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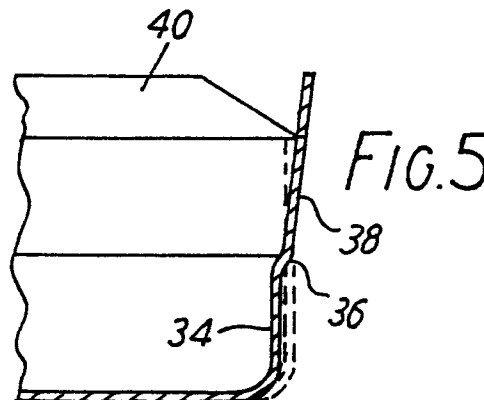
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54 **Floor panels.**

57 A tray or stiffening web for a load-bearing floor panel is produced in two steps. Firstly, the tray is drawn from sheet metal to a desired depth to provide a tray whose side walls are substantially vertical and are closed at the corners. The tray is then redrawn to incline an upper portion of the tray side walls outwardly of the tray while retaining the corners closed. The tray is then covered by a top plate to form the load-bearing floor panel.



Floor Panel

The present invention relates to floor panels.

In many modern office buildings, the floors are formed by load bearing floor panels supported by their edges on a lightweight metal grid several inches above a concrete slab to provide a ready space for routing and access to communication, power and mechanical services. The metal grid is supported by jacks. Alternatively, the floor panels can be supported directly on the jacks. The normal arrangement is for a jack to be positioned at each corner of each panel, one jack therefore providing support to four adjacent panel corners. One or more panels can be removed for access to the aforementioned services.

Hitherto, such a panel has been formed by pressing or drawing from sheet steel to provide a tray or stiffening web having a base and side walls with the floor surface being formed by a flat sheet metal top plate being secured by welding or adhesive to horizontal flanges formed along the upper edges of the tray side walls. The panel walls are inclined at an acute angle to the vertical away from the panel centre to provide an outward taper to the panels. This ensures that adjacent panels engage by "line" contact along their upper edges and not over the whole area of the side walls since the latter would give rise to undue relative moment of the panels when in use. In order to provide the panel with a "solid" feel the panel is infilled with chipboard prior to the top plate being fitted, the chipboard being secured in place by adhesive.

One disadvantage of the above-described panel is that when tested for strength by the application of a point load, there is a tendency for the panel side walls to buckle. The tray or stiffening web, therefore, has to be folded from relatively heavy gauge metal to provide sufficient strength. A further disadvantage is that it has hitherto proved impossible to draw the tray from sheet metal with the desired wall taper without the metal tearing and splitting at the tray corners. Such a tray, therefore, is produced with open corners and these open corners represent a fire hazard. Should a fire occur in the space beneath an array of floor panels the panel open corners would allow the fire to spread relatively quickly through the chipboard infills in the panels and also to any flooring material covering the panels. The corners can, of course, be sealed by welding but the disadvantages of this are obvious in terms of time and cost.

The present invention seeks to provide an improved method for manufacturing a load-bearing floor panel and tray therefor.

Accordingly, the present invention provides a method of producing a tray for a load-bearing floor panel having side walls which are inclined outwardly of the tray and have closed corners, the method comprising the steps of: a) drawing said tray from sheet metal to a desired depth to provide a tray whose side walls are substantially vertical and are closed at the corners thereof; and b) subsequently redrawing said tray to incline an upper portion of said tray side walls outwardly of said tray while retaining said corners closed.

The present invention also provides a floor panel having a tray drawn from sheet metal, the tray having a base and upstanding side walls wherein the corners of said side walls are closed and an upper portion of said walls is inclined outwardly of the panel.

In a preferred form of the present invention the upper edge of each side wall is provided with a flange for turning inwardly of the tray into a horizontal attitude to locate in a rebate formed in an outer edge region of the upper surface of an infill for the tray. The infill is preferably chipboard and the flanges form a flush fit with the upper surface of the infill.

Producing a tray for a floor panel in accordance with the invention provides a floor panel the corners of which are closed, without any additional steps such as welding of the corners having to be undertaken. Having the upper portion of the tray side walls angled relative to the remainder of the side walls provides a wall stiffening feature together with the closed corners thus allowing a thinner gauge sheet material to be used than would otherwise be the case.

The present invention is further described hereinafter, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a sectional elevation through a drawing tool showing a first drawing operation in the production of a preferred form of tray and floor panel according to the present invention;

Figure 2 is a sectional elevation through a second drawing tool showing a second stage in the operation;

Figure 3 is a perspective view of a corner of the tray produced by the operations of Figures 1 and 2;

Figure 4 is a perspective view of the tray corner of Figure 3 in its finished form;

Figure 5 is a vertical section on the line V-V of Figure 3; and

Figure 6 is a view similar to that of Figure 3 showing a corner of a modified form of tray.

Referring to the drawings, Figure 1 shows a punch 10 having an upper die 11, and a lower die 12 in which a sheet metal blank is cold drawn in a first drawing operation, the metal blank having been stamped from a sheet metal, typically sheet steel. As Figure 1 shows, the metal blank is drawn into a cup-shaped tray 14 having a substantially planar base 16 and vertical side walls 18. The depth to which the tray is drawn will, of course, take into account the desired depth of the finished floor panel.

The tray 16 is then redrawn in a second operation, shown in Figure 2, using a further punch 20 and lower die 22. As can be seen from Figure 2, the punch 20 has an upper die 24 which, together with the lower die 22, is shaped to effect the second cold drawing operation mainly on the upper portion of the side walls of the tray 16. Both dies have lower portions 26, 28 with cooperating vertical side walls and cooperating upper portions 30, 32 which are inclined outwardly. The inclined upper portions 30, 32 extend the full periphery of the die walls and, at their juncture with the vertical wall portions 26, 28 are laterally offset outwardly of the dies to effect a beading or "joggle" in the side walls of the tray 16, the joggle extending the full length of the side walls.

The resulting shape of the tray 16 is best seen in Figures 3-5. In Figure 5, the shape of the tray formed by the first drawing operation of Figure 1 is shown in dotted lines with the final shape of the tray resulting from the drawing operation of Figure 2 being shown in solid lines. As can clearly be seen from Figure 5 the lower portion 26 of the upper die has a slightly smaller horizontal cross sectional shape than the upper die 11 of figure 1, with the lower portion 28 of the lower die 22 correspondingly shaped, to reduce the spacing of the lower wall portions 34 of the tray, this reduction being typically 2.5 or 3mm for each side wall. The joggle 36 and inclined upper wall portion 38 are also clearly shown in Figure 5.

Figures 3 and 5 also show upper flanges 40 which are provided on the tray side walls, these being folded inwardly into a horizontal attitude, as shown in Figure 4, to sit flush in rebates formed in the upper surface edge region of a chipboard or other infill 42 previously secured in the tray, for example by adhesive. The top of the tray is then covered by a top plate which is secured to the flanges and infill, again conveniently by adhesive. The chipboard infill provides the panel with a solid feel. Alternatively, these flanges can be trimmed as waste material.

As will be appreciated, providing a taper or incline to the panel walls only along their upper portion reduces the stresses applied to the sheet material during the drawing operations, thus enabling a panel to be produced with closed corners as is clearly shown in Figures 3 and 4.

Wood infills used with the trays occasionally exhibit a lack of consistency in the dimensions of the wood infills as a result of which the side walls of a tray might not fit flush against the side wall of the wood infill, at least along the whole of the uppermost edge of the tray side walls. In order to overcome this problem the uppermost edge portion of each side wall of a tray may be deformed inwardly of the tray by an amount sufficient to ensure that when the wood infill is dropped into the tray contact between the side walls and the infill is made around the whole of the periphery of the infill. The uppermost portion of each side wall is deformed inwardly by an amount typically 0.2 mm. This is sufficient to compensate for any variations in the dimensions of the wood infills. When an infill is dropped into a tray the uppermost portions of the side walls of the latter are forced outwardly by the required amount.

In order to enable the uppermost edge portion of each side wall to be deformed inwardly a small notch 44 is cut into each corner of the tray as shown in figure 6. This notch is typically 3 mm deep so that it is only the uppermost few millimetres of the side walls which is deformed inwardly.

Cutting of the notches can be effected simultaneously with the trimming of waste material from the tray corners.

Prior to the infill being dropped into the tray, the tray and wood infill are sprayed with an adhesive. After the wood infill is dropped into the tray the assembly is then passed beneath rollers which force the infill fully home into the tray.

Inward deformation of the upper portion of the side walls of each tray can be effected conveniently during trimming of waste material from the side walls.

Claims

1. A method of producing a tray for a load-bearing floor panel having side walls which are inclined outwardly of the tray and have closed corners, the method comprising the steps of:

a) drawing said tray from sheet metal to a desired depth to provide a tray whose side walls are substantially vertical and are closed at the corners thereof; and

b) subsequently redrawing said tray to incline an upper portion of said tray side walls outwardly of said tray while retaining said corners closed.

2. A method as claimed in claim 1 wherein in redrawing said tray the spacing between lower portions of opposed side walls of the tray is reduced a pre-elected amount. 5

3. A method as claimed in claim 2 wherein said spacing is reduced by an amount in the range 2.5 mm to 6 mm. 10

4. A method as claimed in claim 2 wherein said spacing is reduced by substantially 3 mm for each side wall of the tray.

5. A method as claimed in any of claims 1 to 4 wherein said step of redrawing said tray comprises forming a line of deformation between said upper portion of said side walls and the remaining lower portion of said side walls. 15

6. A method as claimed in claim 5 wherein said line of deformation comprises a ridge extending substantially parallel with an upper edge of said side walls. 20

7. A method as claimed in claim 5 wherein said line of deformation comprises a joggle extending substantially parallel with an upper edge of said side walls. 25

8. A method as claimed in any of claims 1 to 7 further comprising forming a notch in the upper edge of at least two adjacent corners of said tray and deforming an upper edge portion of the adjacent side wall inwardly of said tray along substantially the whole length of said side wall. 30

9. A method as claimed in claim 8 wherein said upper edge portion is deformed inwardly substantially 0.2 mm. 35

10. A method as claimed in claim 8 or 9 wherein a respective notch is formed in the upper edge of each corner of said tray and the upper edge portion of each side wall is deformed inwardly of said tray. 40

11. A method of producing a tray for a load-bearing floor panel having side walls which are inclined outwardly of the tray and have closed corners, substantially as hereinbefore described with reference to the accompanying drawings. 45

12. A tray for a load-bearing floor panel when produced according to the method of any of claims 1 to 11.

13. A load-bearing floor panel having a tray as claimed in claim 12. 50

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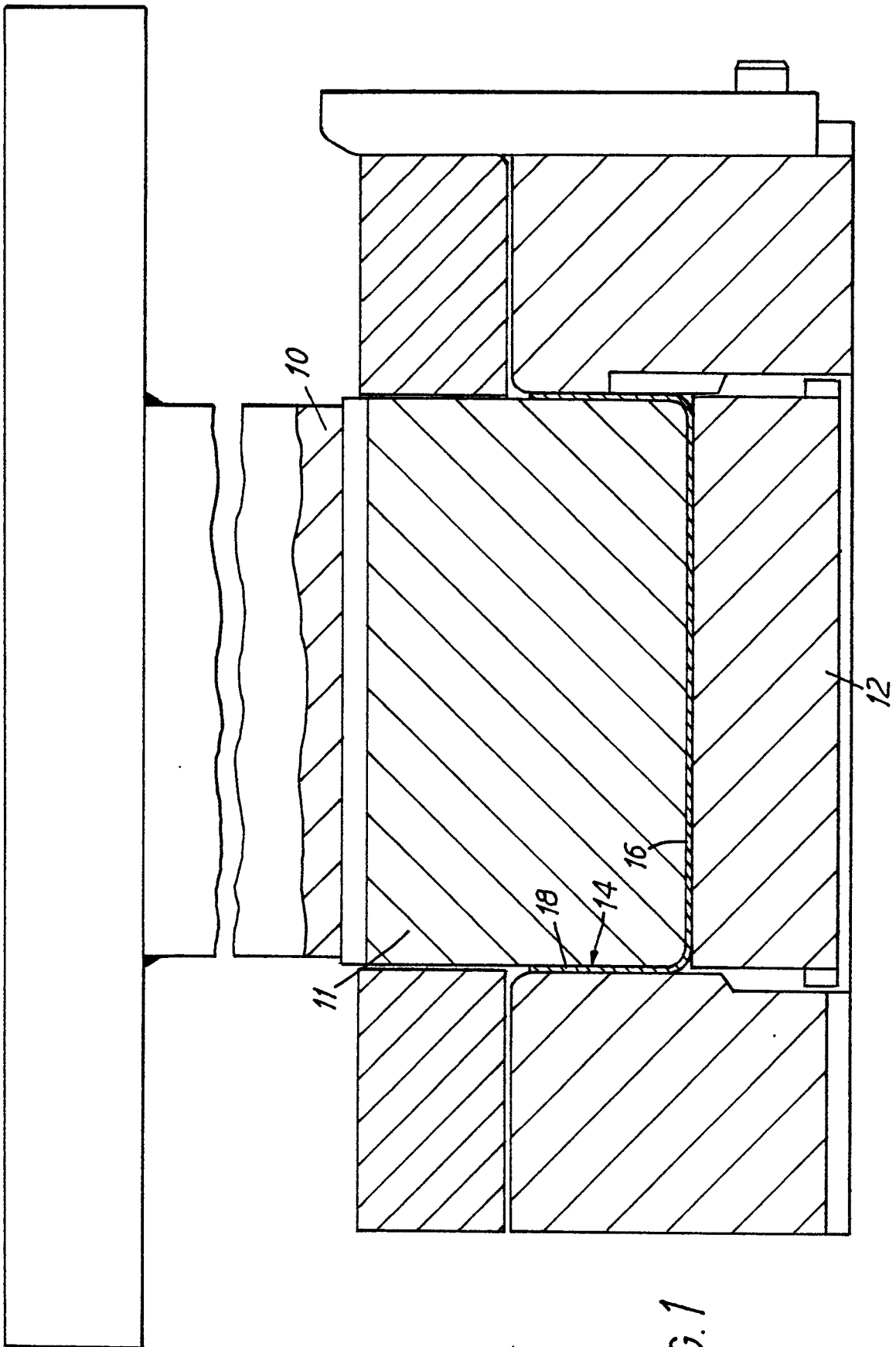
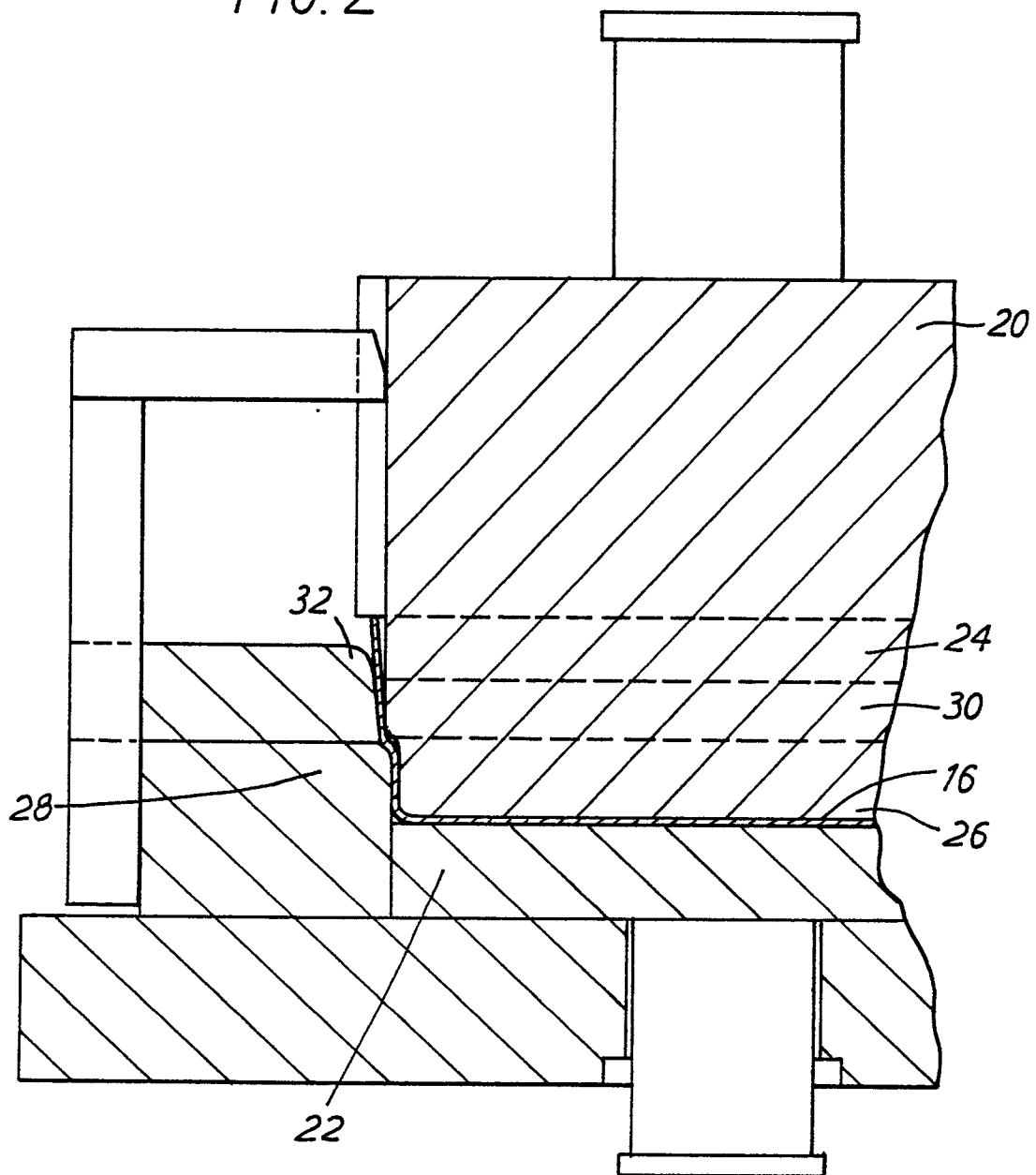


FIG.1

FIG. 2



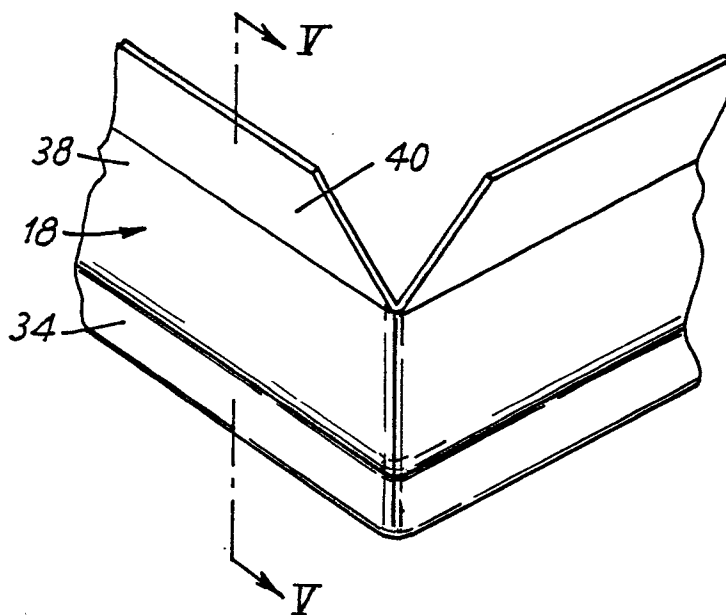


FIG. 3

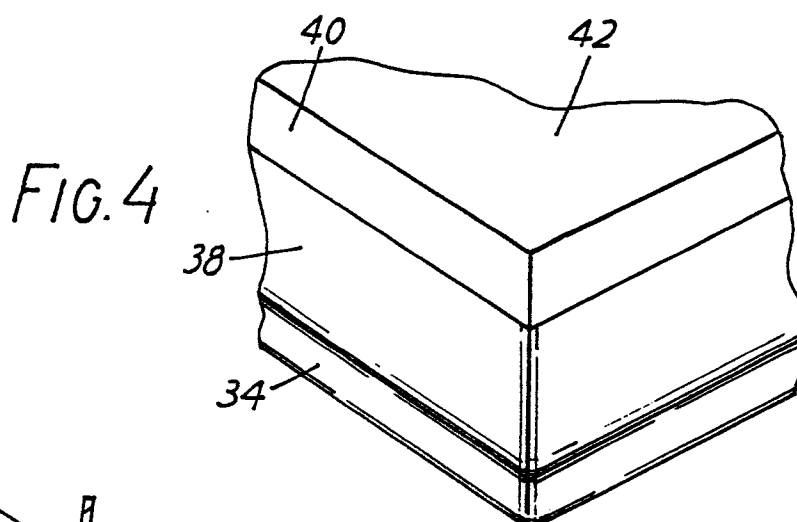


FIG. 4

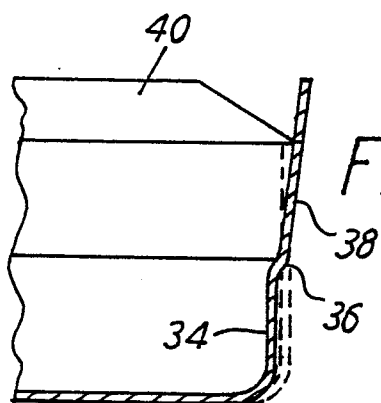


FIG. 5

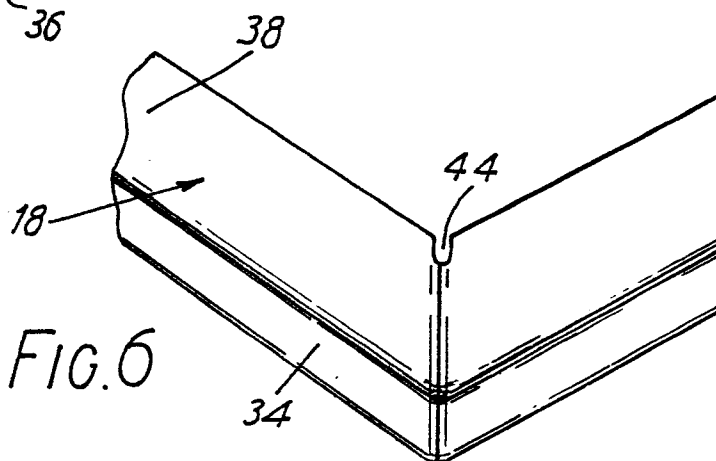


FIG. 6