Dec. 17, 1963 W. L. BRIGGS 3,114,179

HEAT-INSULATED METAL-FRAMED CLOSURE

Filed Dec. 1, 1960 2 Sheets-Sheet 1

Fig. 1

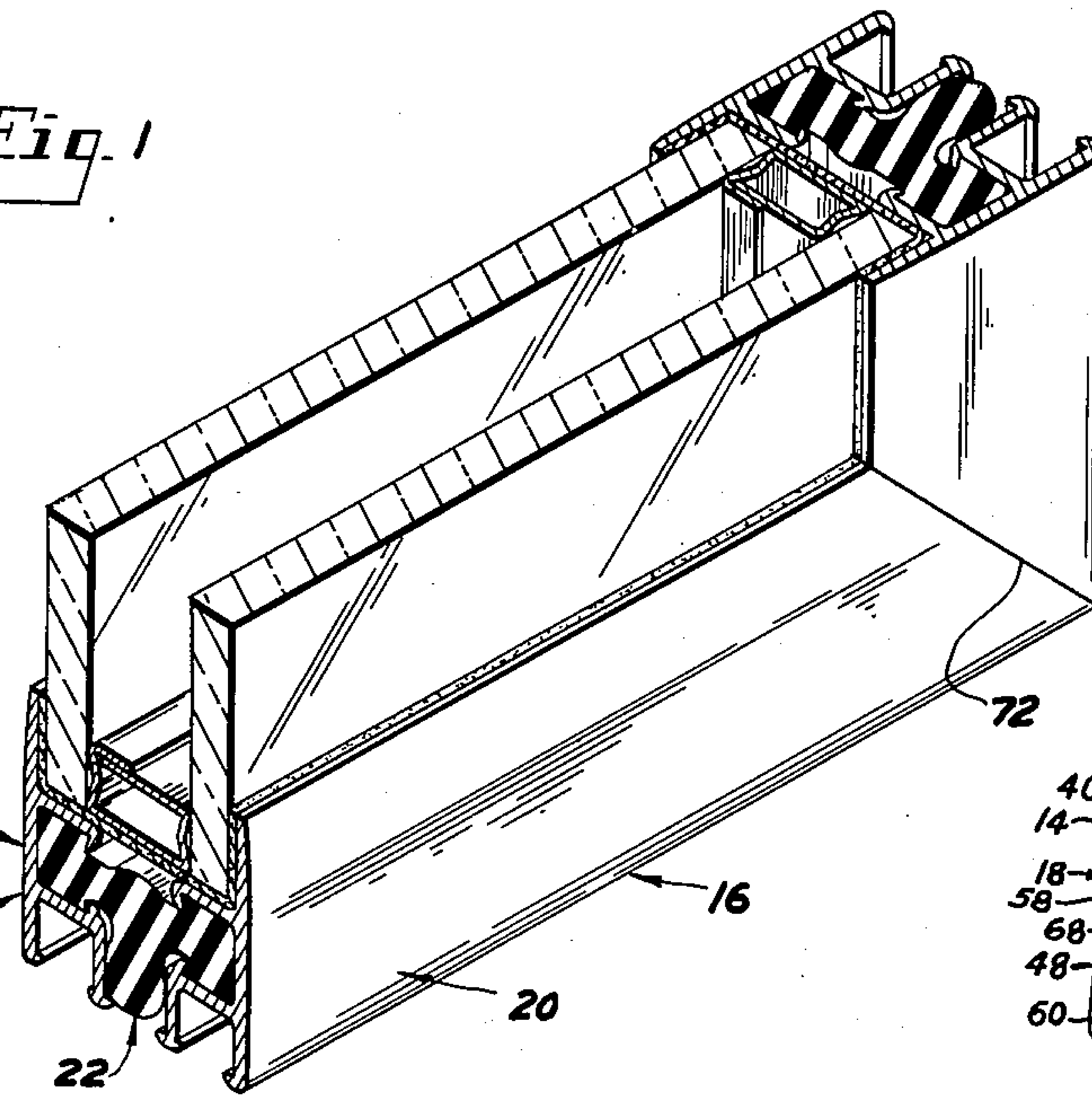


Fig. 8

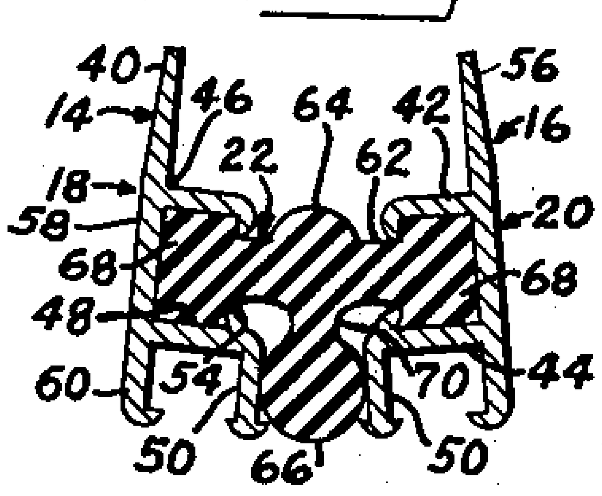
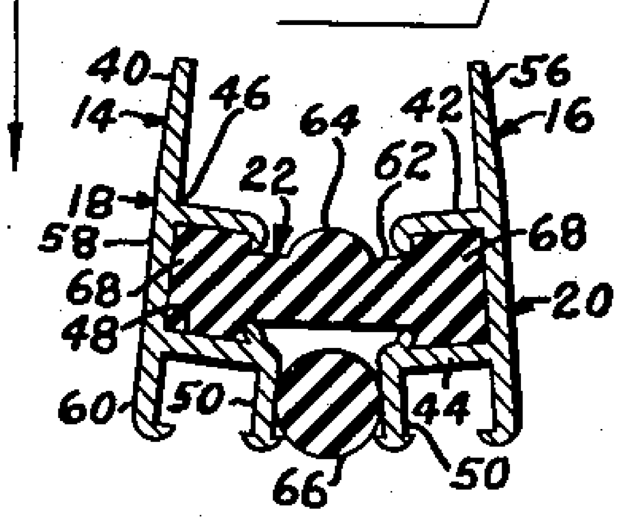


Fig. 3

Fig. 9



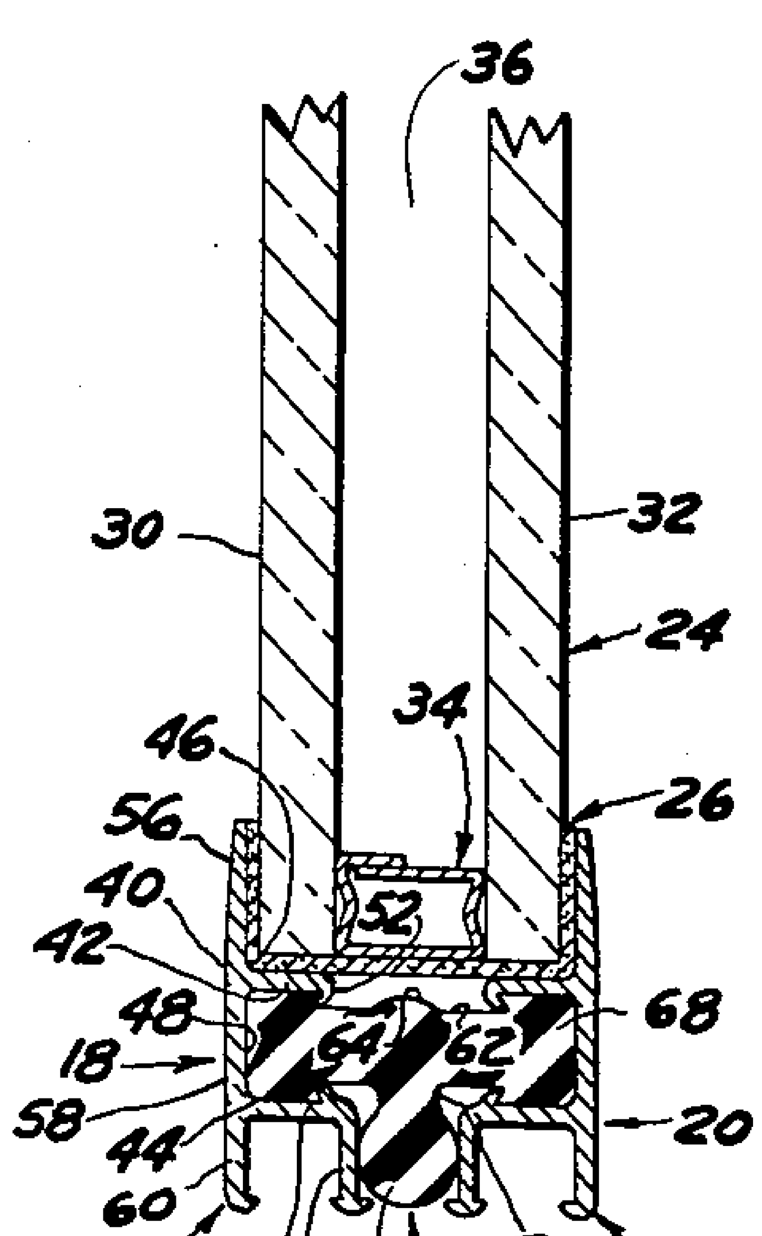
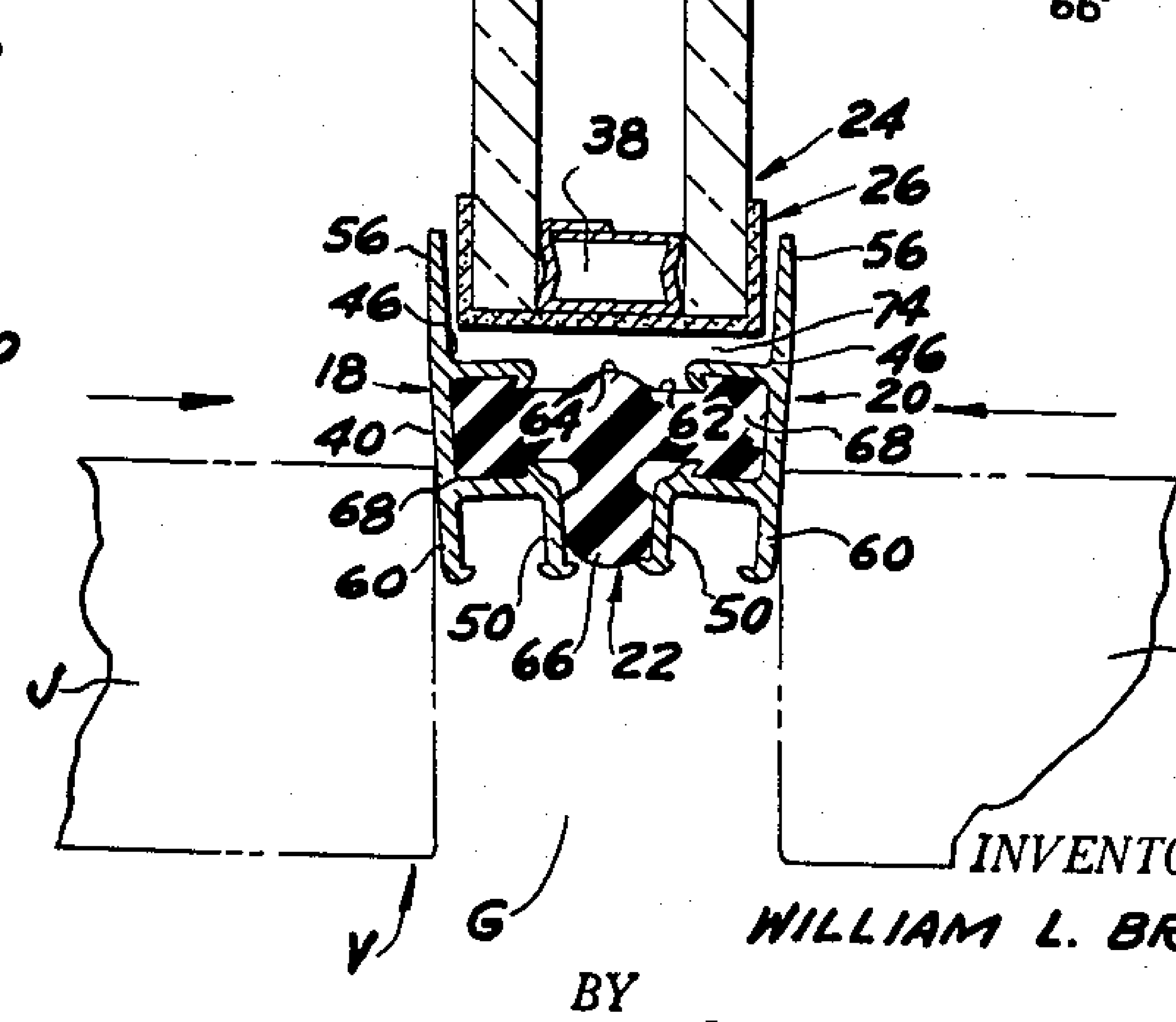


Fig. 2



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2 Sheets-Sheet 2

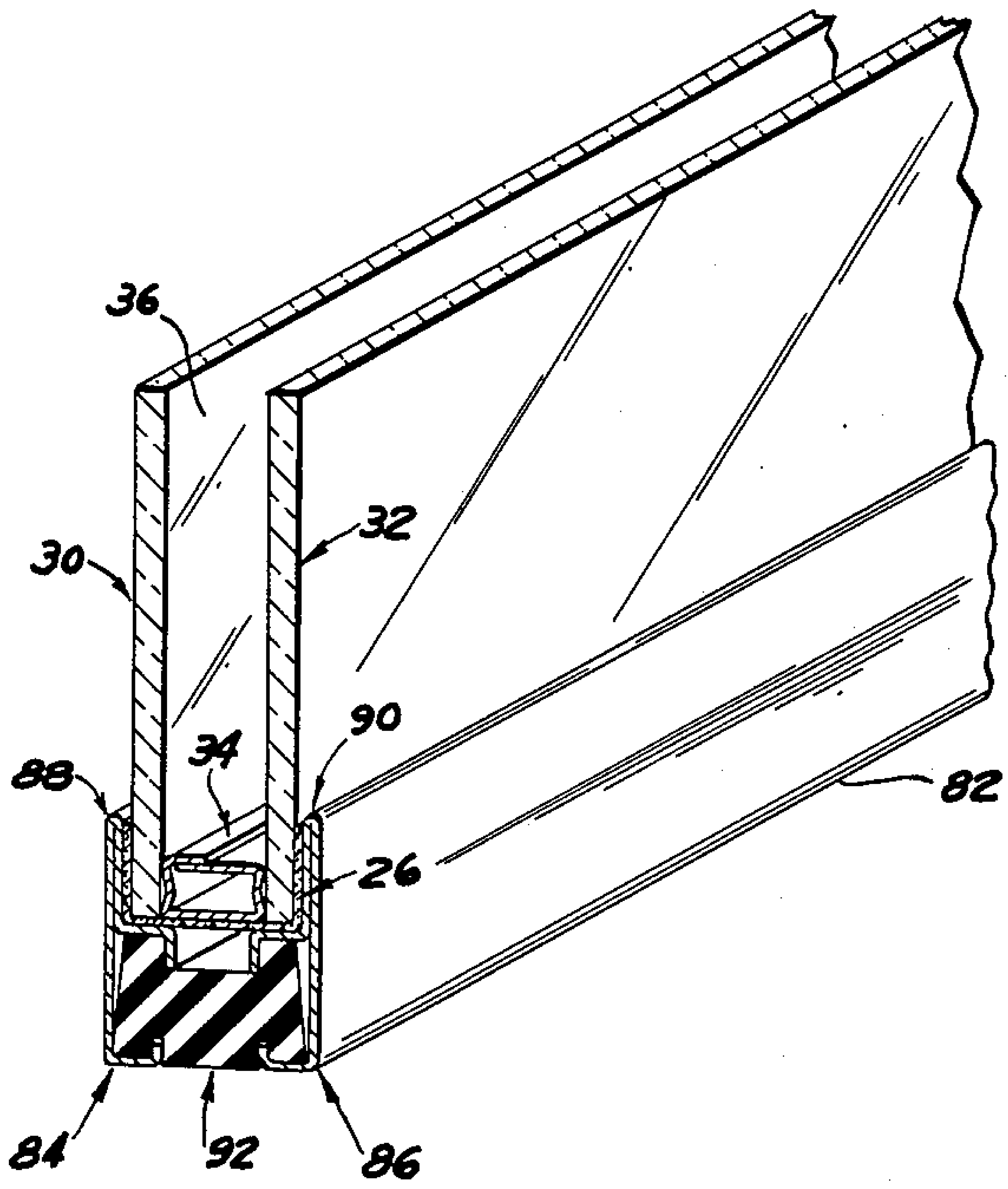


Fig. 4

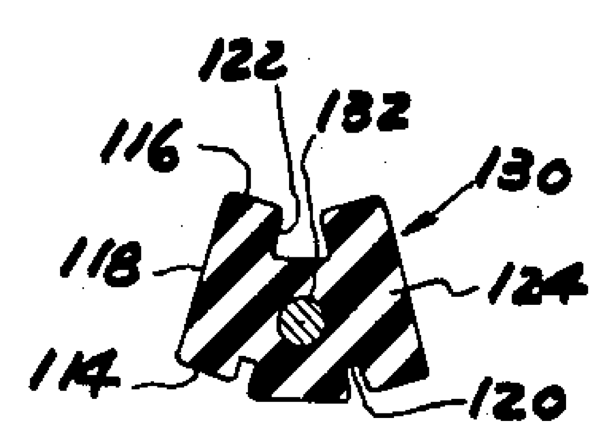


Fig. 7

Fig. 6

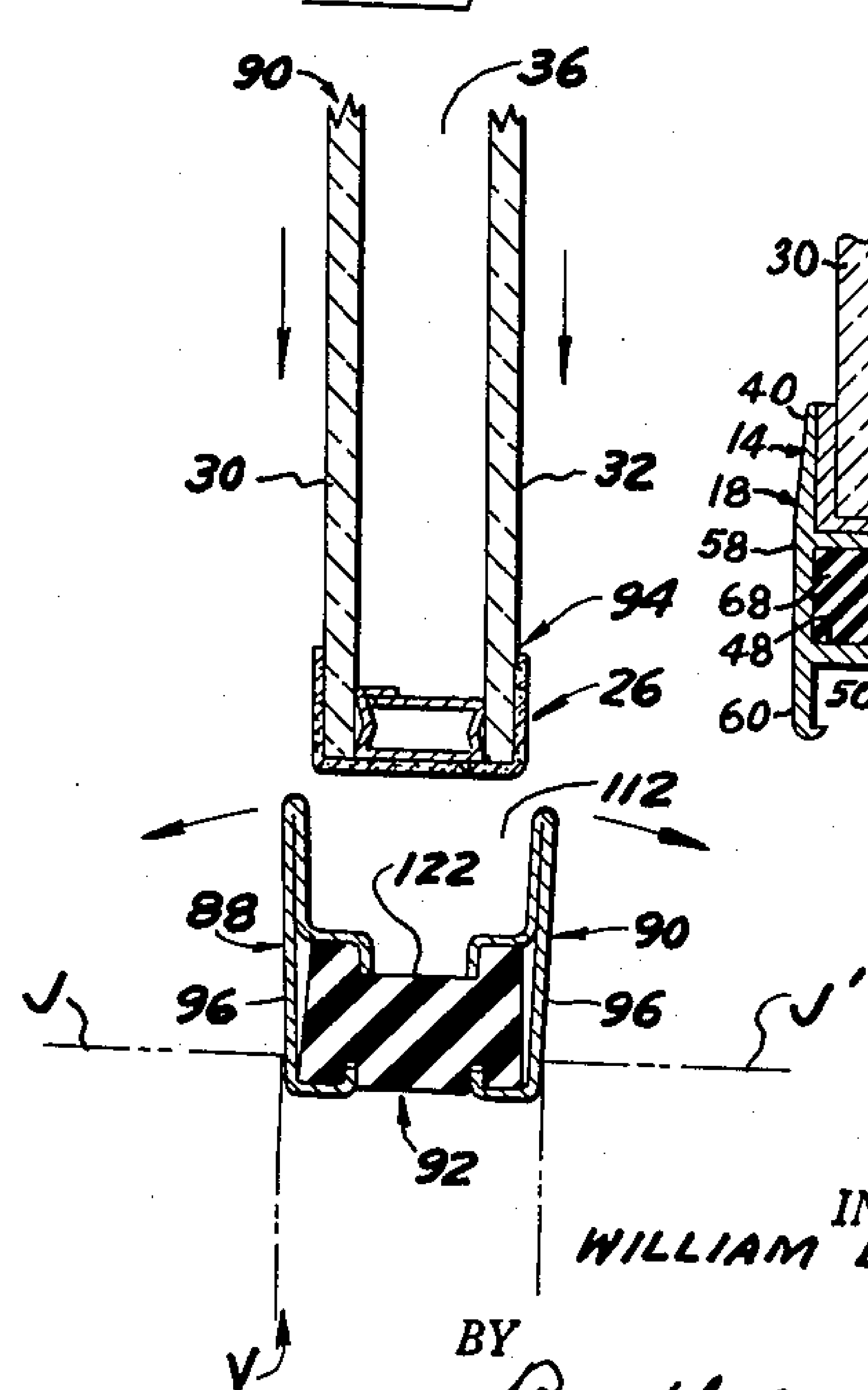
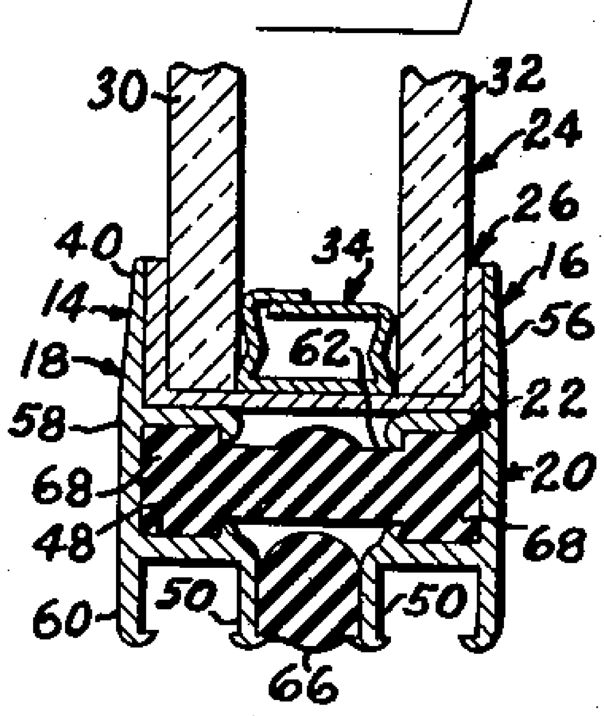


Fig. 10



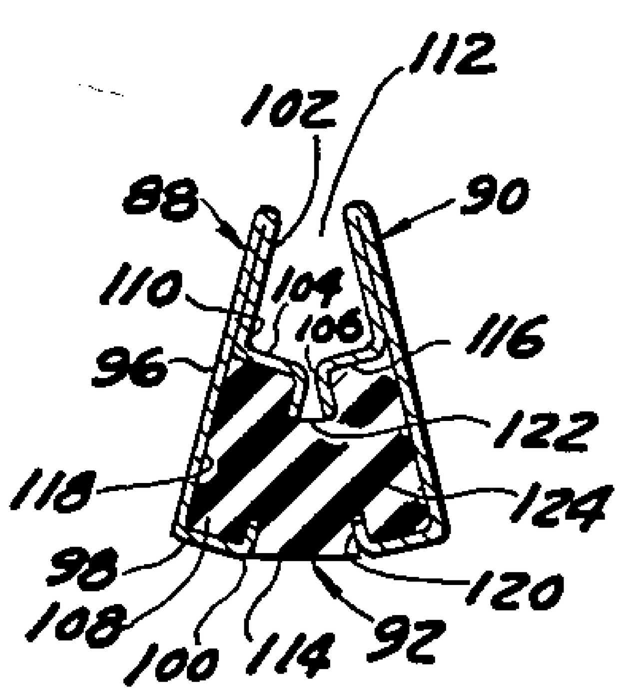


Fig. 5

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HEAT-INSULATED METAL-FRAMED CLOSURE

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10 Claims. (Cl. 20—56.5)

This invention relates to metal-framed double-panelled closures and, in particular, to heat-insulated metal-framed double-panelled closures, such as windows, doors and the like.

One object of this invention is to provide a heat-insulated metal-framed double-panelled closure, such as a door, window sash and similar panels having metal external and internal closure frame members adapted to be rolled from sheet metal or extruded at low cost, and held in assembly by an insulating member in the form of a strip of resilient material having a cross-sectional shape which clamps the closure frames tightly into engagement with the panels yet which positively prevents conduction of heat along any metallic path between the external and internal closure frames.

Another object is to provide a heat-insulated metal-framed double-panelled closure of the foregoing character wherein the insulating strip is of approximately T-shaped cross-section with a transverse portion disposed approximately perpendicular to the planes of the panels and a wedging rib disposed approximately perpendicular to the transverse portion, the opposite ends of the transverse portion being seated in channels formed in the outer and inner closure frame members and the wedging ribs resiliently urging the outer portions of the closure frame members apart from one another so as to compress the inner portions tightly against the window pane unit while flexing around the transverse portion as a fulcrum.

Another object is to provide a heat-insulated metal-framed double-panelled closure of the foregoing character wherein the external and internal closure frame members, in addition to possessing channels in which the opposite ends of the transverse portions of the insulating strip are seated, also have flanges along their outer edges disposed in approximately spaced parallel relationship and closer to one another than the remaining portions of the closure frame members in such a manner as to be engaged by the wedging rib of the insulating strip and urged away from one another by the resilience of the wedging rib.

Another object is to provide a modification of the foregoing heat-insulating metal-framed double-panelled closure wherein the channel portions of the external and internal closure frame members extend substantially from an inner flange forming the bottom of the trough which receives the panel edges to the outer edge of the closure frame, and wherein the insulating strip has a correspondingly enlarged cross-section and a correspondingly-reduced rib, with the result that the insulating strip has the approximate shape of an elongated bar of resilient insulating material with outer and inner channels respectively receiving the outer and inner flanges of the external and internal closure frame members.

Another object is to provide a modified heat-insulating metal-framed double-panelled closure, as set forth in the object immediately preceding, wherein the insulating strip in its relaxed condition is approximately of truncated sector-shaped cross-section causing the side portions of the external and internal sash rails to converge inwardly toward one another so that when the insulating strip is forcibly deformed into approximately rectangular cross-section by pressure upon the outer corner edges of the external and internal closure frame members, the inner edge portions thereof move apart from one another so as to permit insertion of the panel unit into the trough thus formed, whereupon release of such pressure causes the resilient insulating strip to seek to resume its original shape and thereby cause the inner edges of the side portions of the external and internal closure frame members to tightly grip the external and internal sides of the panel units in substantially weather-tight engagement.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings, wherein:

FIGURE 1 is a fragmentary perspective view of a corner portion of a heat-insulated metal-gramed double-panelled closure according to one form of the invention, with the panel unit clamped in position between the external and internal closure frame members by the action of the resilient insulating strip;

FIGURE 2 is a cross-section taken near the left-hand end of FIGURE 1;

FIGURE 3 is a diagrammatic view in cross-section similar to FIGURE 2 but showing the relative position of the parts at an intermediate stage during assembly with the external and internal closure frame members forced apart from one another in order to admit the panel unit;

FIGURE 4 is a perspective view of the lower portion of a modified heat-insulated metal-framed double-panelled closure employing a modified resilient insulating strip of approximately rectangular cross-section when assembled but of truncated sector-shaped cross-section when disassembled and relaxed;

FIGURE 5 is a cross-section through a portion of the closure frame of FIGURE 4 in relaxed condition with the panel unit removed;

FIGURE 6 is a diagrammatic view in cross-section similar to the left-hand end of the perspective view of FIGURE 4, but showing the relative positions of the parts at an intermediate stage during assembly with the external and internal closure frame members forced apart from one another in order to admit the panel unit;

FIGURE 7 is a cross-sectional view of a modification of the insulating strip of FIGURE 5 having a fulcrum core extending therethrough;

FIGURE 8 is a cross-section through a portion of the closure frame of FIGURES 1, 2 and 3 in relaxed condition with the panel unit removed;

FIGURE 9 is a view similar to FIGURE 8, but showing a modification in which the wedging portion of the insulating strip is made separate from the connection portion thereof; and

FIGURE 10 is a cross-section similar to FIGURE 9 but showing the relative positions of the parts with a closure panel inserted therein.

Referring to the drawings in detail, FIGURES 1 to 3 inclusive show a corner portion of a heat-insulated metal-framed double-panelled closure, generally designated **10**, according to one form of the invention as consisting generally of a closure frame or molding assembly **12** having external and internal closure frame units **14** and **16** respectively composed of external and internal closure frame members **18** and **20** respectively separated from one another by heat-insulating strips **22** of resilient material. The closure frame **12** is adapted to tightly grip a double-panelled closure unit **24** which is sealed by a channel-shaped sealing member or layer **26** of bent non-metallic sheet insulating material, such as sheet plastic material, or a layer of suitable sealing and insulating material applied thereto.

Referring to the drawings in detail, the double-panelled closure unit 24 may be a double pane door unit or any one of a number of double-pane window units available commercially on the market under various trade names, the form shown being illustrative and not limiting. The particular double-panelled closure unit 24 consists of external and internal panels 30 and 32 respectively facing respectively the exterior and interior of the building in which the closure is located. The panels 30 and 32 may be of glass or other suitable transparent or translucent material or may be opaque if light transmission is not desired, and are spaced apart from one another by a tubular desiccant holder, generally designated 34, of hollow approximately rectangular cross-section.

The desiccant holder 34, as its name suggests, is adapted to hold a desiccant for removal of any moisture from the space 36 between the panels 30 and 32. For that purpose, the desiccant holder 34 is so constructed as to permit circulation of air between the interpanel space 36 and the desiccant chamber 38, such as by loosely overlapping the side walls of the desiccant holder 34, as shown in the drawings. Alternatively, the inner wall of the desiccant holder 34 may be perforated at intervals to facilitate such circulation of air for removal of moisture therefrom.

The sealing member 26, as previously stated, may consist of a strip of non-metallic sheet insulating material, such as sheet plastic, bent into channel-shaped form or, in the alternative, may consist of a layer of suitable insulating sealing material, such as plastic or asphaltic material extending between the exposed surfaces of the panels 30 and 32 around their outer edges and across the gap between them occupied by the desiccant holder 38. In either case, the assembly 24 forms an air-tight and moisture-tight sealed assembly in which the interpanel space or air chamber 36 is maintained dry by the desiccant in the desiccant chamber 38.

The external and internal closure frame members 18 and 20 of the external and internal closure frames 14 and 16 of the closure frame assembly 12 are of similar but oppositely-facing construction and cross-section, hence a single description will suffice for both. Each closure frame member 18 or 20 consists of a base portion 40 (FIGURE 2) having spaced inner and outer flanges 42 and 44 respectively defining a rabbet 46 forming a closure panel edge seat into which the closure unit 24 fits and an inner channel 48. The outer flange 44 is provided at its edge with an outwardly-bent extension 50 disposed in spaced parallel relationship with the base portion 40. The inner and outer flanges 42 and 44 have inturned edges 52 and 54 respectively directed toward one another at acute angles to their respective flanges 42 and 44 in the direction of the base portion 40.

The base portion 40 has an inner portion 56 adapted to engage the closure panel unit 24, an intermediate portion 58, and an outer portion 60 which enter into the assembly operation discussed below. The inner and outer flanges 42 and 44 are substantially perpendicular to the base portion 40 of the closure frame members 18 or 20, whereas the flange extension 50 is perpendicular to the outer flange 44 and substantially parallel to the base portion 40. The closure frame members 18 and 20 of FIGURES 1 to 3 inclusive are preferably formed by the extrusion of a suitable metal, such as aluminum or aluminum alloy, or they may be formed by rolling operations upon sheet metal ribbon or strip stock, in a manner analogous to that used in the formation of the modification of FIGURES 4, 5 and 6 described below. The processes of making the closure frame members 18 and 20 are beyond the scope of the present invention.

The heat-insulating member or strip 22, as previously stated, is of approximately T-shaped cross-section (FIGURE 2) with a transverse connecting portion 62 having a slight central inner ridge or bulge 64 on the opposite side of the transverse connecting portion 62 from the wedging rib or portion 66. The opposite sides 68 of the transverse portion 62 of the strip 22 comprise enlarged ribs engaged on their inner sides by the inturned edges 52 and 54 of the flanges 42 and 44 with a clinching, locking or gripping action. The wedging rib or portion 66 forming the outer portion of the insulating member 22 projects outwardly from and substantially perpendicular to the transverse portion 62 and is separated from it by a neck portion 70 of reduced width. The wedging rib 66 is preferably of generally circular cross-section and may be torn off or severed at the neck portion 70 for replacement by a wider wedging rib 66 where needed (FIGURES 9 and 10).

The heat-insulated member or strip 22 is preferably formed of elastic deformable material, such as natural or synthetic rubber or resilient synthetic plastic. The wedging rib 66 which projects outwardly from the transverse portion 62 is of such width or cross diameter as to be in a state of compression between the flange extensions 50 when the inner portions 56 of the base portion 40 are in tight clamping and sealing engagement with the closure panel unit 24. As a consequence, the cross diameter of the outwardly-projecting longitudinal rib 22 may differ for closure panel units 24 of different thicknesses in order to effect such a tight sealing engagement. The meeting edges 72 (FIGURE 1) of the outer and inner closure frame members 18 and 20 are mitered or cut at approximately 45 degree angles to meet one another at the corners of the closure frame 12. The oppositely-facing rabbets 46 collectively form a trough 74 which receives the closure panel unit 24, as described below.

In the operation of assembling the heat-insulated metal-framed double-panelled building closure 10, assuming the outer and inner closure frame members 18 and 20 of the outer and inner closure frames 14 and 16 to be cut to the proper length for the size of closure 10 desired, and also assuming that the insulating members 22 are cut into similar suitable lengths, the insulating members are inserted between the outer and inner closure frame members 18 and 20 by sliding their enlarged sides 68 longitudinally into the channels 48 between the inner and outer flanges 42 and 44. The inturned edges 52 and 54 engage the enlarged sides 68 and consequently hold the outer and inner closure frame members 18 and 20 in assembly. At the same time, the outwardly-projecting rib portion 66 slides through and along the space between the parallel extensions 50 of the outer flanges 44, urging them apart and consequently urging the base portion 40 of the closure frame members 18 and 20 into inwardly-converging non-parallel relationship in the relaxed condition thereof before the closure panel unit 24 is installed (FIGURE 8).

The assembly thus formed of the outer and inner closure frame members 18 and 20 and insulating strip 22 is then placed in the gap G of jaws J and J' of a suitable vise or other compressing appliance V (FIGURE 3), with the jaws J and J' engaging the outer portions 60 of the bases 40 of the outer and inner closure frame members 18 and 20. The jaws J and J' are caused to move relatively toward one another so as to narrow the gap G, thereby causing the bases 40 to move into diverging non-parallel relationship (FIGURE 3) around the central connecting portion 62 of the insulating member 22 as a fulcrum, flexing the outer sides 68 relatively thereto and laterally compressing the rib 66 between the flange extensions 50. The parts by this procedure have now assumed the relative positions shown in FIGURE 3 with a divergent channel 74 formed between the rabbets 46.

Meanwhile, two other assemblies of external and internal closure frame members 18 and 20 and heat-insulating strips 22 have been placed at the mitered opposite ends 72 (FIGURE 1) of the previously-assembled closure frame members 18 and 20 and insulating member 22 and secured thereto in spaced relationship, thereby forming three sides of the closure frame or molding assembly 12 with the fourth side open for insertion of the closure panel unit 24. The three assemblies are then spaced apart in the manner described above to provide divergent channels 74 in each, whereupon the closure panel unit 24 is slid into place in the divergent channels 74 thus formed, with the corners of the sealing member 26 entering the rabbets 46 of the outer and inner closure frame members 18 and 20 and coming to rest against the inner flanges 42 thereof.

The operator then moves the jaws J and J' of the vises V outwardly relatively to one another so as to widen the gaps G between them. Thereupon the resilience of the compressed outer rib portion or side 68 of each resilient heat-insulating member 22 pushes the adjacent flange extensions 50 apart from one another around the central strip portion 64 as a fulcrum, causing the transverse connecting portion 62 of each insulating member 22 to straighten out (FIGURE 2) and the inner base portions 56 to enter into snug clamping engagement with the sides of the sealing member or layer 26 of the closure panel unit 24.

The fourth or remaining side of the closure frame 12 is then inserted in the gap between the ends of the spaced closure frame members 18 and 20, completing the assembly in a similar manner while the remaining closure frame members 18 and 20 are spread apart in the above-described manner, as by the use of a clamping device having an action similar to that of the vise V.

The modified heat-insulated metal-framed double-panelled closure, generally designated 80 (shown in FIGURES 4, 5 and 6 consists generally of a closure frame or molding assembly 82 having external and internal closure units 84 and 86 respectively composed of external and internal closure frame members 88 and 90 separated from one another by resilient heat-insulating strips 92 of elastic deformable material. The closure frame 82 is adapted to tightly grip a double-panelled closure unit 94 sealed by a channel-shaped sealing member or layer 26 of bent non-metallic sheet insulating material, such as sheet plastic material, or a layer of suitable sealing and insulating material applied thereto.

The double-panelled closure unit 94 is similar in construction to the double-pane closure unit 24, hence similar parts are designated with the same reference numerals. The external and internal closure panels 30 and 32 are shown in FIGURES 4 and 6 to be slightly thinner than the closure panels 30 and 32 of FIGURE 2 merely to be able to show the range of adaptation of the invention.

The external and internal closure frame members 88 and 90 are shown in FIGURES 4 to 6 as constituting rolled sections formed from sheet metal rather than the extruded sections constituting the closure frame members 18 and 20 of FIGURES 1, 2 and 3. The rolling of such sections as the closure frame members 88 and 90 presents no problem to those skilled in the sheet metal rolling art and is carried out upon conventional rolling machines and processes, both of which are beyond the scope of the present invention. Each of the closure frame members 88 and 90 consists of an exposed base portion 96 having a perpendicular flange 98 at its outer edge terminating in a parallel flange extension 100. Each closure frame member 88 or 90 also has a reversely-bent portion 102 extending from the inner edge of the base portion 96 parallel thereto for approximately one-half of its width at which point it is provided with a perpendicular flange 104 disposed in spaced parallel relationship to the perpendicular flange 98 and similarly having a parallel flange extension 106 extending toward the flange extension 100 (FIGURE 5). In this manner, each of the closure frame members 88 and 90 is provided with an outer channel 108 for receiving the opposite sides of the insulating strip 92 and is also provided with a rabbet 110. The corresponding but oppositely-facing rabbets 110 in the closure frame members 88 and 90 collectively form a trough 112 adapted to receive the double-panelled closure unit 94, as described below in connection with the operation of the assembling of the invention.

Each heat-insulating strip 92 is in the form of an elongated bar of elastic deformable material, such as natural or synthetic rubber or compounds thereof, or suitable synthetic plastic with rubber-like properties. The strip 92 is in general also of approximately T-shaped or more specifically of truncated sector-shaped cross-section in its relaxed condition (FIGURE 5) with arcuate outer and inner surfaces 114 and 116 and flat converging side surfaces 118. The convex outer side 114 has a pair of grooves 120 therein spaced laterally apart from one another and also spaced away from the opposite sides of the strip 92 by substantially the same distance as the flange extension 100 so as to snugly receive the latter. The concave inner side 116 of the strip 92 has a central groove 122 therein of approximately triangular cross-section with an entrance slot of restricted width, and this groove 122 receives the two inner flange extensions 106 of the closure frame members 88 and 90. The outer grooves 120 and the inner groove 122 produce, in effect, enlarged ends 124 of approximately rectangular cross-section (FIGURE 5) on the insulating strip 92.

The modified insulating strip, generally designated 130, shown in FIGURE 7 is similar to the insulating strip 92 of FIGURE 5, except that a cable-like fulcrum member or core 132 of approximately circular cross-section and of harder elastic deformable material hence of higher durometer test than the remainder of the strip is bonded thereto near the center thereof. Similar reference numerals are therefore used.

In the operation of assembling the modification 80 of FIGURES 4, 5 and 6 or using the modified insulating strip 130, the outer and inner closure frame members 88 and 90 are assembled with the insulating strip 92 or 130 by sliding these endwise relatively to one another with the flange extensions 100 and 106 sliding lengthwise along their respective grooves 120 and 122 and with the strip end portions 124 sliding along their respective channels 108. When this subassembly has been completed as shown in FIGURE 5, the closure frame 82 is completed on three sides as described above in connection with the arrangement 10 of FIGURES 1, 2 and 3, leaving the fourth side open.

The operator then spreads the inner edges of the opposite closure frame members 88 and 90 of each of the three sides of the incomplete closure frame 82 apart from one another, such as by the use of a vise V similar to that shown in FIGURE 3 and with its jaws J and J' similarly applied near the outer corner edges (FIGURE 6). This action causes the cross-section of the insulating strip 92 or 130 to be deformed from truncated sector-shaped cross-section (FIGURES 5 and 7) to approximately rectangular cross-section (FIGURE 6) at the same time widening the central inner groove 122 of the insulating strip 92 or 130.

With the trough 112 opened up in this manner so that the opposite base portions 96 of the closure frame members 88 and 90 become divergent (FIGURE 6) instead of convergent (FIGURE 5), the double-panelled closure unit 94 is slid into place in the three troughs 112. The fourth side of the closure frame 82 is then slid into place, completing the closure frame 82 in a manner similar to that described above in connection with the operation of the insulated double-panelled closure 10 of FIGURE 1. The outer and inner closure frame members 88 and 90 of the closure frame 82 are then released by the vise V or other spreading device, whereupon the resilience of the insulating strips 92 or 130 forces the reversely-bent portions 102 of the closure frame members 88 and 90 into tightly gripping contact with the sealing member or layer 26 of the closure unit 94 (FIGURE 4).

When the core-equipped insulating strip 130 of FIGURE 7 is used, the operation is similar to that described above, except that the core 132 acts as a fulcrum around which flexing takes place, as described above. This construction provides a controlled flexing action of improved uniformity.

What I claim is:

1. A heat-insulated metal frame structure for receiving closure panels and the like comprising elongated external and internal metal closure frame components having base portions with facing surfaces disposed in laterally-spaced relationship and having outer and inner edges, said base portion of each frame component having an inner flange spaced away from the inner edge and providing a closure panel edge seat thereon, said base portion of each frame component also having an outer flange spaced apart from the inner flange and defining with said inner flange a channel bounded by said base portion and said flanges, said flanges of said external and internal frame components extending toward one another from their respective base portions and terminating in laterally spaced relationship to one another, a wedging heat-insulating strip device of approximately T-shaped cross-section and of elastic deformable heat-insulating material mounted adjacent said closure panel edge seats and disposed between and interconnecting said frame components, said strip device having a laterally-extending connecting portion with opposite sides seated in said channels and a wedging portion projecting outwardly between said frame components toward said outer edge and of sufficient thickness to dispose said base portions thereof in inwardly-converging relationship relatively to one another in the relaxed condition thereof before installation of a closure panel therein, and means for securing said connecting portion sides in said channels, said heat-insulated structure being responsive to the insertion of a closure panel in the closure panel edge seats of said closure frame components for urging said base portions toward parallelism with one another while deforming said wedging portions.

2. A heat-insulated metal-framed closure, according to claim 1, wherein said outer flanges have flange extensions projecting from the edges thereof substantially parallel to their respective base portions and wherein said wedging portion of said heat-insulating strip device resiliently engages and urges apart said flange extensions.

3. A heat-insulated metal-framed closure, according to claim 1, wherein said securing means includes retaining projections extending toward one another from the inner and outer flanges of each closure frame component into engagement with said connecting portion ends.

4. A heat-insulated metal-framed closure, according to claim 1, wherein said inner flanges of said external and internal closure frame components and said connecting portion cooperatively form a panel edge receiving trough including said panel edge seat.

5. A heat-insulated metal-framed closure, according to claim 3, wherein the inner side of said connecting portion intermediate the ends thereof has groove means therein receiving the retaining projections of said inner flanges.

6. A heat-insulated metal-framed closure, according to claim 1, wherein said outer flanges have flange extensions extending outwardly therefrom substantially parallel to their respective base portions and wherein said wedging portion of said heat-insulating strip device resiliently engages said flange extensions.

7. A heat-insulated metal-framed closure, according to claim 1, wherein said heat-insulating strip device in its relaxed condition is of approximately truncated sector-shaped cross-section.

8. A heat-insulated metal-framed closure, according to claim 7, wherein said heat-insulating strip in the inner side of the connecting portion thereof has a groove therein and wherein inner flanges have flange extensions projecting outwardly into said groove.

9. A heat-insulated metal-framed closure, according to claim 1, wherein said heat-insulating strip is provided with an elongated core of approximately circular cross-section extending longitudinally therethrough and connected thereto.

10. A heat-insulated metal-framed closure, according to claim 9, wherein said core is of elastic deformable material of greater hardness than the material of the remainder of said strip.

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