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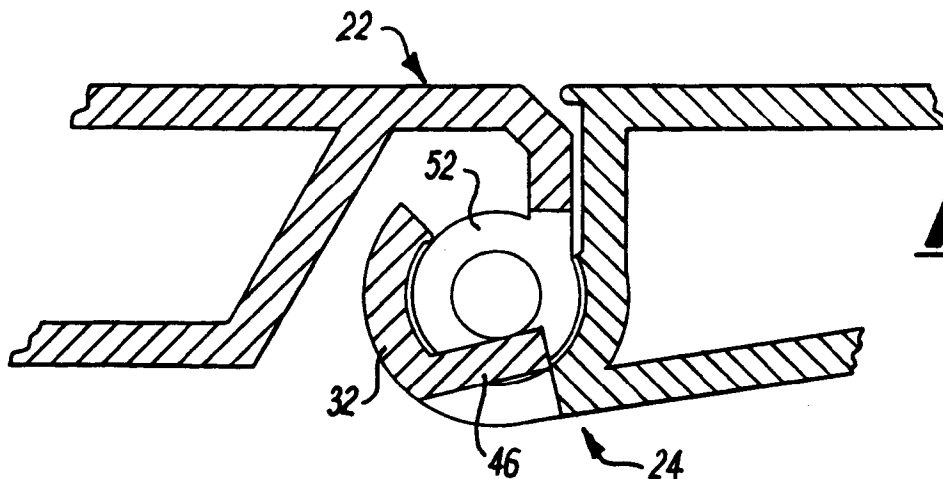
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(54) **Closure arrangement.**

(57) A tambour door arrangement is constructed by means of tambours connected by male and female edge regions 22, 24 which fit together to provide a hinged connection. The male edge 22 consists of a circular cylindrical head parallel to the length of the extrusion. The female edge 24 consists of a circular cylindrical sleeve formed to receive the head of the male edge of an adjacent slat. Each slat has at least one formation 46 formed in the female edge, and a corresponding recess cut-out of the male edge to leave end faces 52 into which the projection 46 may locate. An abutment of the projection 46 against end faces 52 prevents or limits relative movement of the slats in either sense. The projection 46 and corresponding cut-outs are not visible from the front face of the tambour door (uppermost in the drawing).



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The present invention relates to closure arrangements, such as doors and shutters, and particularly, but not exclusively to tambour doors.

A tambour door consists of a plurality of slats which are arranged alongside each other. Each slat is connected in a hinged manner to both adjacent slats. The slats can be arranged to form a substantially planar door. The hinged connections also allow the door to be rolled. In a common arrangement, a roller is located horizontally across the top of a doorway or other opening, or vertically to one side of the opening, and the tambour door is rolled onto the roller in order to open the door or rolled off the roller to close the opening. Tambour doors of this general form are widely used for various types of office furniture, such as filing cabinets and storage cupboards, and similar arrangements are used for other purposes, such as blinds and security shutters.

A problem arises if the style of hinge arrangement allows relative movement of adjacent slats, parallel to the length of the slats. A large door may then prove difficult to handle during the construction of a piece of furniture, by virtue of the large number and/or length of the slats. Furthermore, slats which can move relative to one another during the construction or use of furniture can produce a risk of the door jamming or otherwise causing damage to the slats or other parts of the furniture.

It has been previously proposed to use adhesive tape to secure adjacent slats but the tape has a tendency to peel. Adhesive can transfer to the front face of the door, where it attracts dirt and becomes unsightly.

It is an object of the invention to obviate or mitigate these or other disadvantages of previous proposals.

According to the invention, there is provided a closure arrangement comprising a plurality of slat members hingedly connected together to form a closure member which may move between a closed condition, in which the slats form a closure member which closes an opening, and an open condition to which the closure member may move by virtue of the hinged connections, the slats being retained substantially contiguous and at least one slat member comprising at least one formation which may engage an adjacent slat member to prevent or limit relative movement of adjacent slat members generally parallel to the length of the slat members, and wherein the or each formation is so formed as to prevent or limit relative movement in either sense.

Each slat member may comprise a first hinge portion and a second hinge portion able to engage a first hinge portion of a like slat member to provide a hinged connection therebetween. The first or second hinge portions is preferably modified at least at one position to provide an engaging formation as aforesaid. The other hinge portion is preferably modified to provide

a complementary formation for receiving the or each engaging formation. Each first hinge portion may comprise an elongate channel portion and each second hinge portion may comprise an elongate portion which is received, in use, in the channel portion of another slat member to provide a hinged connection by rotation of the elongate portion in the channel portion. One or both of the hinge portions may be modified at least at one position to provide an engaging formation. A wall portion of the channel portion may project into the channel to provide the engaging formation. A portion of the second hinge portion may be removed to form a recess for receiving the engaging formation.

Preferably one or both of the channel portion and the elongate portion extend along substantially the whole length of the slat member.

The or each engaging formation may be formed by deforming part of the material of the slat member to form the formation in a slat member. Each slat member may comprise at least one cut-out for receiving an engaging formation.

Preferably the closure member adopts a rolled condition when in the open condition. Preferably each slat member comprises at least one formation as aforesaid. Preferably at least one formation comprises a projection engageable with another slat member. The projection may have a first region engageable with another slat member at a first location to prevent or limit relative movement in a first sense, and a second region engageable with the other slat member at a second location to prevent or limit relative movement in a second sense. The projection preferably has first and second faces providing the said first and second regions. Preferably each slat member comprises a recess for receiving a projection as aforesaid, wherein relative movement is prevented or limited by abutment of the projection with the recess walls.

Preferably the slat members are so formed that the or each engaging formation is substantially not visible from said front face.

In another aspect, the invention provides a closure arrangement comprising a plurality of slat members hingedly connected together to form a closure member which may move between a closed condition, in which the slats form a closure member which closes an opening and has a front face, and an open condition to which the closure member may move by virtue of the hinged connections, the slat members being retained contiguous and at least one slat member comprising at least one formation which may engage an adjacent slat member to prevent or limit relative movement of adjacent slat members generally parallel to the length of the slat members, and wherein the slat members are so formed that the or each engaging formation is not visible from the said front face, preferably when the closure member is in the closed condition.

Each slat member may comprise a first hinge por-

tion and a second hinge portion able to engage a first hinge portion of a like slat member to provide a hinged connection therebetween. The first or second hinge portions is preferably modified at least at one position to provide an engaging formation as aforesaid. The other hinge portion is preferably modified to provide a complementary formation for receiving the or each engaging formation. Each first hinge portion may comprise an elongate channel portion and each second hinge portion may comprise an elongate portion which is received, in use, in the channel portion of another slat member to provide a hinged connection by rotation of the elongate portion in the channel portion. One or both of the hinge portions is preferably modified at least at one position to provide the said engaging formations. A wall portion of the channel portion may project into the channel to provide the engaging formation. A portion of the second hinge portion may be removed to form a recess for receiving the engaging formation.

One or both of the channel portion and the elongate portion preferably extend along substantially the whole length of the slat member.

The or each engaging formation may be formed by deforming part of the material of the slat member to form the formation in a slat member. Each slat member may comprise at least one cut-out for receiving an engaging formation.

Preferably the closure member adopts a rolled condition when in the open condition. Preferably each slat member comprises at least one formation as aforesaid. The slat members may provide a substantially continuous front face when the closure member is in the closed condition. At least one formation preferably comprises a projection engageable with another slat member. The formation is preferably located wholly behind the front face. The formation may project from the rear face towards the front face. The formation may be formed by deforming part of the material of the slat, preferably of the rear face of a slat member.

Each slat member preferably comprises a recess for receiving a projection as aforesaid, wherein relative movement is prevented or limited by abutment of the projection with the recess walls.

The or each formation may be so formed as to prevent or limit relative movement in either sense.

Embodiments of the present invention will now be described in more detail, by way of example only, and with reference to the accompanying drawings, in which:-

Fig. 1 is a schematic elevation of a tambour door assembly;

Fig. 2 is a side elevation of three slats of a tambour door;

Fig. 3 is a schematic horizontal section through the assembly of Fig. 1;

Figs. 4A and 4B are respectively an end elevation

and section through the female edge of a slat forming part of a tambour door according to the present invention;

Figs. 5A and 5B correspond to Figs. 4A and 4B and show an alternative;

Fig. 6 is an edge view of the slats of Figs. 4A, 4B, 5A, 5B;

Figs. 7A and 7B are an end elevation and section through the male edge of a slat for use with the slats of Figs. 4, 5 and 6;

Fig. 8 is an edge view of the slat of Figs. 7A, 7B; Figs. 9A and 9B are respectively an end elevation and section through a hinge assembled from the slats shown in Figs. 4A, 4B, 6, 7A, 7B and 8;

Figs. 10 and 11 are respectively an end elevation and edge view of the female edge of an alternative embodiment of the invention;

Figs. 12 and 13 are a section and edge view through the male edge of a slat for use with the slat of Figs. 10 and 11; and

Figs. 14 and 15 are respectively an edge view and end elevation of a hinge formed from a slat of Figs. 10 and 11, and a slat of Figs. 12 and 13.

Fig. 1 shows a tambour door arrangement 10. Although the embodiments described are all tambour door arrangements, it is to be understood that the invention can be applied to other closure arrangements and closure members, such as roller shutters, blinds, and security shutters. The arrangement 10 comprises a plurality of slat members 12 hingedly connected together to form a door 14 which may slide between a closed condition (shown in Fig. 1), in which the slats form a door 14 closing an opening 16, and an open condition in which the door adopts a rolled condition around a roller 18, by virtue of the hinged connections.

Three slats 12 are shown in more detail in Fig. 2. Each slat is an identical length of extruded material, preferably synthetic plastics material. Other materials, such as metal, could be used, and techniques other than extrusion could be used to form the slats. The slats 12 each have a box section central region 20 and male and female edge regions 22, 24 which can fit together to provide a hinged connection.

The central region 20 has two cavities 26 in the example shown. The male edge 22 consists of a circular cylindrical head 28 parallel to the length of the extrusion, and attached to the central region 20 by means of an arm 30.

At the female edge 24, a circular cylindrical sleeve 32 is formed and is sufficiently large to receive the head 28 of an adjacent slat 12. The mouth 34 of the sleeve 32 is sufficiently wide to allow at least limited hinging movement of one slat relative to another when the head 28 of the one slat is fitted in the sleeve 32 of the other, to be rotatable therein. This can be appreciated from Fig. 2, which shows three slats connected at two joints 36, 38. In the upper joint 36, the

upper and middle slats are aligned so that the front faces 40 of the slats form a substantially continuous front face to the door. The continuous nature of the front face is further enhanced by the presence of a lip 42 at the female edge 24. At the lower joint 38, the head 28 has rotated in the sleeve 32 so that the lowest slat 12 has rotated relative to the middle slat and is close to the other extreme position. It can be seen that the front face 40 of the door has now been broken but that the articulation would allow a door formed of many slats to be wound onto a roller of sufficiently large radius.

Throughout this hinging movement, the slats remain substantially contiguous. That is, there are substantially no gaps between them. This, and the continuous nature of the sleeves 32 and heads 28 along substantially the whole length of the slats ensures that slats cannot be separated to allow access or viewing through the closure member. This represents an important security feature in many applications.

It is to be understood that many other forms of hinge could be used instead of the arrangement shown.

A roller 18 would normally be mounted horizontally above the door 14 (as shown), or vertically to one side of the opening. The door 14 can then be rolled onto the roller 18 to open the door, or pulled from the roller 18 to close the door. Movement of the door is assisted by guide channels 44 placed vertically at the sides of the opening 16, as shown schematically in Fig. 3.

It will be apparent from Fig. 2 that in the absence of the arrangements described below, the head 28 may slide along the sleeve 32. This could make use or installation of a door difficult and possibly cause the door to jam, with consequent damage to slats or elsewhere in the furniture. In order to overcome this, each slat 12 has at least one formation 46 (Figs. 4A,4B etc.) which may engage an adjacent slat 12 to prevent or limit movement of adjacent slats generally parallel to the length of the slats. Each formation is formed to prevent or limit relative movement in either sense, as will be described.

The formation 46 is a projection formed by pressing or punching the material of the wall of the sleeve 32, at one or locations along the slat. This deforms the wall to form the projection. Figs. 4A and 4B show one alternative for forming the projection 46 by breaking the material of the sleeve 32 along part of its length, and bending a leaf of material to project into the channel. This leaf of material can be attached to the slat 12 at either edge, according to how it is formed, and these two alternatives are shown in Figs. 4A,4B and 5A,5B. Figs. 4A and 5A are end elevations of the sleeve 32 showing an end face 48 of the projection 46. Figs. 4B and 5B are sections at the projection 46.

Fig. 6 is a side view of the sleeve 32 showing the length of the projection 46. It is to be noted that the

projection 46 does not extend the whole way along the sleeve and that it has two end faces 48. It is also to be noted that in most situations, the slat will be very much longer than the projection 46, so that the length of the projection 46 and its position along the slat can be selected to ensure it is adequately strong for the intended application, taking into account the material used and the forces expected, but without being limited by the length of the slat. Using a projection with two oppositely-directed end faces allows relative movement in either direction to be prevented by a single projection. Thus, the projection is of virtually arbitrary length and can be virtually arbitrarily located.

The male edge 22 (Figs. 7A,7B,8) is adapted to receive the projection 46 by cutting away part of the head 28 to leave a recess 50. The length of the recess 50 (parallel to the main length of the slat 12) is chosen to be slightly longer than the corresponding length of the projection 46. The two end faces 52 of the recess 50 provide surfaces for abutment of the end faces 48, as will be described.

Figs. 9A and 9B correspond to the views of Figs. 4A,4B respectively, but show a hinge formed by inter-connecting the edges 22,24 of adjacent slats 12. It can be seen from Figs. 9A,9B that the projection 46 is received in the recess 50. Since the recess 50 is slightly longer than the projection 46, there will be slight clearance between the corresponding end faces 48,52 but abutment of these end faces at one or other end of the recess 50 will limit relative movement of the slats 12.

In order for the hinge shown in Figs. 9A and 9B to be formed, it is necessary to provide each slat with a projection 46 and recess 50 at the same locations along their lengths, so that any pair of slats 12 can be mated with the projection 46 of one engaging the recess 50 of the other.

It can be seen from Figs. 9A,9B that the arrangements for preventing relative movement of the slats are not visible from the front face 40. This improves the aesthetics of the door when installed.

However, since the projection 46 projects forward from the rear face of the slat, towards the front face, it is expected that it can be readily formed by a punching or pressing operation.

The strength of the engagement between adjacent slats can be improved by increasing the length of the projections 46 (and the recesses 50) or by forming additional projections and recesses at other locations along the slats.

The remaining figures show an alternative arrangement for providing engagement between slats in such a manner that the arrangement is not visible from the front face, particularly when the door is in the closed condition. In this arrangement, the single formation of the arrangements described above is replaced by two formations, preferably located one at each end of each slat. Figs. 10 and 11 show a projec-

tion 54 formed by punching a short length of the wall of the sleeve 32 through into the interior of the sleeve, close to one end 56 of the slat 12. This exposes a face 58 within the sleeve 32.

Figs. 12 and 13 show that a length of the head 28 at the end 56 is cut away to leave a gap 60 and an abutment face 62. The gap 60 can receive the projection 54 when the hinge is assembled as indicated in Figs. 14 and 15. It can be seen from these views that the gap 60 is slightly over length relative to the projection 54, providing clearance at 64, so that a little play is available, but abutment of the faces 58,62 limits relative movement of the slats.

It is to be noted (from Fig. 15) that the projection 54 and gap 60 are not visible from the front face 40 when the door is in the closed condition.

The other end of each slat would be formed as a mirror image of the forms shown in Figs. 10 to 15, so that at each end of the slat, there is a formation limiting relative move in one sense, but neither being visible from the front face of the door.

It will be apparent that many variations and modifications may be made to the embodiments described above, without departing from the scope of the invention. Shapes and extrusion profiles, materials and manufacturing techniques may all be varied.

Whilst endeavouring in the foregoing specification to draw attention to those features of the invention believed to be of particular importance it should be understood that the Applicant claims protection in respect of any patentable feature or combination of features hereinbefore referred to and/or shown in the drawings whether or not particular emphasis has been placed thereon.

Claims

1. A closure arrangement (10) characterised by comprising a plurality of slat members (12) hingedly connected together to form a closure member (14) which may move between a closed condition, in which the slats form a closure member which closes an opening (16), and an open condition to which the closure member may move by virtue of the hinged connections, the slat members being retained substantially contiguous and at least one slat member comprising at least one formation (46) which may engage an adjacent slat member to prevent or limit relative movement of adjacent slat members generally parallel to the length of the slat members, and wherein the or each formation is so formed as to prevent or limit relative movement in either sense.
2. A closure arrangement (10) comprising a plurality of slat members (12) hingedly connected together to form a closure member (14) which may move between a closed condition, in which the slats form a closure member which closes an opening (16) and has a front face (40), and an open condition to which the closure member may move by virtue of the hinged connections, the slat members being retained substantially contiguous and at least one slat member comprising at least one formation (46,54) which may engage an adjacent slat member to prevent or limit relative movement of adjacent slat members generally parallel to the length of the slat members, and wherein the slat members are so formed that the or each engaging formation is substantially not visible from the said front face.
3. An arrangement according to claim 1 or 2, characterised in that the formation (46,54) is not visible when the closure member (14) is in the closed condition.
4. An arrangement according to claim 2 or 3, characterised in that each slat member (12) comprises a first hinge portion (24) and a second hinge portion (22) able to engage a first hinge portion of a like slat member to provide a hinged connection therebetween.
5. An arrangement according to claim 4, characterised in that the first or second hinge portion (24,22) is modified at least at one position to provide an engaging formation (46,54) as aforesaid.
6. An arrangement according to claim 5, characterised in that the other hinge portion (24,22) is modified to provide a complementary formation (50,60) for receiving the or each engaging formation (46,54).
7. An arrangement according to any of claims 4 to 6, characterised in that each first hinge portion (24) comprises an elongate channel portion (32) and each second hinge portion (22) comprises an elongate portion (28) which is received, in use, in the channel portion of another slat member (12) to provide a hinged connection by rotation of the elongate portion in the channel portion.
8. An arrangement according to claim 7, characterised in that one or both of the hinge portions (22,24) is modified at least at one position to provide an engaging formation (46,54).
9. An arrangement according to claim 8, characterised in that a wall portion (46,54) of the channel portion (32) projects into the channel to provide the engaging formation.
10. An arrangement according to claim 8 or 9, characterised in that the wall portion (46,54) projects into the channel to provide the engaging formation.

acterised in that a portion (50,60) of the second hinge portion (22) is removed to form a recess for receiving the engaging formation (46,54).

11. An arrangement according to any of claims 7 to 10 characterised in that one or both of the channel portion (32) and the elongate portion (28) extend along substantially the whole length of the slat member (12). 5
12. An arrangement according to any preceding claim, characterised in that the or each engaging formation (46,54) is formed by deforming part of the material of the slat member (12) to form the formation in a slat member. 10
13. An arrangement according to claim 12, characterised in that each slat member (12) comprises at least one cut-out (50,60) for receiving an engaging formation (46,54). 15
14. An arrangement according to any preceding claim, characterised in that the closure member (14) adopts a rolled condition when in the open condition. 20
15. An arrangement according to any preceding claim, characterised in that each slat member (12) comprises at least one formation (46,54) as aforesaid. 25
16. An arrangement according to any preceding claim characterised in that the slat members (12) provide a substantially continuous front face (40) when the closure member (14) is in the closed condition. 30
17. An arrangement according to any preceding claim, characterised in that at least one formation (46,54) comprises a projection engageable with another slat member (12). 35
18. An arrangement according to claim 17, characterised in that the projection (46) has a first region (48) engageable with another slat member at a first location (52) to prevent or limit relative movement in a first sense, and a second region (48) engageable with the other slat member at a second location (52) to prevent or limit relative movement in a second sense. 40
19. An arrangement according to claim 18, characterised in that the projection (46) has first and second faces (48) providing the said first and second regions. 45
20. An arrangement according to any of claims 17 to 19, characterised in that each slat member (12) 50

comprises a recess (50,60) for receiving a projection (46,54) as aforesaid, wherein relative movement is prevented or limited by abutment of the projection with the recess walls (52,62).

21. An arrangement according to any preceding claim characterised in that the formation (46,54) is located wholly behind the front face (40) of the closure member (14). 5
22. An arrangement according to any of preceding claim characterised in that the formation (46,54) projects from the rear face of the closure member (14) towards the front face (40). 10
23. An arrangement according to any preceding claim insofar as it is dependent on claim 1, characterised in that the slat members (12) are so formed that the or each engaging formation (46) is substantially not visible from the said front face (40). 15
24. An arrangement according to any of preceding claim insofar as it is dependent on claim 2, characterised in that the or each formation (46) is so formed as to prevent or limit relative movement in either sense. 20
25. Any novel subject matter or combination including novel subject matter disclosed, whether or not within the scope of or relating to the same invention as any of the preceding claims. 25

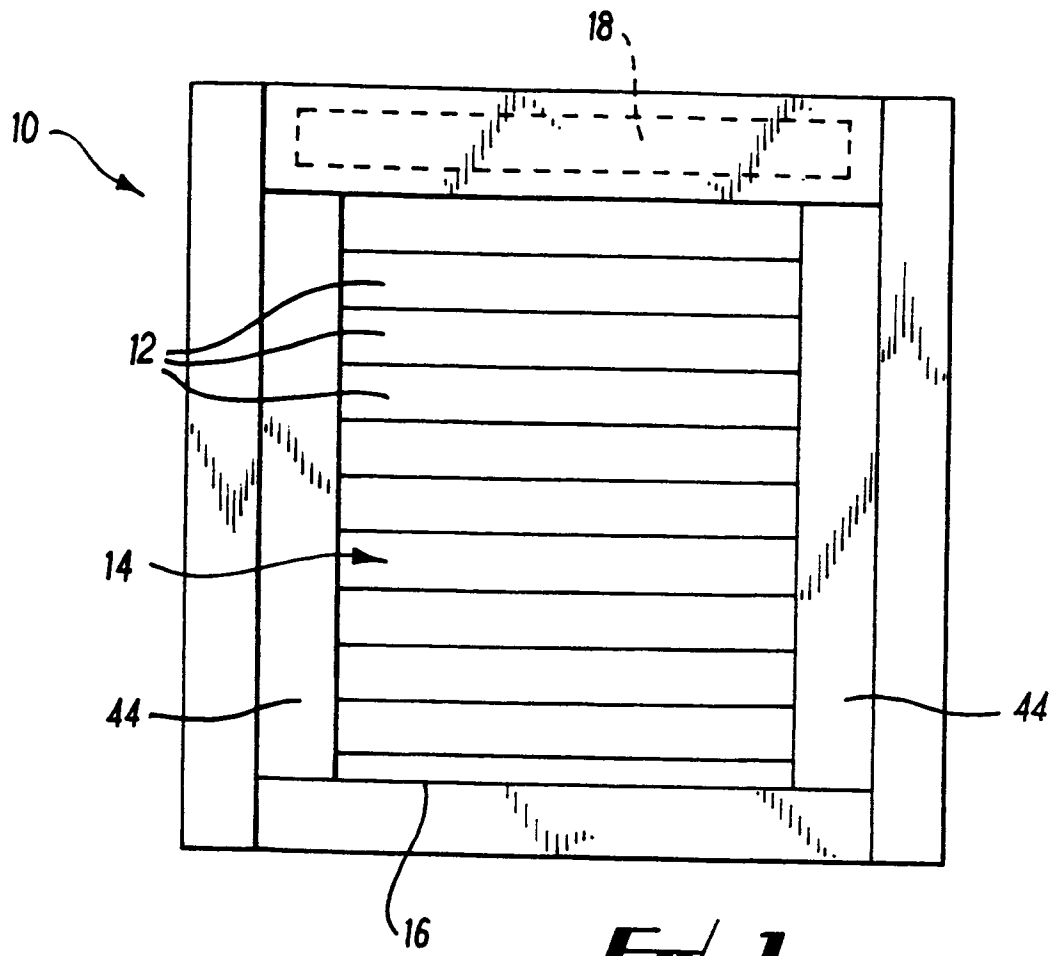


FIG. 1

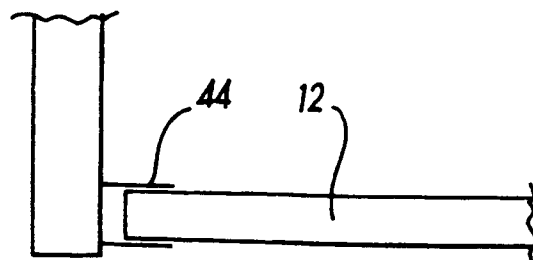
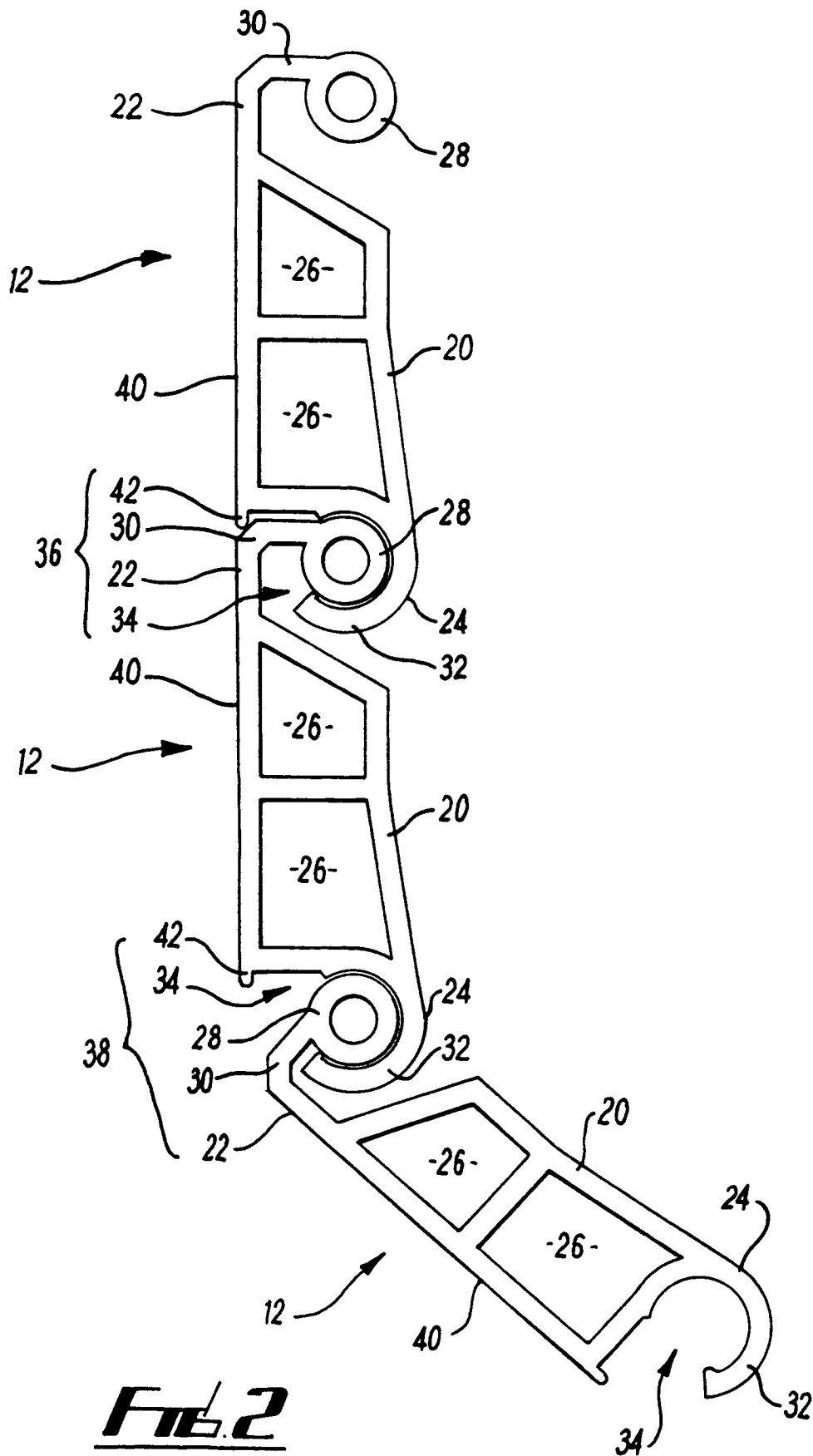


FIG. 3



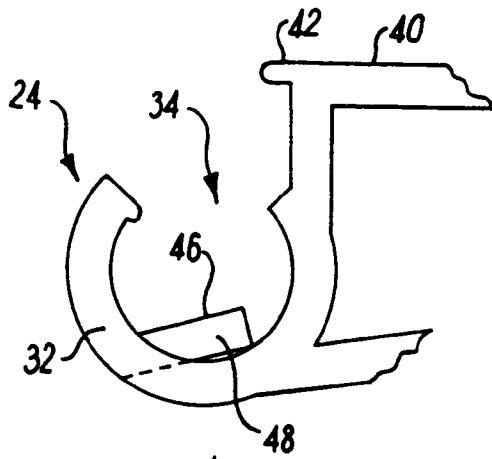


FIG. 4A

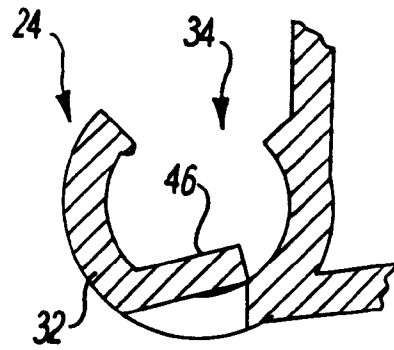


FIG. 4B

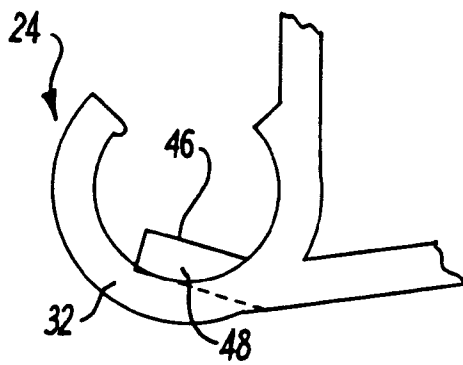


FIG. 5A

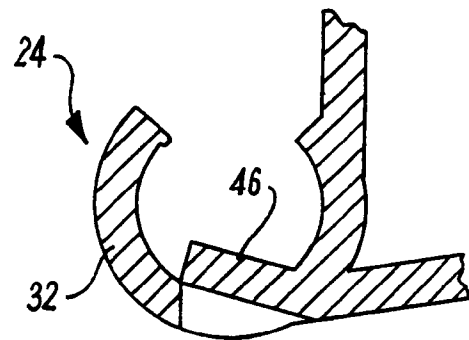


FIG. 5B

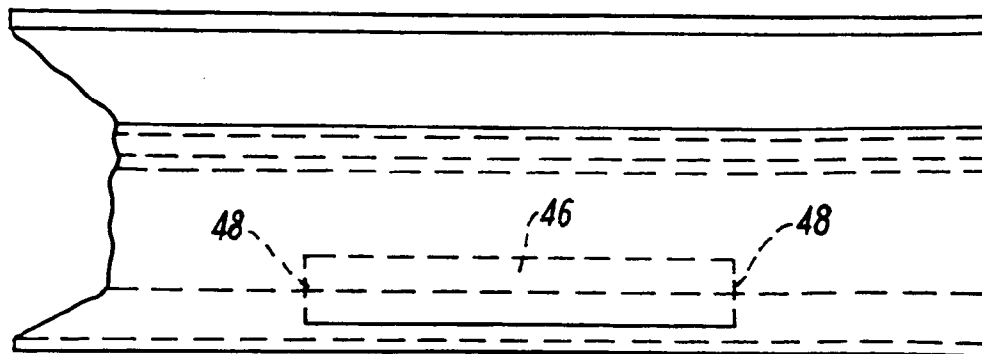


FIG. 6

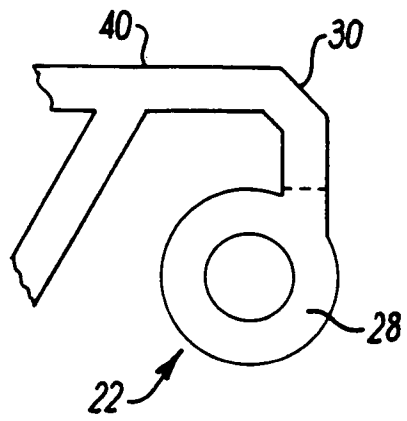


Fig. 7A

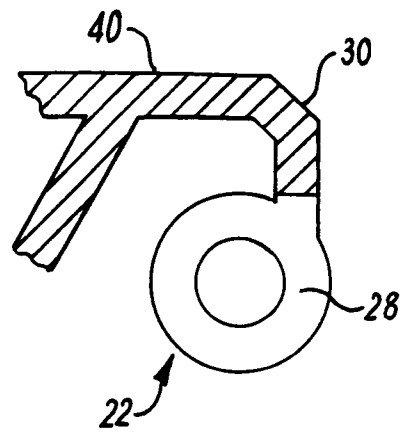


Fig. 7B

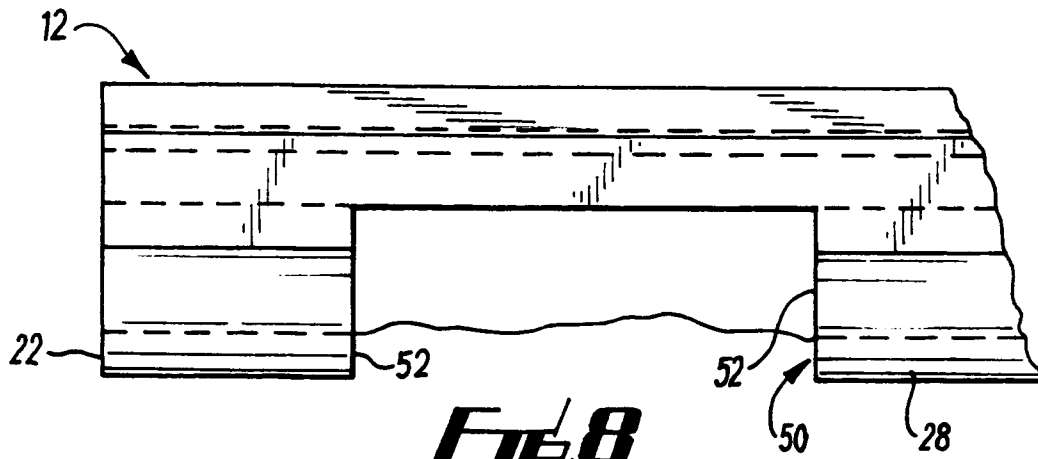


Fig. 8

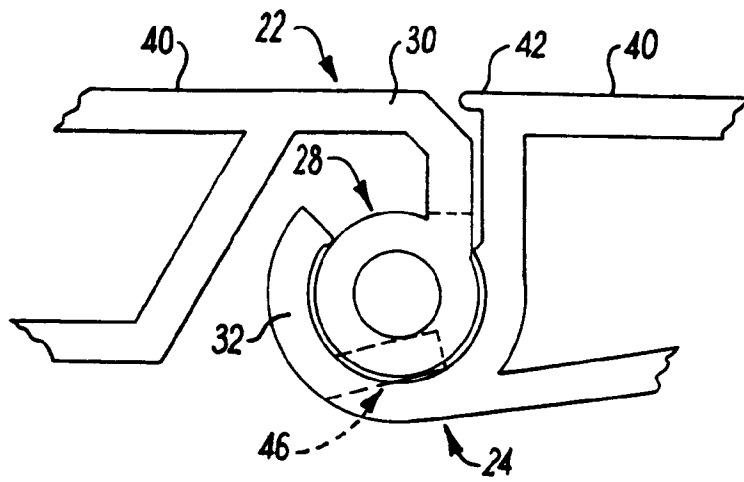


FIG. 9A

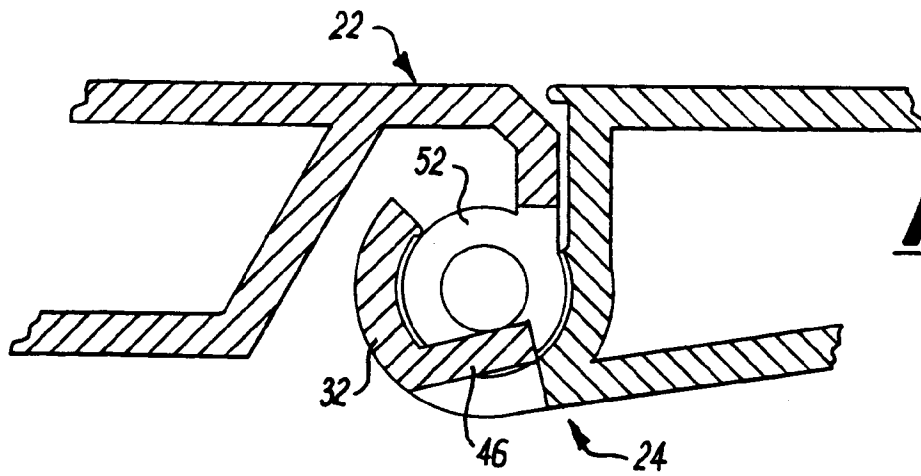


FIG. 9B

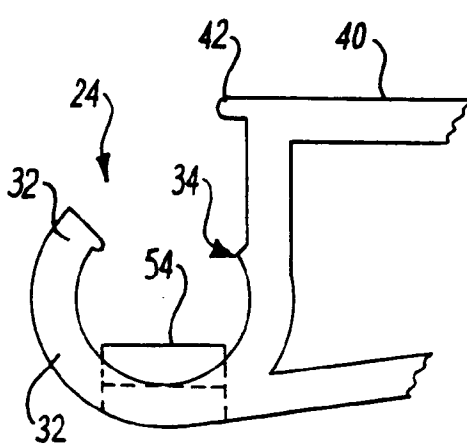


FIG. 10

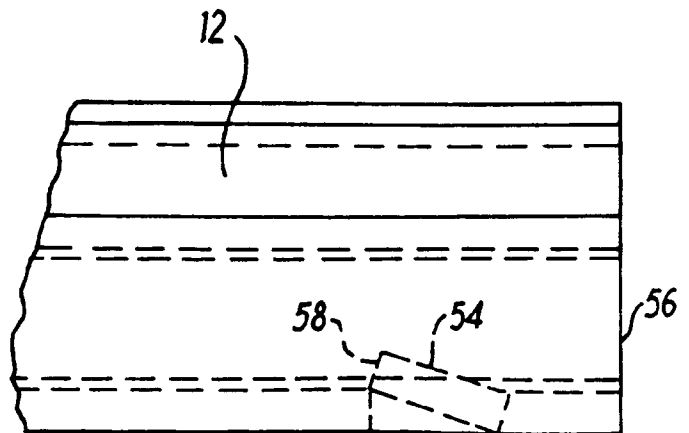
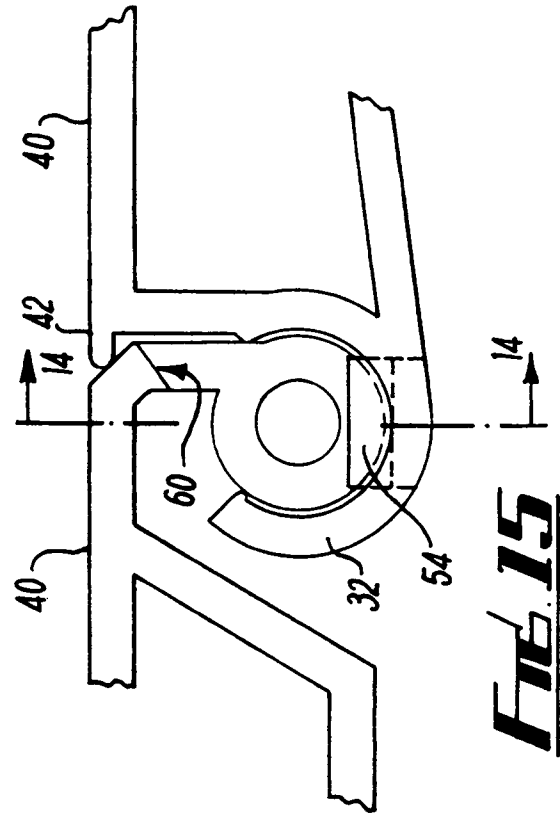
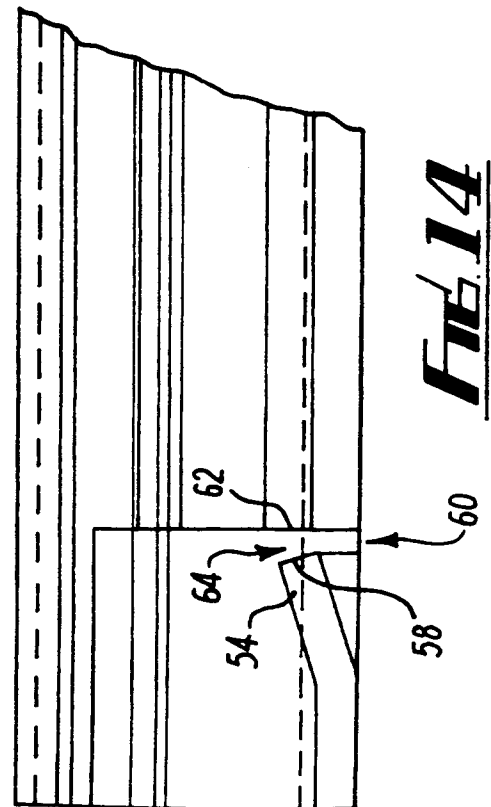
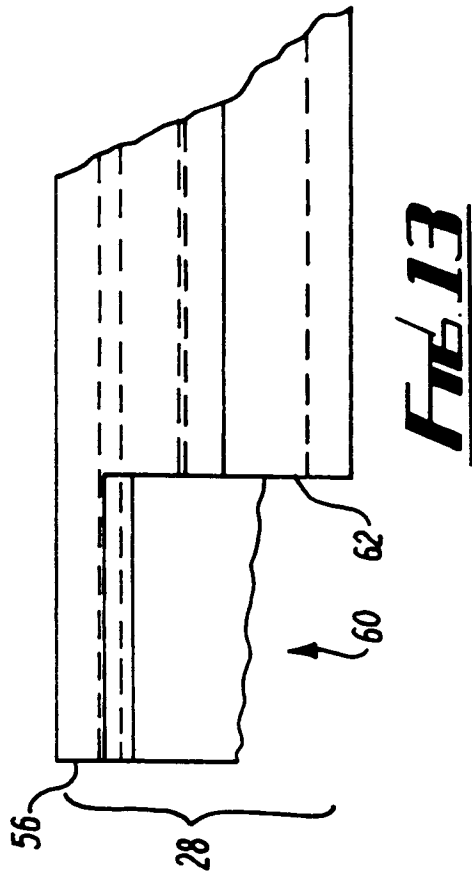
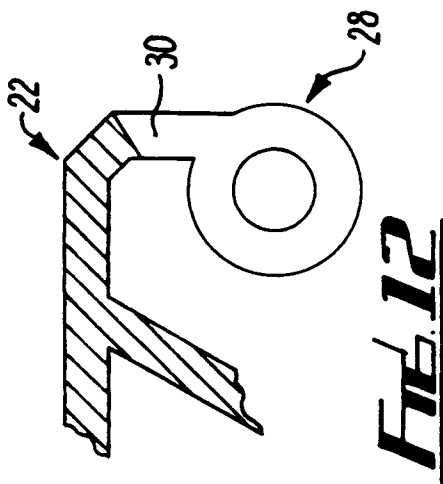


FIG. 11





European Patent
Office

EUROPEAN SEARCH REPORT

Application Number
EP 95 30 2657

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
X	DE-U-87 02 763 (HETAL-WERKE FRANZ HETTICH) 3 September 1987 * the whole document *	1-25	E06B9/15
X	GB-A-894 260 (MARTINAGE) * the whole document *	1-15, 17-25	
X	BE-A-637 053 (BRASELMANN) * page 4, line 2 - line 13 * * page 8, line 1 - line 7; figure *	1-8, 11, 14-18, 20-25	
A	DE-C-338 382 (WOHLFAHRT)		
The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (Int.Cl.6) E06B
Place of search THE HAGUE		Date of completion of the search 1 August 1995	Examiner Fordham, A
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