

June 7, 1955

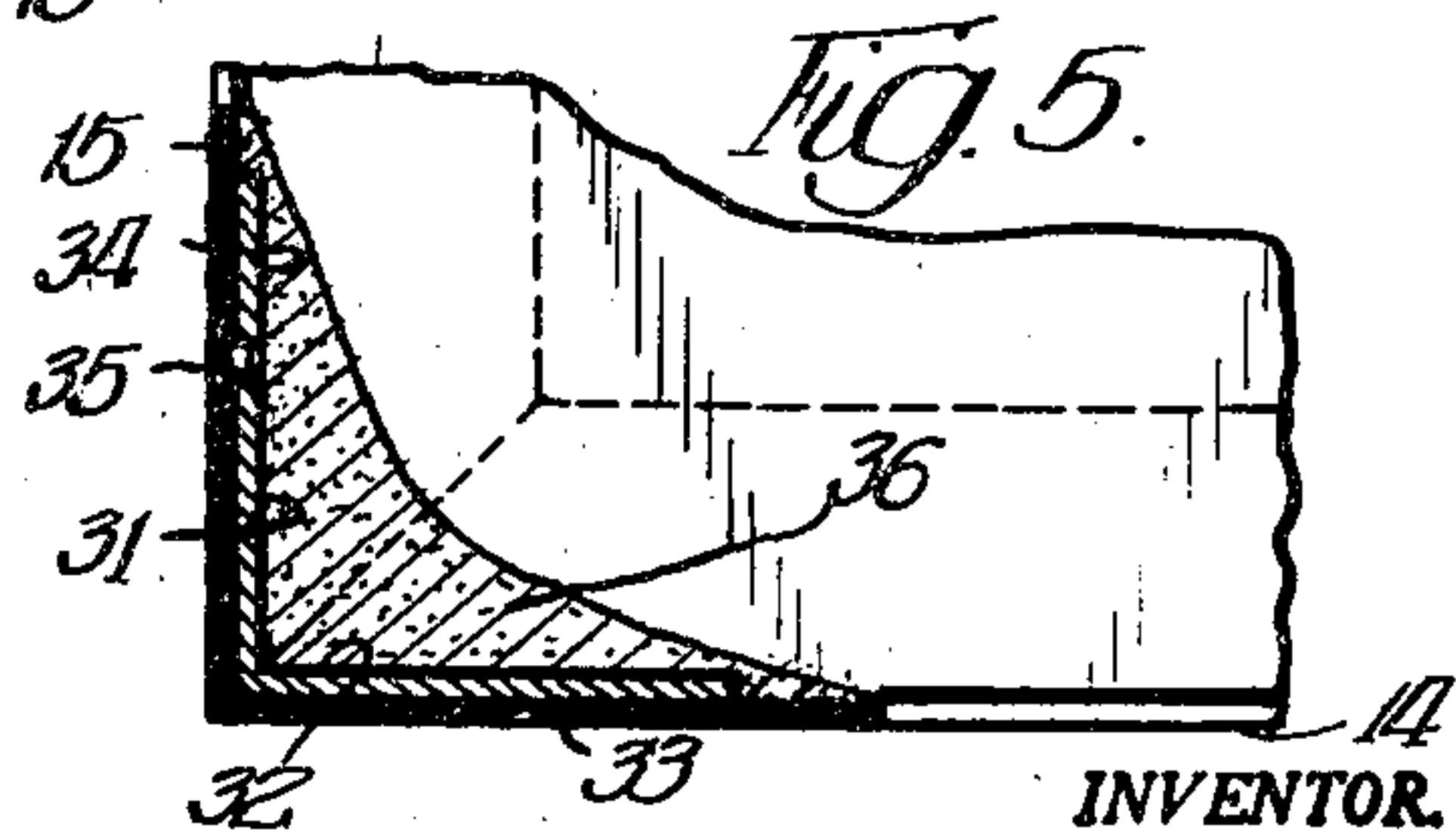
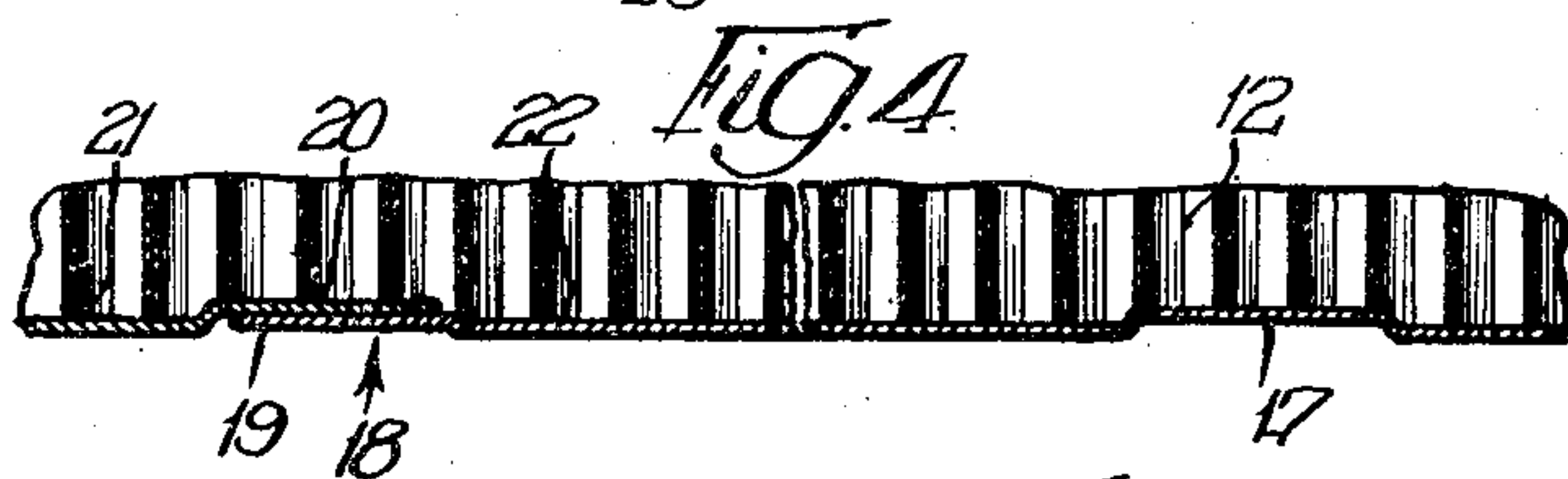
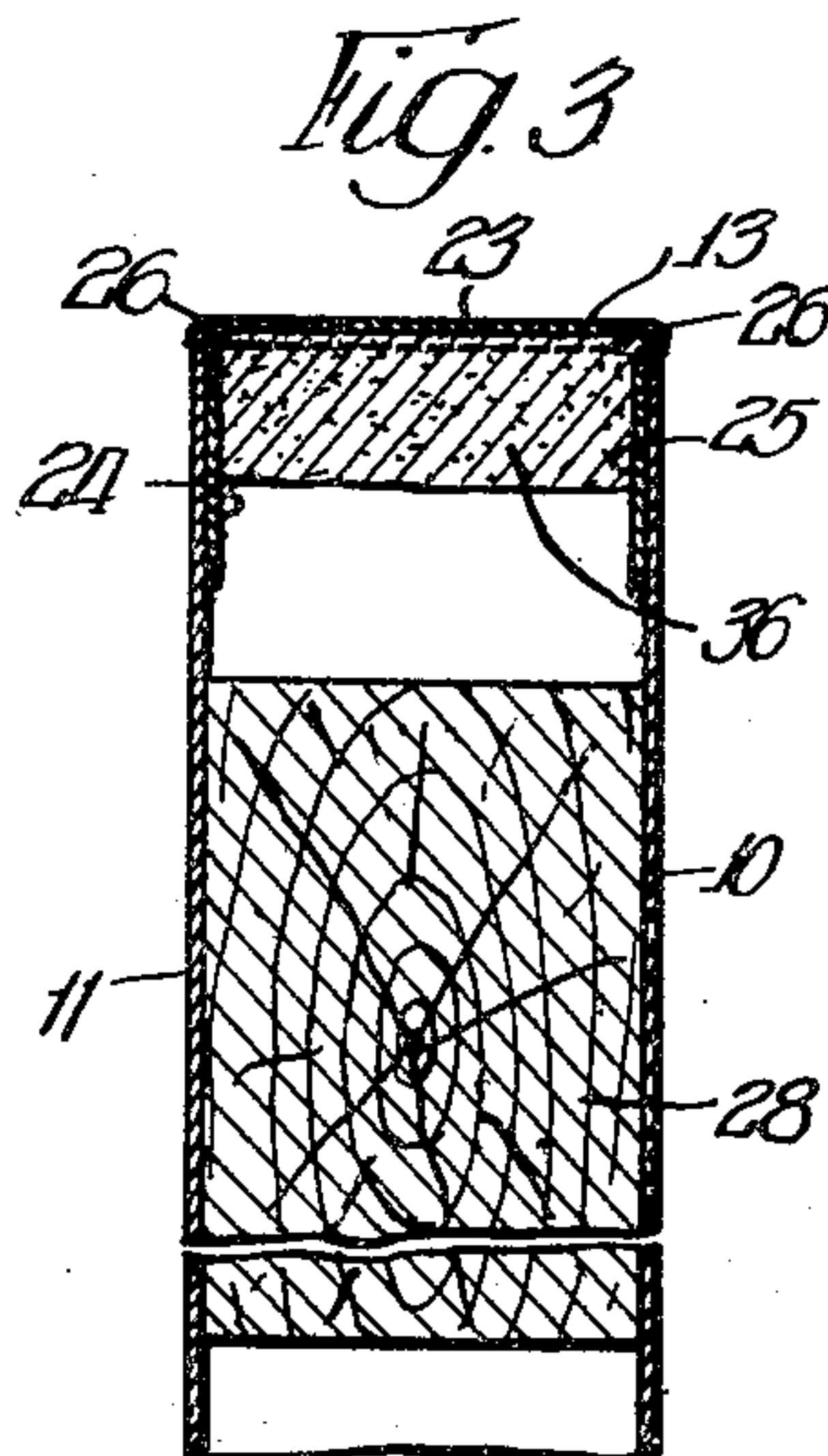
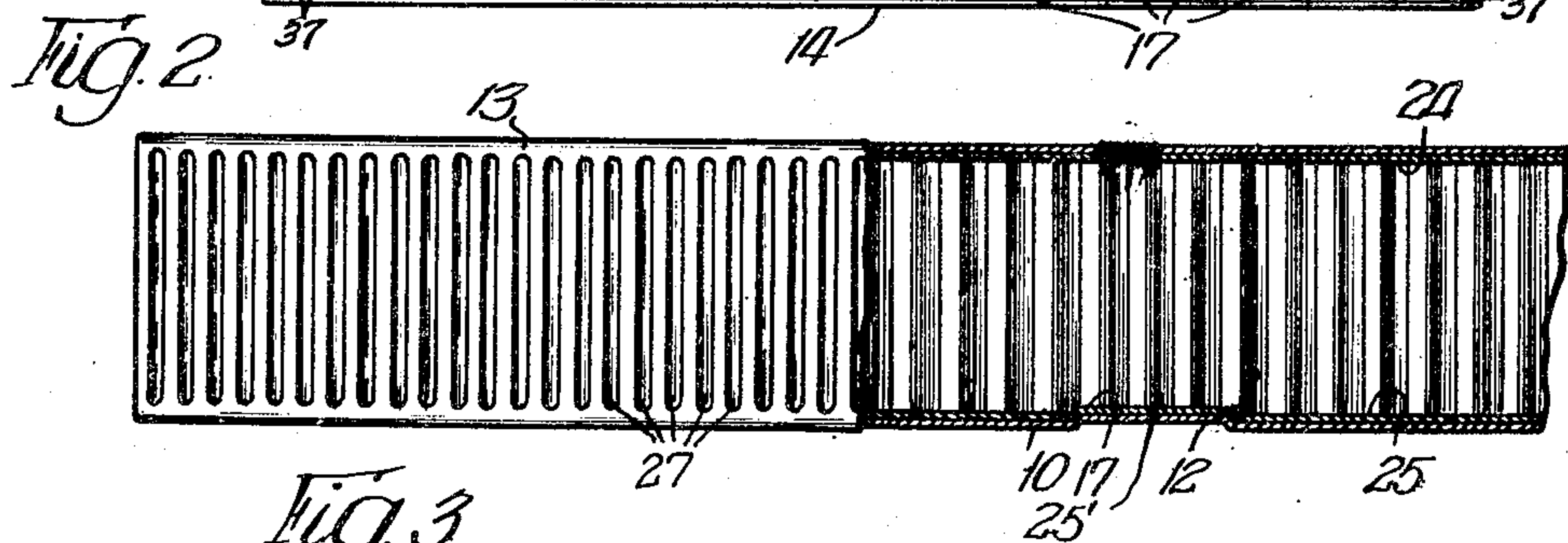
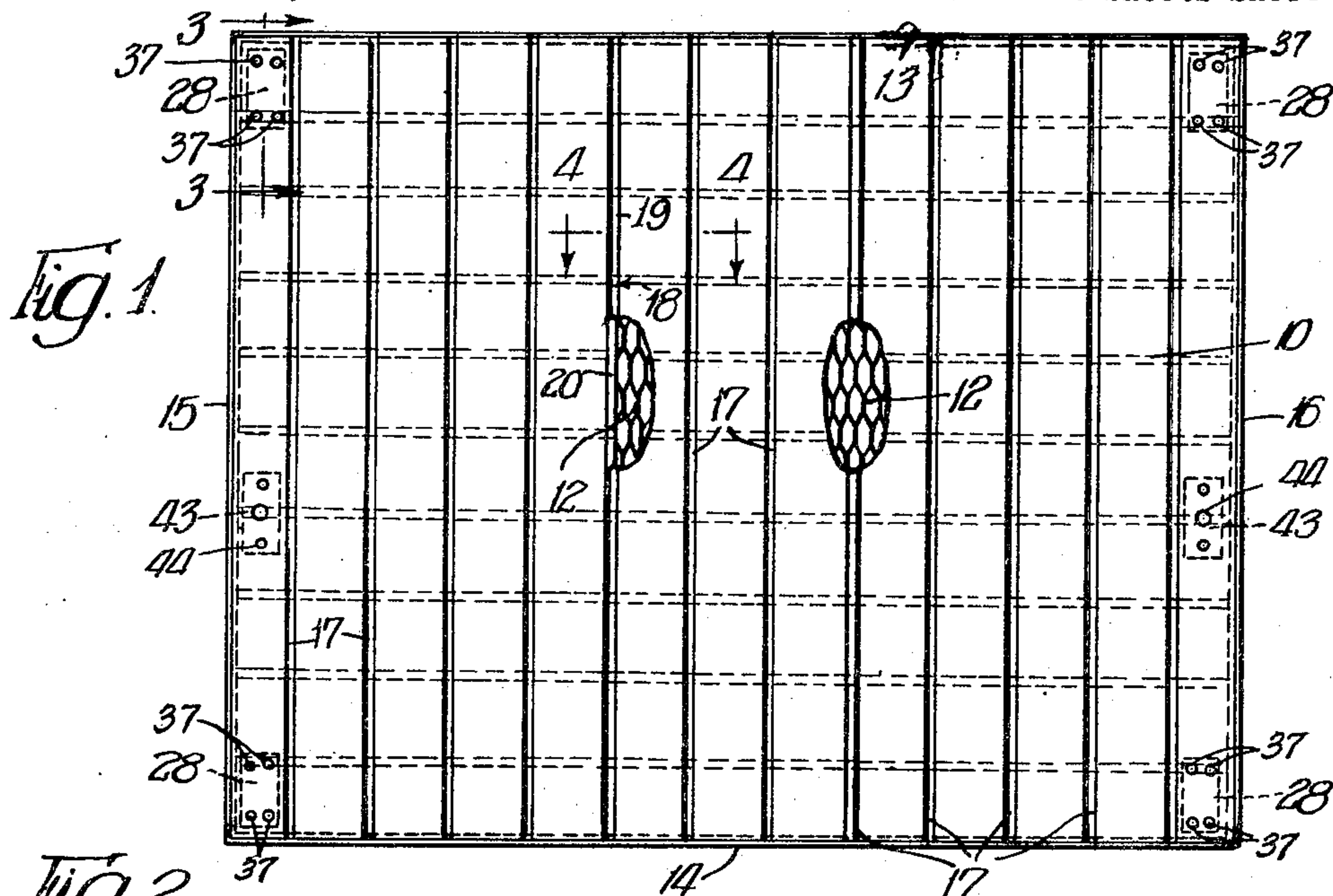
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2,710,080

DOOR CONSTRUCTION

Filed Feb. 16, 1950 .

2 Sheets-Sheet 1



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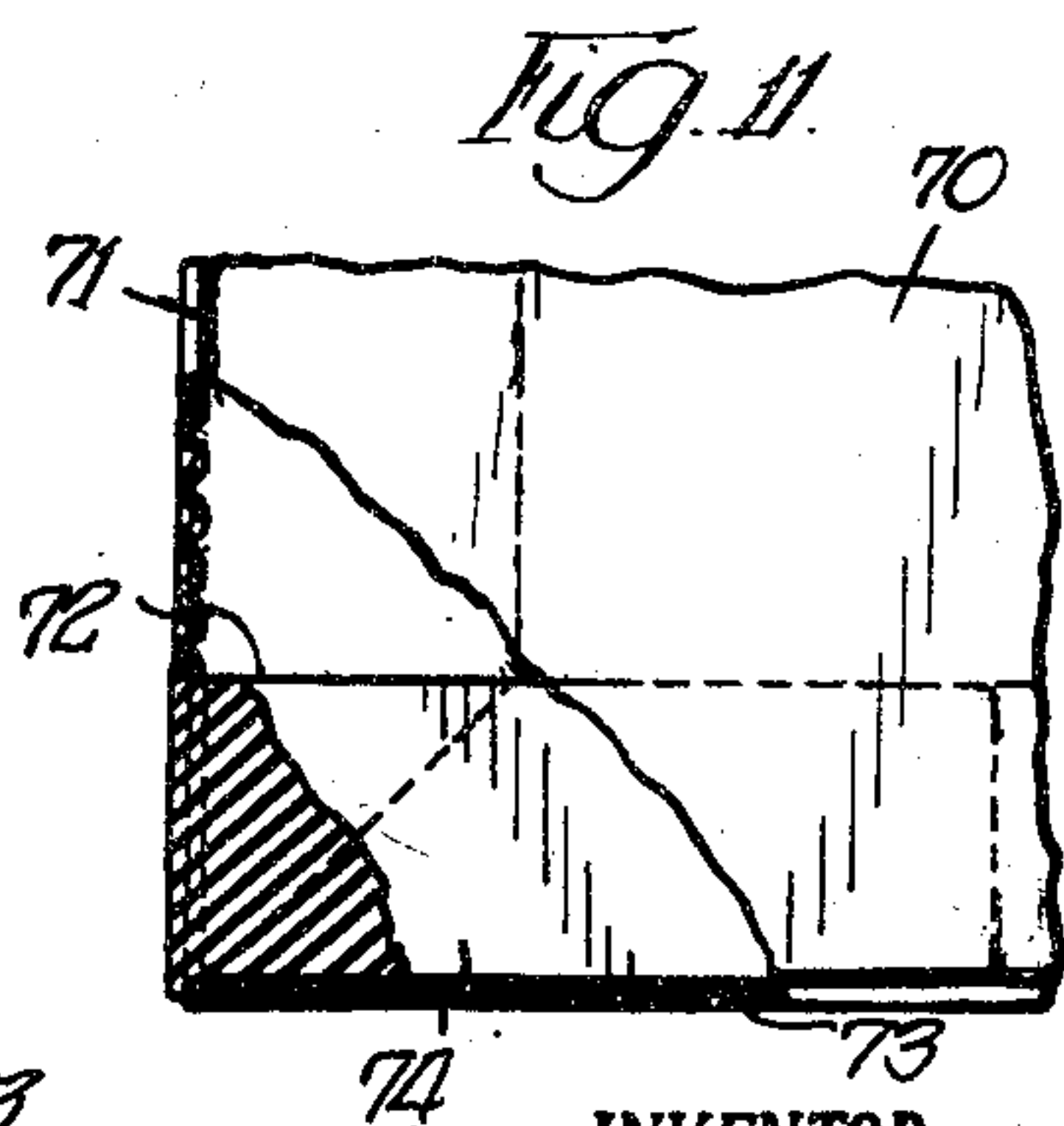
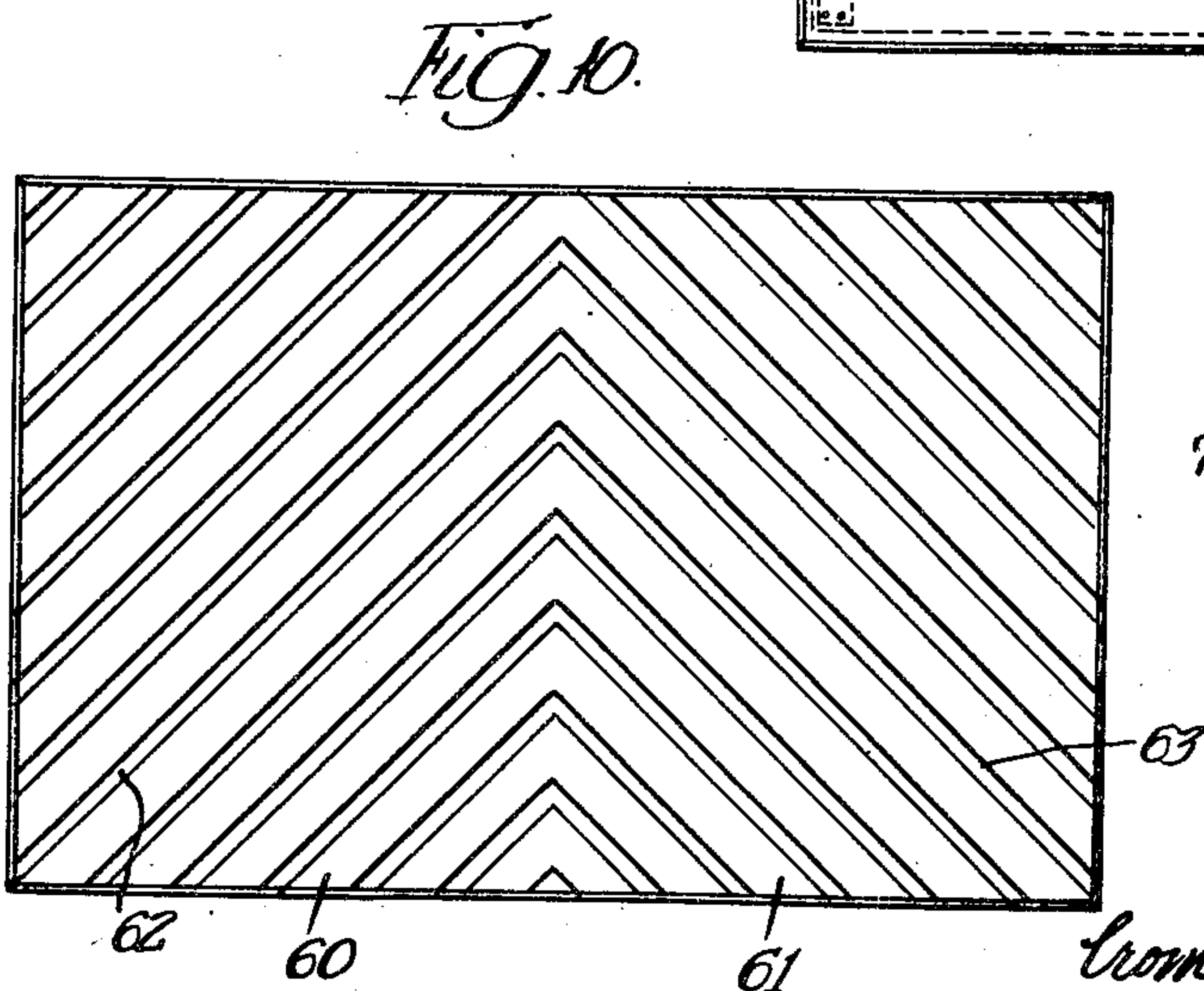
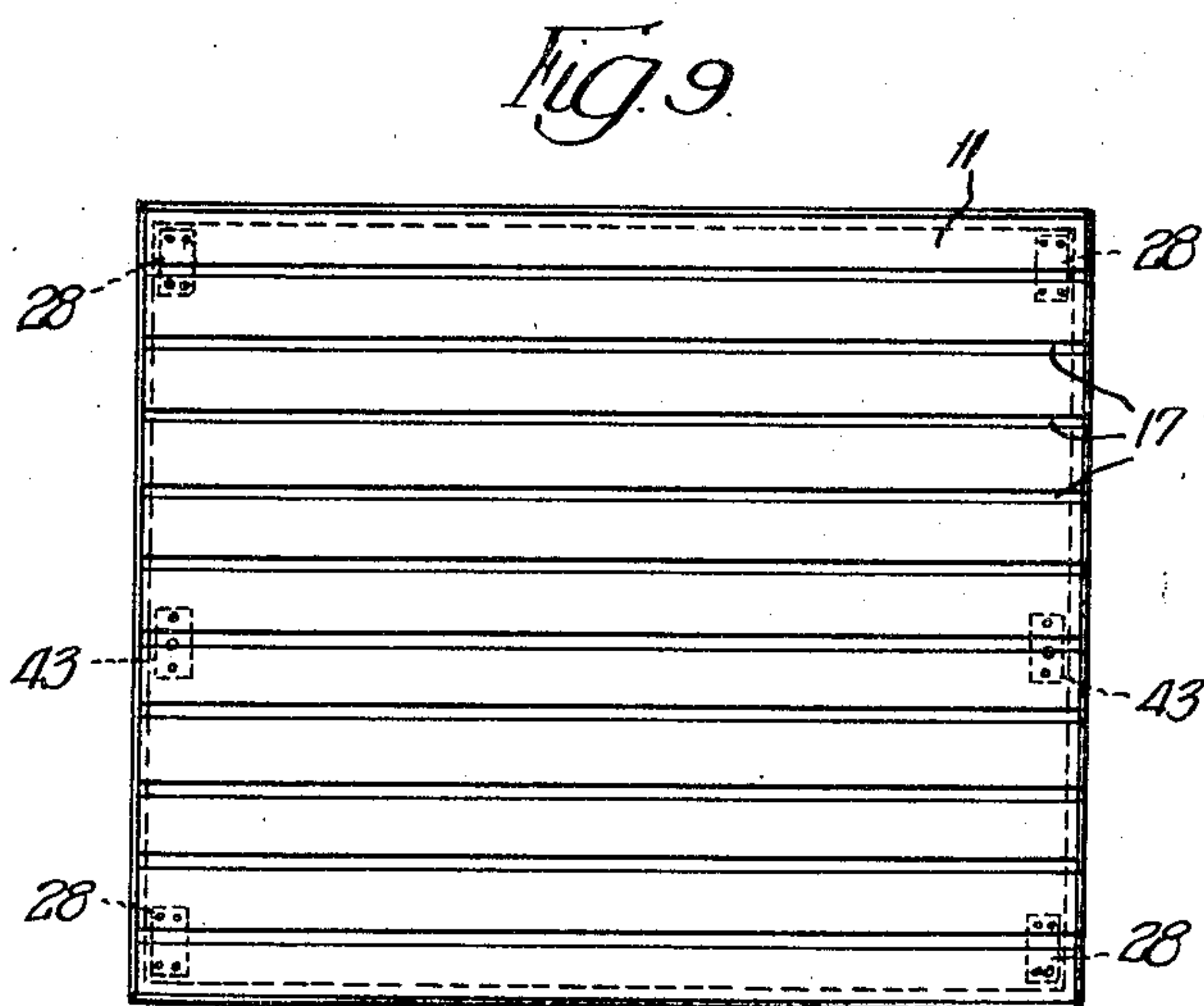
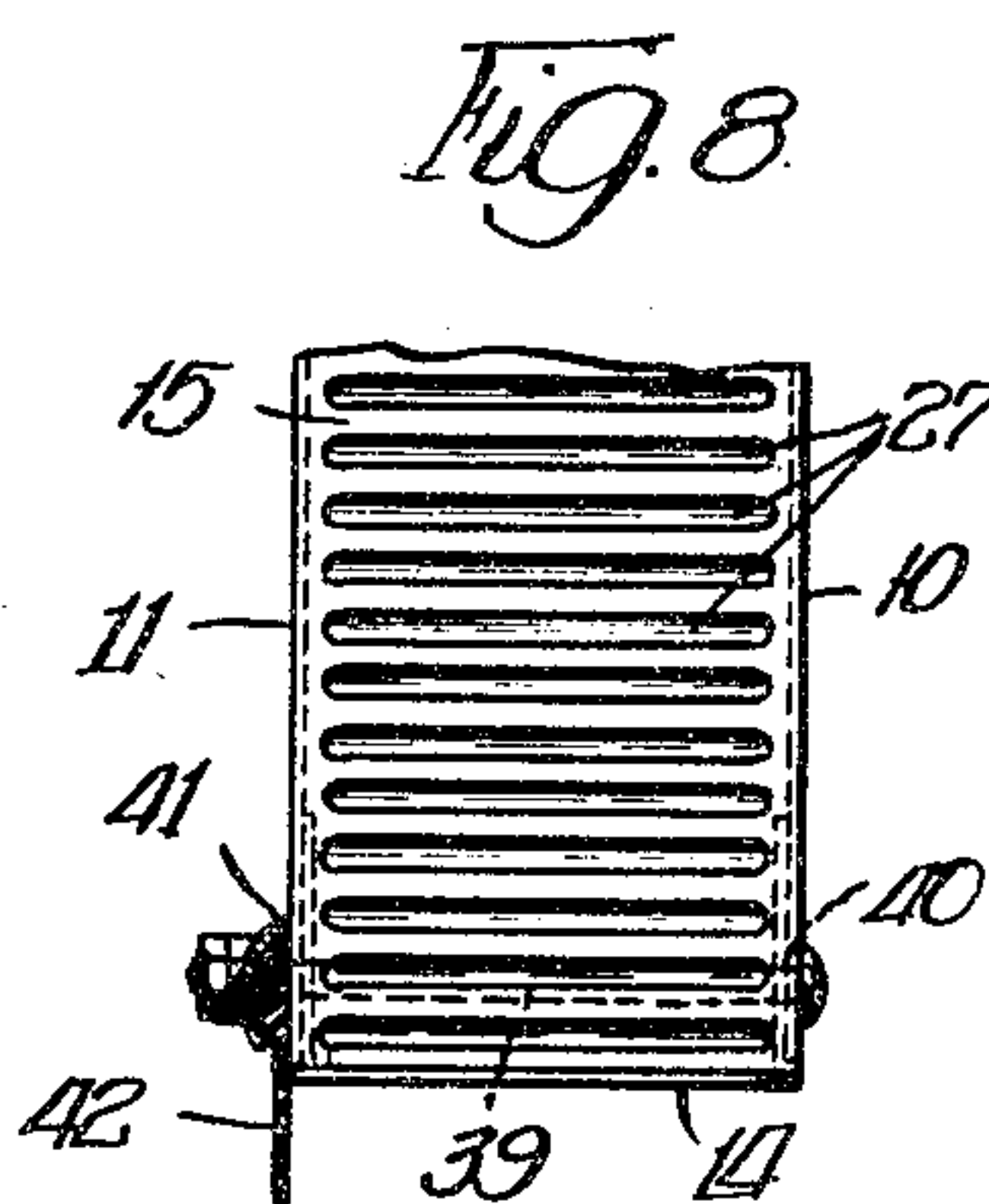
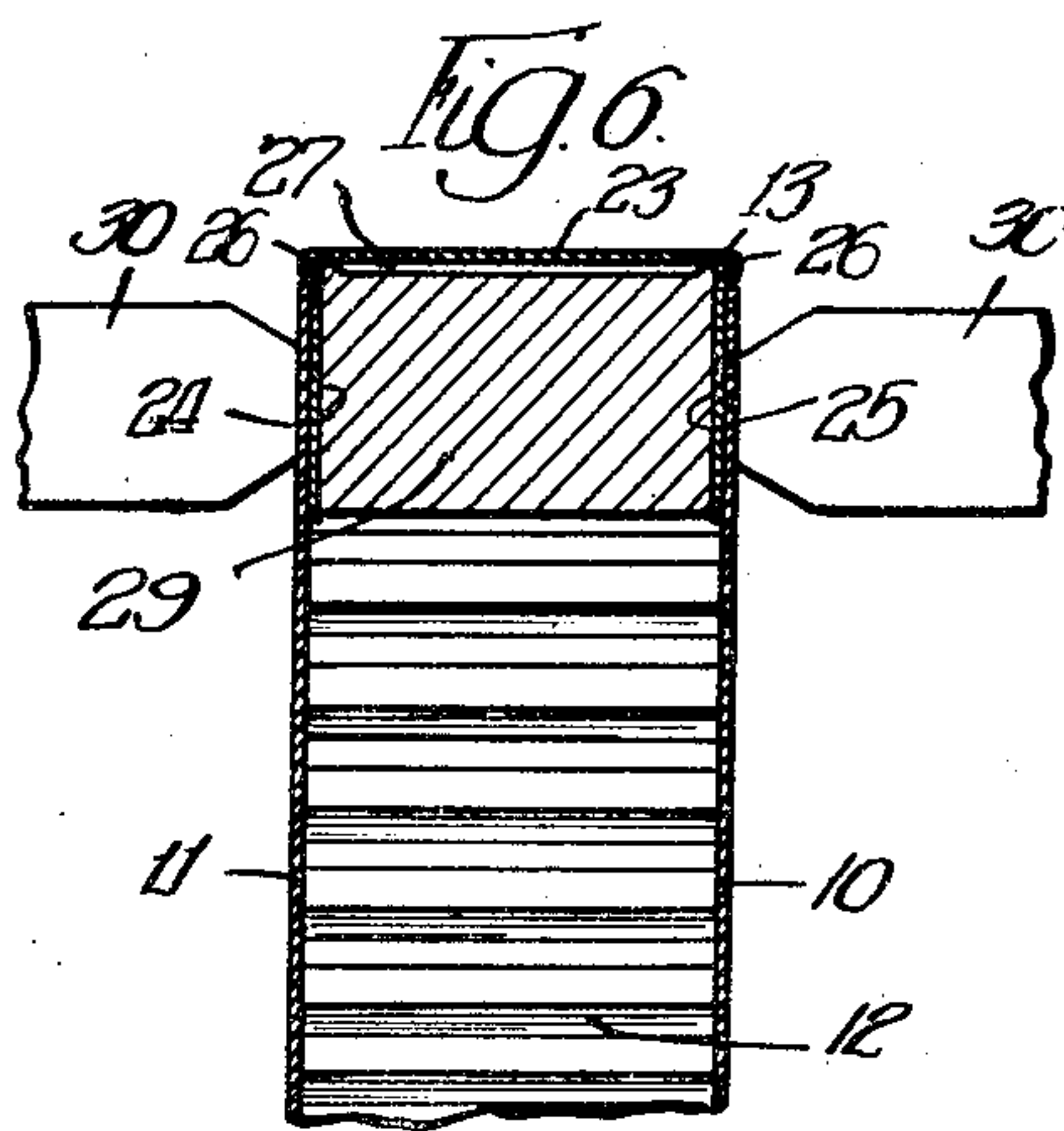
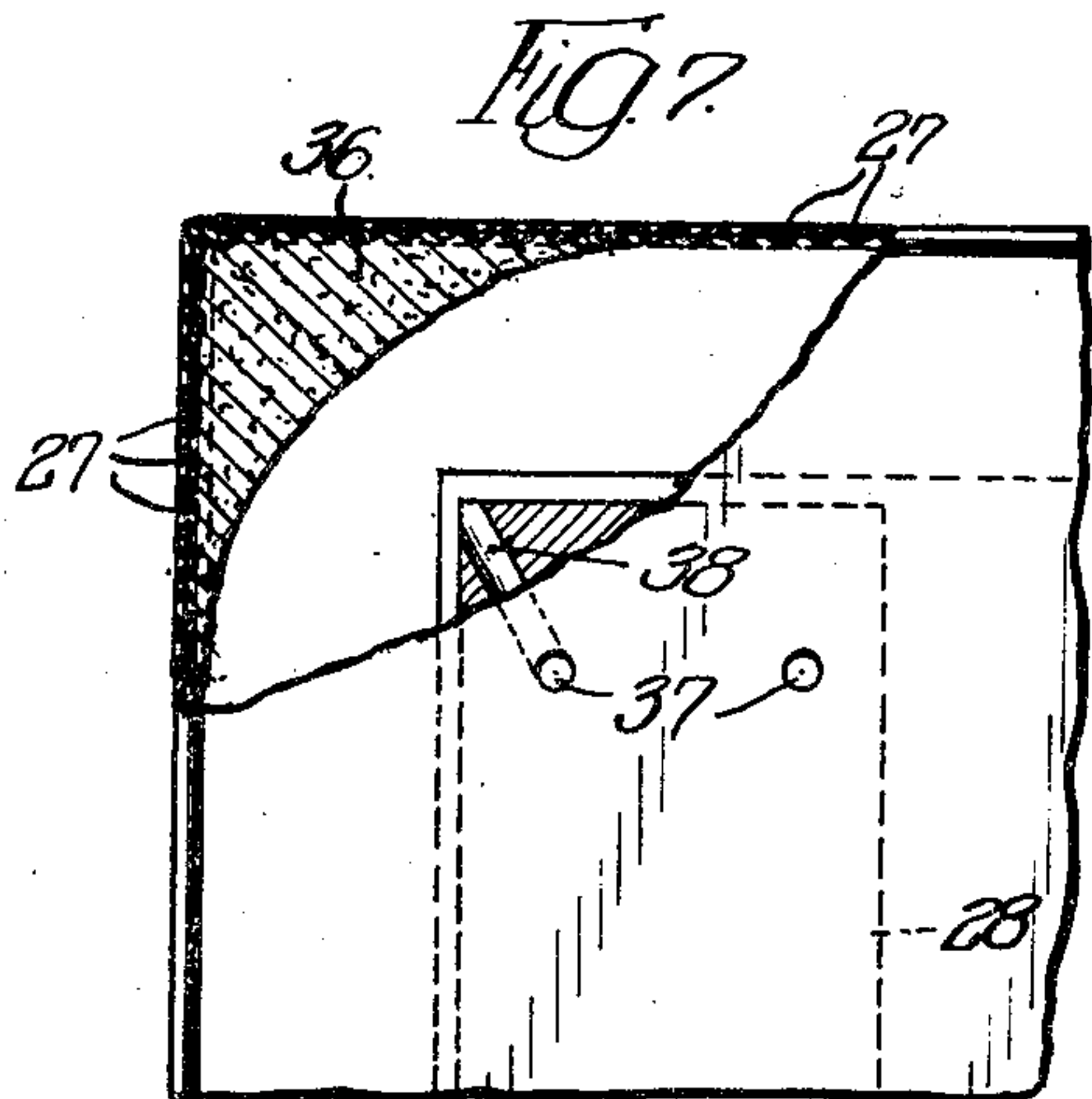
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2,710,080

DOOR CONSTRUCTION

Filed Feb. 16, 1950

2 Sheets-Sheet 2



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2,710,080

DOOR CONSTRUCTION

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Application February 16, 1950, Serial No. 144,447

11 Claims. (Cl. 189—46)

This invention relates to door constructions and is more particularly concerned with improvements in the fabrication of a hollow sheet metal door having flush or substantially flush exterior surfaces.

It is a general object of the invention to provide a door constructed of thin sheet metal and having a lightweight non-metallic compression resistant core structure which door is simple and attractive in appearance, economical to manufacture, easily handled and shipped and readily installed in a variety of locations.

It is a more specific object of the invention to provide a hollow metal door particularly adapted for garages and similar structures which comprises side wall members or panels provided with groove formations which reinforce the panels and lend an attractive appearance to the same and which permit large panels to be formed from a plurality of sheets of material with the joints between the sheets located in and effectively concealed by the groove formations.

It is a further object of the invention to provide a door of substantially flush construction wherein side wall panels are connected at the edges in spaced relation by edge members which are generally U-shaped in cross section, with the leg sections secured between the side wall members, and the edge forming face being provided with reinforcing grooves.

It is another object of the invention to provide a waterproof, light weight metal faced, relatively rigid door structure comprising ornamentally formed thin sheet metal faces and a generally U-shaped metal edge molding having portions for attachment to the margins of said faces and provided with embossed portions conforming to the formed surfaces of the faces and with rigidifying edge formations.

It is still another object of the invention to provide a hollow metal door having a reinforcing core and spaced blocks of wood or similar material adjacent the margins thereof with holes for receiving hardware securing bolts extending through the blocks, the holes being arranged in such a manner that the door may be hung from either side, with either face front, using the same hardware, and the loading imposed by the connecting or mounting mechanisms will be advantageously distributed.

It is a further object of the invention to provide a completely encased hollow waterproof door structure having architecturally dissimilar surfaces on its opposite faces and being provided with symmetrically disposed holes through the structure, at points where symmetrically placed compression resistant blocks are bonded between the face sheets, for receiving bolts mounting the supporting and latching hardware, the holes being arranged so that the door may be mounted with either face outward and with the latching mechanism at either side edge.

These and other objects of the invention will be apparent from a consideration of the door construction shown by way of illustration in the accompanying drawings, wherein:

Fig. 1 is an elevation showing one face of a door con-

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structed in accordance with the principles of the invention;

Fig. 2 is a partial edge elevation to an enlarged scale with portions thereof broken away;

Fig. 3 is a section taken on the line 3—3 of Fig. 1 to an enlarged scale;

Fig. 4 is a section taken generally on the line 4—4 of Fig. 1;

Fig. 5 is a detail section showing a bottom corner construction;

Fig. 6 is a detail section through the edge trim showing the method of welding the same;

Fig. 7 is a detail of a corner of the door with portions broken away showing the insertion of a mastic in the edge trim;

Fig. 8 is a detail of the bottom edge of the door showing a weather strip attached thereto;

Fig. 9 is an elevation showing the opposite face of the door;

Fig. 10 is a view similar to Fig. 1 showing a door face having an alternative arrangement of the reinforcing grooves; and

Fig. 11 is a detail section showing a bottom corner of a modified construction.

Referring to the drawings, there is illustrated a door structure and a method of fabricating the same which embodies the principal features of the invention.

The illustrated door comprises two sheet-like side wall members 10 and 11 which are held in parallel spaced relation by a honeycomb core structure 12 extending throughout the major area of the side wall surfaces and also by edge forming trim members 13, 14, 15 and 16 at the top, bottom and sides. The edge forming members are mitered at the ends and rigidly secured to the side wall members 10 and 11.

The side wall members 10 and 11 are arranged to provide the door with architecturally dissimilar faces and either face of the door may be outside or inside as desired. These members are preferably fabricated from relatively thin sheets of steel, aluminum or similar metal which are formed to provide a plurality of spaced relatively narrow embossed or offset portions 17 which form grooves on the outer face of the sheet. As shown in Figs. 1, 4 and 9, the grooves 17 are arranged in parallel vertical relation on one face of the door and in parallel horizontal relation on the opposite face of the door. Where a rather wide door is desired a plurality of narrow sheets may be joined with their edges in lapped and welded relation. The joints are preferably arranged so that they occur at a groove formation 18 (Fig. 4), the marginal edge portion 20 of the sheet 21 of adjoining sheets 21 and 22 being offset to additional depth and overlapped with edge portion 19 of sheet 22 so that the groove 18 has the same outside appearance as the groove 17. The grooves 17 and 18 are shallow, being preferably a depth approximately equal to the thickness of the sheet metal, and are formed by being offset sharply so that they reinforce the members 10 and 11 against buckling and also provide the surfaces of the door with a uniform decorative appearance.

The edge trim members 13, 14, 15 and 16 may have the same cross sectional formation except for the location of embossed portions to match the embossed portions on the walls 10 and 11. As shown in Fig. 3 trim member 13 is generally U-shaped in cross section with a bight portion 23 forming the top or outer edge of the door and two leg portions 24 and 25 forming connecting side webs for receiving the marginal edges of the wall members 10 and 11. The leg portions or connecting side webs 24 and 25 are integrally joined to the bight portion or the outer edge member 23 by rounded edge or bead forming portions 26 which project laterally beyond the outer surfaces of the connecting webs 24 and 25 approximately the thickness of the material in the side wall members 10 and 11 so

that when assembled and joined the surfaces of the door are substantially flush. The rounded edge portions 26 form reinforcing beads along the edge of the door. The door edge forming portion 23 of the member 13 is preferably provided with a series of spaced transverse reinforcing grooves or depressions 27 as shown in Fig. 2 to provide greater rigidity for the edge of the door. The connecting web member 25 on one side of member 13 is provided with embossed portions 25' (Fig. 2) which match the embossed portions or groove formations 17 on wall member 10, the connecting web member 24 on the other side of member 13 being plain or unembossed since the grooves in face member 11 run horizontally and parallel with member 13. Where a lapped joint occurs as at 18 in Fig. 4 the embossment on the connecting web member 25 is deepened to accommodate the double thickness of material.

The core structure 12 is preferably an expanded and rigidified honeycomb of proper thickness. The core 12 is preferably formed from kraft or similar paper and may be fabricated in the manner set out in copending application by George I. Goodwin and Howard H. Klee, Serial No. 17,424, filed March 27, 1948, now Patent Number 2,648,371 issued Aug. 11, 1953, or in any other similar manner. The core 12 is arranged as indicated in Figs. 1 and 2 with the edges of the material adhered to the inside faces of the side wall members 10 and 11 by a suitable adhesive.

A block 28 of wood or similar material which will resist the clamping effect of hardware attaching bolts is arranged within each corner of the door in recesses provided in the core structure. The blocks 28 and the wall members 10 and 11 are provided with holes 37 which are properly spaced to receive the bolts for attaching the supporting hardware. Intermediate blocks 43 of a similar character are provided adjacent both side edges and holes 44 are provided extending through the same for attaching the lock mechanism. The blocks 28 are symmetrical and so positioned that the mounting hardware may be attached on either face while the blocks 43 are arranged to accommodate the locking mechanism at either side of the door with either face outside, the holes on the side which is not used being adapted to be covered by a decorative plate, or the like, when the door is installed. The blocks 28 and 43 are adhered to the wall members 10 and 11 by a suitable adhesive and are provided with grooves to match the grooves in the wall members 10 and 11, as required.

In fabricating the door structure the side wall members 10 and 11 are first bonded to the core structure 12, the latter being adhered to the inner faces of the members. One edge strip, as for example, the top edge strip 13, is then positioned with the connecting leg or web portions 24 and 25 telescoped within the marginal edges of the side wall members 10 and 11, the core structure 12 terminating short of the edges a sufficient distance to permit a bar member 29 (Fig. 6) to be positioned, either before or after the positioning of the edge strip 13, between the leg portions of the edge strip. The bar member 29 is preferably copper or a similar electrical conductor which cooperates with the welding elements 30 applied to the exterior surfaces of the side wall members 10 and 11 to seam or spot weld or otherwise bond the edge strip 13 to the side wall members. When this operation is completed the bar 29 is withdrawn and the side edge strips 15 and 16 are rigidly connected to the side wall members 10 and 11 in the same manner.

The bottom edge member 14 may be secured in position last by means of angle plates 31 (Fig. 5) having one leg 32 welded at 33 or otherwise secured to the inside surface of the member 14 and the other leg 34 detachably secured by a bolt 35 having its head seated in a countersunk hole and flush with the outside surface of the side edge member 15.

After the edge trim members have been assembled with and secured to the side wall members, a suitable mastic material 36 (Fig. 6) such as caulking compound, is forced into the mitered corners of the edge trim members. The mastic may be forced through one of the bolt receiving apertures 37 provided in the blocks 28 by providing a passageway 38 in each block which communicates with the corner aperture 37 in the block. A sufficient quantity of the mastic will be forced into the door to cover the exposed portions of the miter joints and insure a watertight seal at each joint. The mastic will be of such a character that it will adhere to the metal but not react chemically with it. Alternately, the mastic 36 may be inserted by a nozzle extending through an aperture provided in the edge forming webs of the edge trim members which may be sealed off by the mastic as the nozzle is withdrawn.

The bottom edge trim member 14 may be secured throughout its length to the side wall members 10 and 11, preferably when the door is installed, by a plurality of spaced carriage bolts 39 (Fig. 8) or similar fastening devices extending through aligned apertures 40 in the side wall members and the edge trim member. The bolts 39 also extend through apertures provided in a clamping strip 41 to secure a weather strip 42 of rubber or similar material to the bottom edge of the door. The strips 42 may, of course, be secured on either side wall 10 or 11 of the door.

The arrangement of the reinforcing grooves may be varied to secure various decorative effects. The door may be provided with the same arrangement of grooves on both faces either vertically as in Fig. 1 or horizontally as in Fig. 9. When the grooves extend horizontally and several sheets are joined the lapped joint will be arranged so that water will drain downwardly over the same without entering the joint.

In Fig. 10 a double door 60, 61 is shown in which the grooves 62 and 63 are arranged diagonally opposite to each other. Any lapped joints in this construction will likewise be arranged so that the margin of the upper sheet is outermost and water will drain over the joint without any tendency to enter the joint.

In the door illustrated in Figs. 1 to 9 different groove formations are provided on opposite faces of the same door, horizontal grooves being provided on one face and vertical grooves on the other face so that a single door may be employed to secure different architectural effects by simply mounting the door with the side outermost which produces the desired architectural design. Because the opposite faces of the door are provided with different arrangements of the grooves the edge trim strips will be provided with embossments to match the face grooves and face lap joints, as required, to form a tight joint.

An alternative method may be employed for securing the final edge trim strip in the fabrication of the door. Referring to Fig. 11, the door structure 70 may be formed in the manner already described, with the top and side trim strips spot welded to the wall members. One side trim strip 71 is provided at its lower end with a cut-out portion in its outer edge forming face as indicated at 72 which cut-out portion is of sufficient size to accommodate a welding bar member of the same character as bar member 29 in Fig. 6. The bottom edge trim strip 73 is welded to the side plates with the welding bar member in position between the leg portions and after the welding is completed the bar member is withdrawn through the aperture 72. The aperture 72 is then closed by a plug 74 of hard rubber, or the like, the exposed portions of the plug 74 being flush with the adjacent surfaces of the door or extending slightly beyond the same, as desired. The space occupied by the welding bar member may be filled with a mastic before the plug 74 is inserted in the aperture 72 or the mastic may be inserted as previously described.

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A door constructed in the manner described is rigid, thin and flat, which permits a maximum number to be arranged without crating in a minimum of shipping space, all surface projecting members being removable. The provision of architecturally dissimilar faces and the symmetrically arranged holes for the mounting and latching hardware enables the dealer to use a single stock door to supply a variety of needs so that a large inventory of different types is not required.

While specific materials and details of construction have been referred to in describing the illustrated form of the invention, it will be understood that other materials and other details of construction may be resorted to within the spirit of the invention.

I claim:

1. A door construction comprising relatively thin sheet metal side plates, a compression resistant non-metallic honeycomb core structure connecting the side plates in parallel spaced relation, the edges of said core structure terminating short of the margins of said side plates, sheet metal edge forming trim strips of generally U-shaped cross section, said trim strips facing inwardly and having leg portions rigidly secured to the inside margins of said side plates, and said trim strips having their ends in abutting relation.

2. A door construction comprising relatively thin side plates of sheet metal material having relatively shallow reinforcing ribs defined by exterior grooves which are architecturally decorative and of dissimilar pattern, a rigid non-metallic honeycomb core structure connecting the side plates in spaced relation, the edges of said core structure terminating short of the margins of said side plates, metal edge forming trim strips of generally U-shaped cross section having leg portions embossed to correspond to the grooves in the side plates, said trim strips facing inwardly with the leg portions rigidly secured to the inner margins of said side plates, the ends of said trim strips being in abutting relation at the corners thereof, and a mastic material within the door sealing the abutting ends of the edge trim strips.

3. A door construction as recited in claim 1 and a plurality of solid wooden core blocks arranged in spaced symmetrical relation adjacent the margins of the door and provided with apertures for accommodating door mounting and locking hardware when either face of the door is positioned outermost.

4. A door construction as recited in claim 2 wherein the side plates comprise a plurality of sheets of material with the edges thereof overlapped and bonded together at a reinforcing rib.

5. A rectangular door construction comprising relatively thin metal side plates provided with reinforcing grooves extending in spaced relation across said side plates and forming a decorative pattern thereon, a rigid paper honeycomb core structure connecting the side plates in parallel spaced relation, the edges of said core structure extending to adjacent the margins of said side plates, metal edge forming trim strips of U-shaped cross section having leg portions shaped to conform to the grooves in the side plates and welded to the margins of said side plates in inwardly extending relation thereto, and said trim strips extending around at least the top and sides of said door.

6. A method of fabricating a door, which door is characterized by thin metal side plates, connected in parallel spaced relation by a rigid honeycomb core structure and metal edge forming trim strips of U-shaped cross section having leg portions adapted to be rigidly connected to the margins of said side plates, said method comprising securing the side plates to the core with the margins of said plates extending beyond the margins of the core, placing one of the trim strips in inwardly facing position with its legs contacting the side plates and with a welding bar in the space provided between the marginal edges of the core and the marginal edges of said side

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plates, welding said trim strip to said side plates, withdrawing the welding bar lengthwise of the trim strip, successively positioning the other trim strips relative to the said side plates and welding the same in a similar manner and finally covering the inner surfaces of the joining edges of the trim strips with a mastic material.

7. A method of fabricating a door, which door is characterized by thin metal side plates, connected in parallel spaced relation by a rigid honeycomb core structure, and metal edge forming trim strips of generally U-shaped cross section having leg portions adapted to be rigidly connected to the margins of said side plates, said method comprising securing the side plates to the core with the margins of said plates extending beyond the margins of the core, placing one of the trim strips in inwardly facing position with its legs contacting the side plates and with a welding bar in the space provided between the marginal edges of the core and the marginal edges of said side plates, welding said trim strip to said side plates, withdrawing the welding bar lengthwise of the trim strip, successively positioning the adjoining trim strips relative to the said side plates and welding the same in a similar manner, positioning the final trim strip relative to the side plates and welding the same, withdrawing the welding bar from within the final trim strip through an aperture provided in one of the trim strips adjoining the same, inserting a plug member in the aperture and then covering the end joints of the trim strips with a mastic material.

8. A method of fabricating a door, which door is characterized by thin metal side plates, connected in parallel spaced relation by a rigid honeycomb core structure, and metal edge forming trim strips of generally U-shaped cross section having leg portions adapted to be rigidly connected to the margins of said side plates, said method comprising securing the side plates to the core with the margins of said plates extending beyond the margins of the core, placing one of the trim plates in inwardly facing position with its leg portions contacting the side plates and with a welding bar in the space provided between the marginal edges of the core and the marginal edges of said side plates, welding said trim strip to said side plates, withdrawing the welding bar lengthwise of the trim strip, successively positioning the adjoining trim strips relative to the said side plates and welding the same in a similar manner, positioning the final trim strip relative to the side plates and securing the same by means of bolts and covering the inner surfaces of the end joints of the trim strips with a mastic material.

9. A door construction comprising relatively thin sheet metal side plates, said side plates having spaced parallel reinforcing grooves which are arranged to extend across the outer faces of the plates to form thereon different architectural designs, a compression resistant non-metallic honeycomb core structure connecting the side plates in parallel spaced relation, the edges of said core structure terminating short of the margin of said side plates, channel-shaped sheet metal edge forming trim strips having flange portions extending inwardly and rigidly secured to the inner confronting margins of the side plates, said flange portions having reinforcing grooves corresponding to the grooves in the side plates, said trim strips having their ends in abutting relation, and a mastic material within the door in a position to seal the abutting end edges of the trim strips.

10. A rectangular door construction comprising relatively thin sheet metal side plates provided with reinforcing grooves extending in spaced parallel relation forming different architectural patterns on opposite faces of the door, a rigid paper honeycomb core structure connecting the side plates in parallel spaced relation, the edges of said core structure extending adjacent the margins of said side plates, metal edge forming trim strips of U-shaped cross section having connecting webs forming leg portions shaped to conform to the reinforcing

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grooves in the side plates and welded to the interior margins of said plates, said trim strips having beaded edges whereby when the edges of the side plates are joined thereto the surfaces of the door are substantially flush, and said web portions extending around at least the top and sides of said door.

11. A hollow metal door structure comprising a pair of relatively thin parallel spaced side plates formed of sheet metal, a rigid pressure-resistant non-metallic honeycomb core structure secured between the spaced side plates and extending to adjacent the margins thereof, inwardly opening channel-shaped metal edge forming trim strips having side web portions secured to the inside margins of the side plates and relatively rigid hardware receiving blocks of more pressure-resistant material than the core structure arranged in symmetrical relation within opposite side margins of the door, said blocks and said side plates having aligned bolt holes symmetrically positioned for receiving attaching hardware in engagement with either face of the door.

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