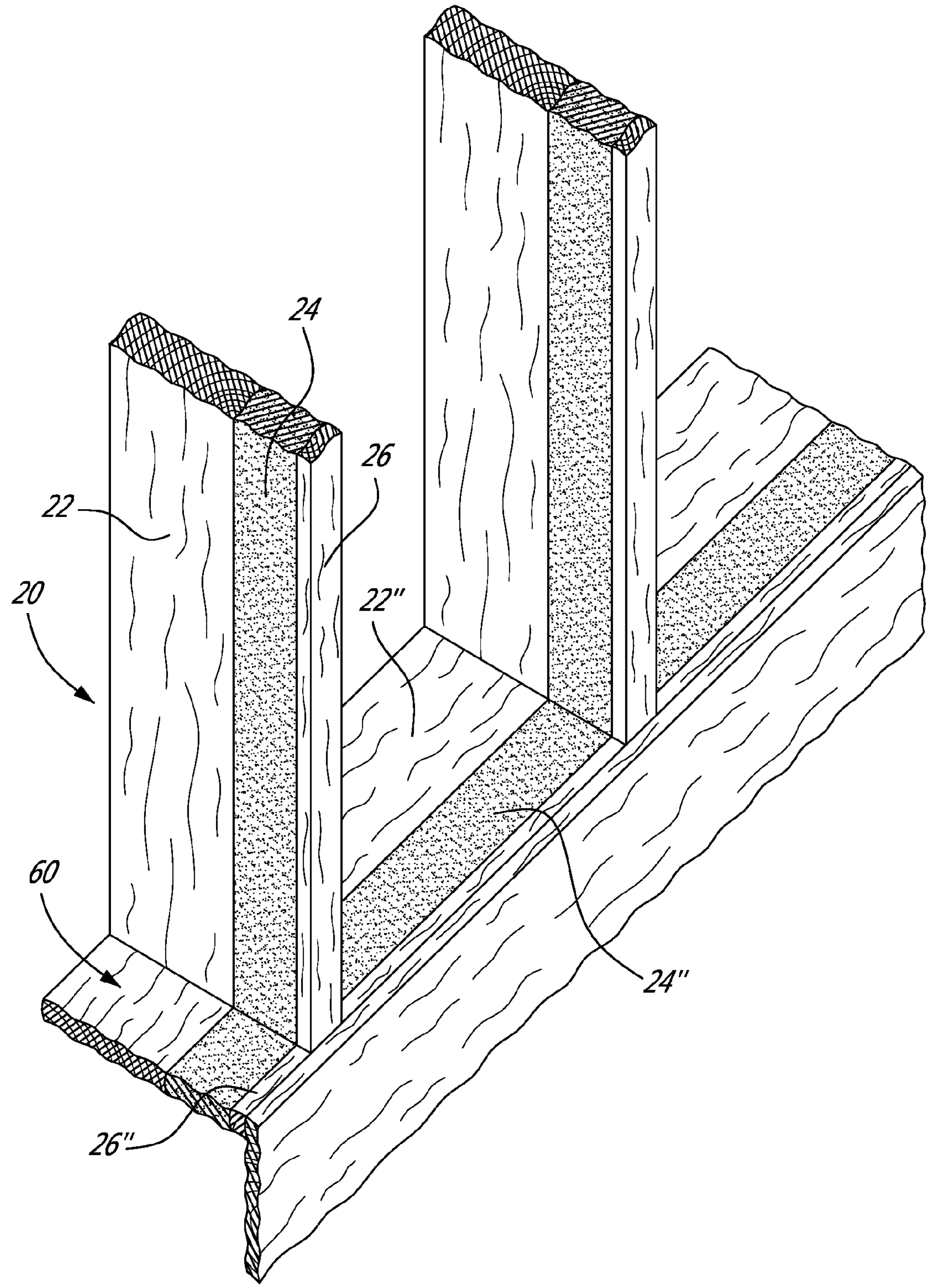


FIG. 4

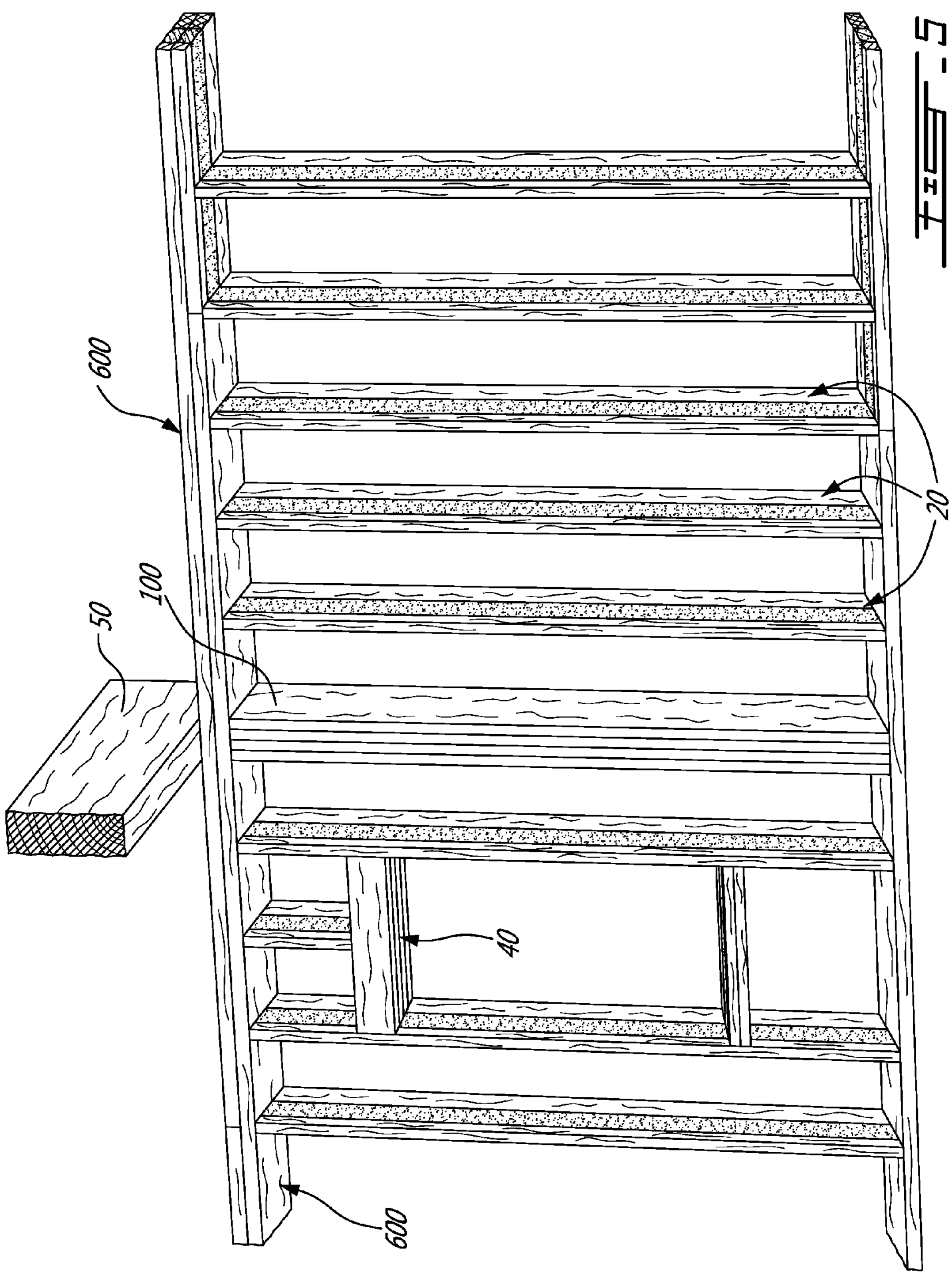


FIG-5

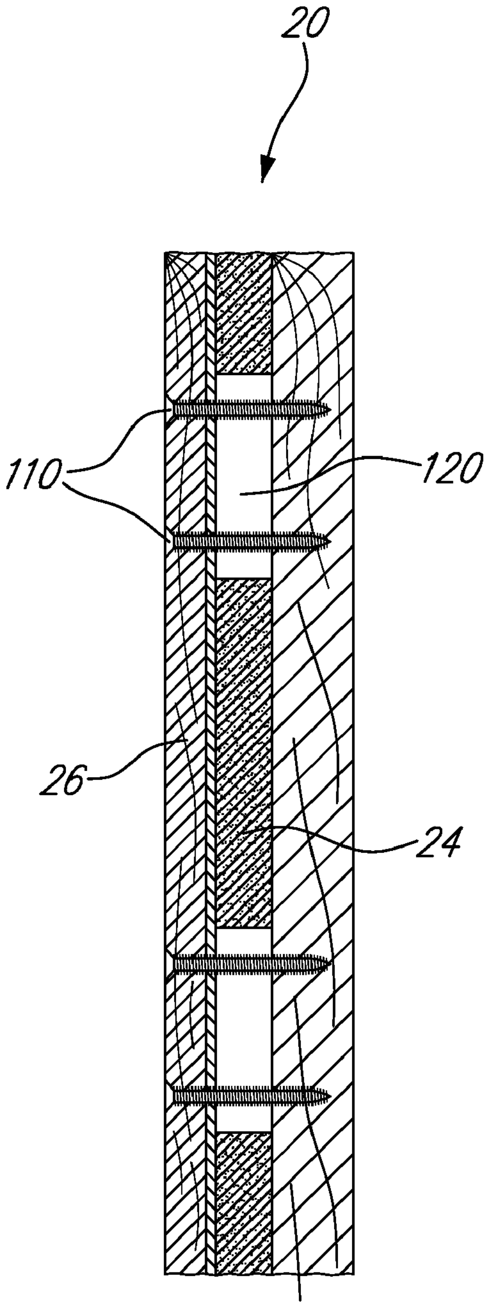


FIG. 6a

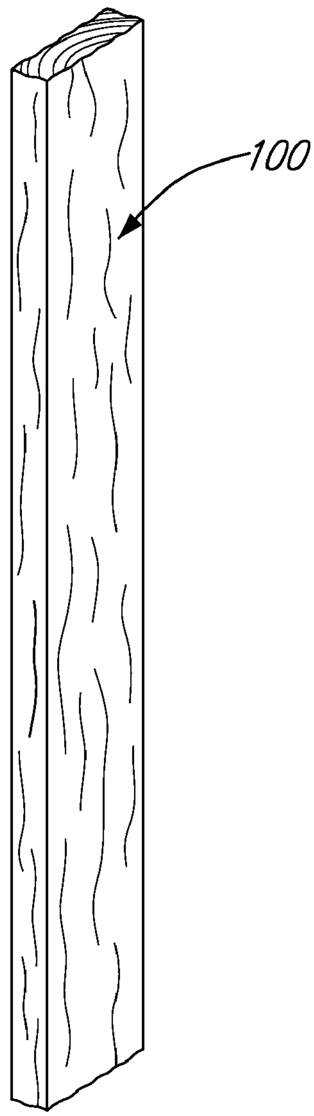


FIG. 6b

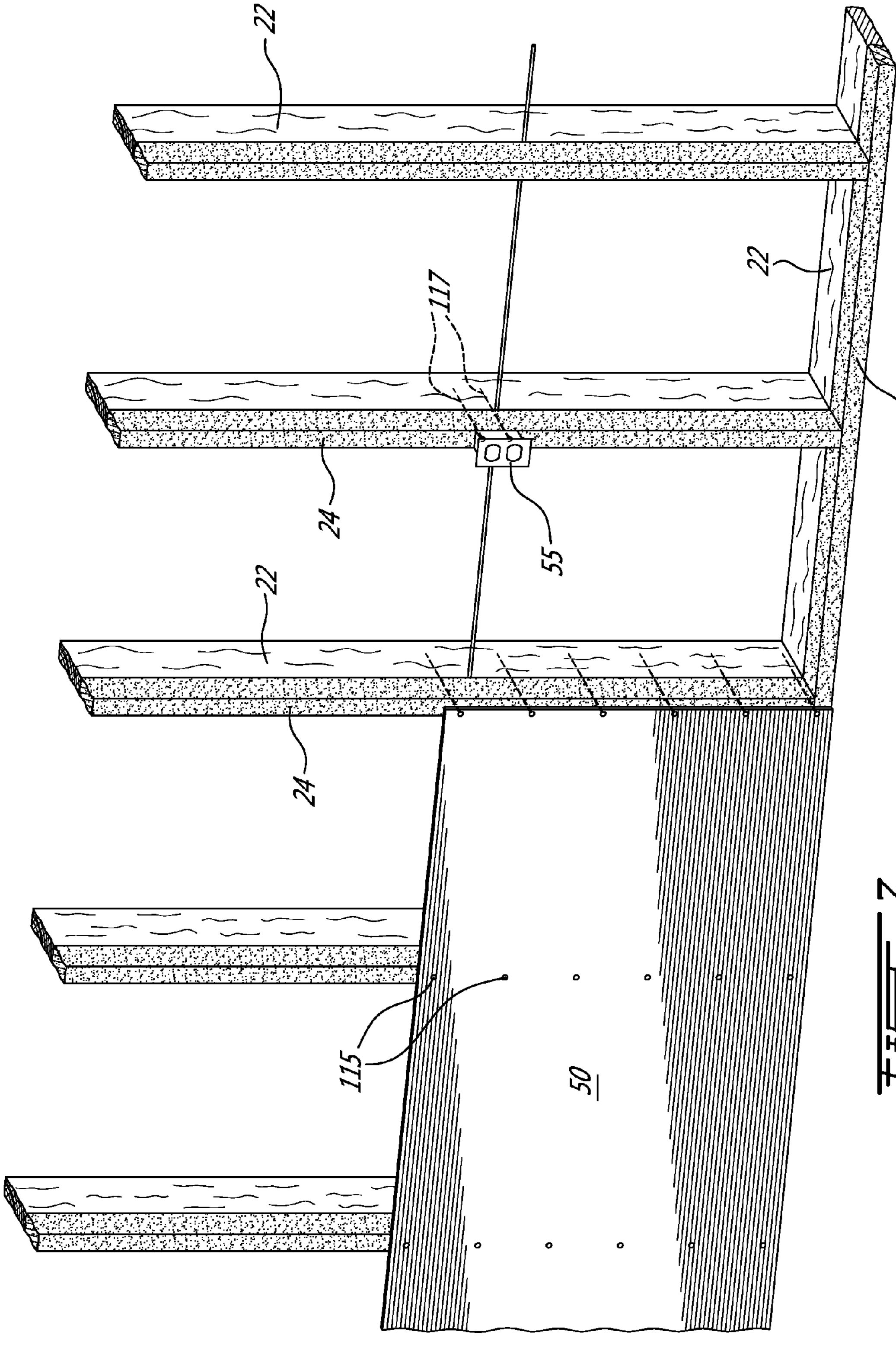


FIG-7

FRAMING SYSTEM AND COMPONENTS WITH BUILT-IN THERMAL BREAK

FIELD OF THE INVENTION

[0001] The present invention relates to framing systems. More specifically, the present invention is concerned with a framing system and components with built-in thermal break.

BACKGROUND OF THE INVENTION

[0002] Standard construction today in residential and light commercial wood framing uses either 2×4 or 2×6 solid lumbers spaced 16" on center. Energy conservation concerns and building codes have forced most builders to frame exterior wall with 2×6's. Framing requirements (roof loads, carry beams, headers) and details (window and door openings, inside and outside corners, wall intersections) greatly increase the amount of solid wood in an exterior wall. The United States national average is 25 percent of the wall as a solid wood framing.

[0003] Thermal bridges are points in the building envelope that allow heat conduction to occur. Since heat flows through the path of least resistance, thermal bridges can contribute to poor energy performance. A thermal bridge is created when materials create a continuous path across a temperature difference, in which the heat flow is not interrupted by thermal insulation.

[0004] A common construction design is based on stud walls, in which wood studs, plates, headers, or any other framing members in an exterior wall, may constitute thermal bridges. There is a relationship between the "framing factor" (framing percentage) and the "framing effect" in any insulated wall. As the framing factor increases the amount of insulation decreases and, since the insulation has a much higher R-value (thermal resistance, or R, ru, R-factor, R-value) than the framing member, the thermal efficiency of the wall suffers.

[0005] Thermal bridges through wood framing members have been a concern for some time now and manufacturers provide wood framing systems developed to reduce them (see FIGS. **1***c* and **1***d*). A most common system comprises wrapping the entire exterior of the building in rigid insulation to eliminate the heat loss through the wood framing members. This system requires that the builder makes multiple trips around the building, which greatly increases labor costs. Moreover, it also increases the wall thickness, resulting in more expensive window and door jambs extension for example.

[0006] FIGS. **1** illustrates conventional framework components, such as conventional headers for 2×6 walls, for example. Typically, such headers are made of beams (B) of solid wood alternating with layers of plywood (P) (see FIG. **1***a*) or laminated veneer lumbers (LVL) for larger spans (see FIG. **1***b*). Insulated headers can also be found, comprising a foam insulation (I) sandwiched between two laminated veneer lumbers (LVL) or two laminated strand lumbers (LSL) (FIGS. **1***c* and **1***d*).

[0007] Other wall systems such as ICF (insulated concrete forms) and SIP (structural insulated panels) have also been developed and marketed as being more energy efficient because they reduce the amount of thermal bridging that exist in wood framing.

[0008] There is still a need in the art for a framing system and components, with built-in thermal break.

SUMMARY OF THE INVENTION

[0009] More specifically, there is provided a framing component with built-in-thermal break for a wall of a building, comprising: a structural member; and an insulation member secured to the structural member on an inside of the building; wherein the structural member is made in wood, the insulation member is made in a thermal break material; the structural member and the insulation member forming a one-piece insulated framing component, a bearing depth of the component being smaller than a bearing depth of the wall.

[0010] There is further provided a framing system comprising at least one component with built-in-thermal break for a wall of a building, comprising: a structural member; and an insulation member secured to the structural member on an inside of the building; wherein the structural member is made in wood, the insulation member is made in a thermal break material; the structural member and the insulation member forming a one-piece insulated framing component, a bearing depth of the component being smaller than a bearing depth of the wall.

[0011] Other objects, advantages and features of the present invention will become more apparent upon reading of the following non-restrictive description of embodiments thereof, given by way of example only with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0012] In the appended drawings:

[0013] FIGS. **1** illustrate framing components of the prior art: a) headers made of beams of solid wood alternating with layers of plywood; b) headers made of laminated veneer lumbers; c) insulated headers comprising a foam insulation sandwiched between laminated veneer lumbers; and d) insulated headers comprising a foam insulation sandwiched between laminated strand lumbers;

[0014] FIG. **2***a*) shows a detail of a framework structure according to an embodiment of the present invention; FIG. **2***b*) shows a detail of a stud according to an embodiment of the present invention; FIG. **2***c*) shows a detail of a header according to an embodiment of the present invention; and FIG. **2***d*) shows a detail of a plate according to an embodiment of the present invention;

[0015] FIG. **3** shows a header and a stud assembled according to an embodiment of the present invention;

[0016] FIG. **4** shows a stud and a plate assembled according to an embodiment of the present invention;

[0017] FIG. **5** shows a system according to an embodiment of the present invention;

[0018] FIG. **6** shows a detail of a door framing, according to an embodiment of the present invention; and

[0019] FIG. **7** shows a system according to a further embodiment of the present invention.

DESCRIPTION OF EMBODIMENTS OF THE INVENTION

[0020] There is provided a complete framing system including studs, plates, and headers, all designed to work together with a continuous structural load path, an insulation plane, and a nailer plane (see FIG. **2***a*).

[0021] As illustrated in FIGS. **2***b*, **2***c* and **2***d*, a stud **20**, a header **40** and a plate **60** generally each comprises an insulation member **24** sandwiched between a structural member **22** and a support **26**.

[0022] The structural member **22** is typically a wood member, which provides the strength needed to support load. It can be made in a range of lumber species or engineering lumbers, such as, for example, solid sawn lumber, spruce-pine-fir (spf), Douglas fir (df), Hem-fir (Hf), or finger jointed or engineered LVL (laminated veneer lumber), plywood, oriented strand board (OSB).

[0023] The insulation member **24** is a thermal break material, generally a poor conductor of heat. Typically, the insulation member **24** is a rigid foam material, providing thermal insulation. Spray urethane may be used as both an adhesive and the insulation if used in an injection-type process.

[0024] Combined strands of wood fiber and insulation may be extruded together into a single piece of framing combining the properties of both members **22** and **24**, i.e. the strength required to support the load and the insulating thermal properties required.

[0025] The support **26** is a non-structural component, merely covering the insulation member **24**, on the inside of the building. It acts as a nailer for the interior wall finishes, such as drywalls, boards, trims or moldings, for example, and electrical boxes. It can be made of OSB, plywood, lumber or engineered wood.

[0026] As a result, each one of the stud **20**, header **40** and plate **60** are a one-piece insulated structural member.

[0027] These members may be glued together, or secured together using mechanical fastening such as nails or screws, although this may cause a problem when the builder hits a nail or a screw while cutting the members for in-situ installation. Additionally, metal fasteners may create a thermal bridge for heat loss.

[0028] Due to the unique properties of urethane, as mentioned hereinabove, it can be used as the adhesive for securing the members together, while forming the insulation **24**.

[0029] It could be contemplated not using any support **26**, as discussed hereinbelow in relation to FIG. **7**.

[0030] A system according to an embodiment of the present invention may thus comprise a $3^{1/2"}$ lumber as the structural member **22**, an $1^{1/2"}$ insulation foam as the insulation member **24**, and a ½" piece of OSB as the support **26**, for a total assembly of $5^{1/2"}$. Such an assembly matches a 2×6 framing. Clearly, as people in the art may appreciate, all dimensions can be modified.

[0031] As people in the art will appreciate, the header **40** structure matches the stud **20** load capacity, which varies across a depth thereof. The header is dimensioned according to the thickness of the wall, i.e. a 2×4 wall has a $3^{1/2"}$ wide header, and a 2×6 wall has $5^{1/2"}$ wide header. However, owing to the structure of the header **40** as just described above, the bearing depth is smaller than the thickness of the wall.

[0032] By using the structures of the header **40** and the stud **20** above, all the load capacity of the structural member **22'** of the header **40** (see arrows A) is picked up by the stud **20** (see arrows B), as shown in FIG. **3**.

[0033] Similarly, as shown in FIG. **4**, once assembled, the structural member **22"**, the insulation member **24"** and the support **26"** of the plate **60** fit with the structural member **22**, the insulation member **24** and the support **26** of the stud **20**, respectively.

[0034] As people in the art will appreciate, the present system creates a thermal break for each member component of the wall framing.

[0035] The R-value of the framing components is increased from 5.5 to 11.5 compared to conventional studs, headers or plates. Thermal bridging is virtually eliminated and the thermal efficiency of the wall system as a whole is vastly improved, as shown in Table I below.

TABLE I

Framing Percentage	Conventional Framing	Framing of the present invention	Increase in thermal efficiency
30%	R-12.3	R-16.9	+27.2%
25%	R-13.2	R-17.4	+25.4%
20%	R-14.1	R-17.9	+20.9%

[0036] The present system allows insulating all exterior wall framing components, studs, plates and headers in a wood frame construction. The fabrication of each framing component can be done in a mill and then the assembled components can be shipped to clients.

[0037] The present system improves the energy performance in residential buildings, at a constant wall depth. It is found that the additional cost involved when using the present system is small, with a short payback period, especially since the price of energy increases.

[0038] Moreover, because the foam insulation **24** and the OSB **22** are very dimensionally stable compared to solid lumber, the likeliness of drywall callbacks from nail pops for example, is reduced.

[0039] The present system is easy for electricians to wire. Moreover, it is found to reduce sound transmission from outside.

[0040] The above advantages are provided without builders having to change the way they currently build. They only find that the walls are lighter. Indeed, based on a content density of wood species, a 2×6 wall according to an embodiment of the present invention may be about 25% lighter than a conventional 2×4 wall, since 27% of the structural wood member is replaced with light weight foam insulation, for example.

[0041] The frame components as described hereinabove may be interchangeable with conventional framing components if needed. For instance, as illustrated in FIG. **5**, in the case of a point load from a carry beam **50** or girder above a stud, the load may be such that a 2×6 stud is required. Then a conventional 2×6 stud (label **100**) can be used in the same wall with insulated framing provided that the plates **600** are conventional 2×6 plates above and below the point load, since the bearing of the plate must match the bearing capacity of the stud.

[0042] Other place where conventional framing may be interchanged is at door framing, particularly in swing doors. As shown in FIG. **6**, screws **110** in top hinges may be of a length such that they hit the jack stud, while other screws only go into the jamb. Thus, it may happen that long hinge screws **110** do not hit anything structural, only foam. Moreover, on the other side of the door is the lock and possibly a deadbolt, the strikes of all deadbolt being attached to the jack studs with long screws that may also hit nothing but foam. Blocking **120** may be used to accommodate the hinge and lock screws mentioned hereinabove. Alternatively, a conventional stud **100** could be used.

[0043] In an embodiment illustrated in FIG. **7**, the system only uses structural members **22** and insulation members **24**. In the case of a 2×4 structural member **22**, the foam **24** would be 2" in order to make the assembly $5^{1/2"}$, which, as people in the art will appreciate, is the shallowest depth possible when using fiberglass insulation to meet minimum building codes in North America for example. With the foam insulation **22** 2" thick and a drywall **50** of $^{1/2"}$, screws **115** required to hold the drywall **50** need to be of a minimum of $3^{1/2"}$. Similarly, electrical boxes **55** need long screw **117**, probably 3".

[0044] There is thus provided a framing system with built-in-thermal break, which improves the thermal efficiency of a building envelope. The present framing system increases R-value and energy efficiency of homes and wood frame building structures, therefore lowering heating and cooling costs and conserving natural resources. This system improves the energy performance of most wood framing and insulation systems that currently exist.

[0045] Although the present invention has been described hereinabove by way of embodiments thereof, it may be modified, without departing from the nature and teachings of the subject invention as defined in the appended claims.

1. A framing member with built-in-thermal break for a wall of a building, comprising:
- a structural member; and
- an insulation member secured to said structural member on an inside of the building;
- wherein said structural member is made in wood, said insulation member is made in a thermal break material; said structural member and said insulation member forming a one-piece insulated framing component, a bearing depth of the component being smaller than a bearing depth of the wall.

2. The framing member of claim **1**, further comprising a nailer member covering the insulation member on the inside of the building.

3. The framing member of claim **1**, wherein said structural member is made in a range of lumber species or engineering lumber.

4. The framing member of claim **1**, wherein said structural member is selected in the group comprising solid sawn lumbers, finger jointed and engineered LVL (laminated veneer lumber), plywood and oriented strand boards (OSB).

5. The framing member of claim **1**, wherein said insulation member comprises a rigid foam material.

6. The framing member of claim **1**, wherein said insulation member comprises urethane.

7. The framing member of claim **1**, wherein said members are glued together.

8. The framing member of claim **1**, wherein said structural member is formed by strands of wood fiber, said strands of wood fiber and said insulation is extruded together into the one-piece insulated framing component.

9. The framing member of claim **2**, wherein said nailer member is selected in the group consisting OSB, plywood, lumber and engineered wood.

10. The framing member of claim **1**, wherein said component is one of a stud, a header and a plate.

11. The framing member of claim **1**, having an R-value reaching 11.5.

12. A framing system comprising at least one member as recited in claim **1**.

* * * * *