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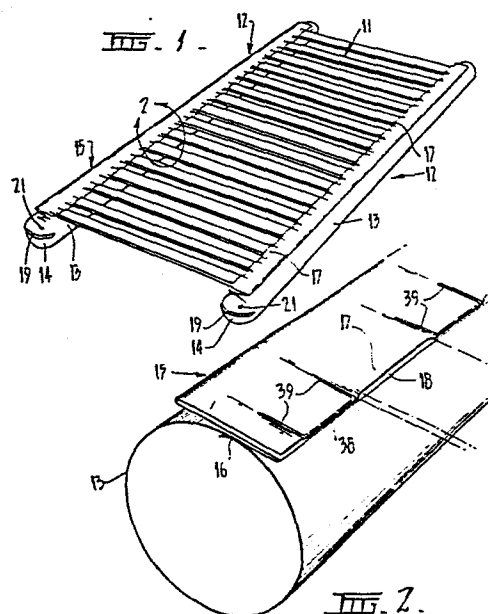
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(54) **Body support system.**

(57) A support system for mattresses or cushions used in body support appliances comprising, spaced air springs in the form of tubular bladders (13) provided with a series of longitudinally spaced pockets (17) having open mouths (18) accommodating the ends of transversely extending slats (11). The pockets are formed in a tangential flap (15) connected to the tubular bladder (13) along a longitudinal connection line (16) at the surface of the tubular bladder (13) such that the open mouths (18) of the pockets (17) are spaced along a longitudinal edge of the flap (15).



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Title: BODY SUPPORT SYSTEM

This invention relates to support systems for mattresses or cushions in beds, chairs, sofas, settees, stretchers and other body support appliances. Such support systems will be referred to as systems "of the kind defined".

5 The invention is particularly applicable to support systems of the kind defined in which a mattress or cushion rests on slats extending between supporting air springs. My British Patent Application No. 12121/80 and European Patent Application No. 81301481.8 disclose
10 mattress support systems of this kind in which the air springs are in the form of long inflatable tubes on which the ends of mattress supporting slats are rested. Such beds have been successful but one problem has been the tendency for the slats to move on the tubes and the
15 consequent need to provide some holding means which will not interfere with the flexure of the springs or the slats and which is not unduly complex and expensive. The present invention enables economical manufacture of air springs fitted with appropriate slat restraining
20 means.

According to the invention there is provided an air spring for supporting ends of parallel slats in a support system of the kind defined, which air spring comprises an inflatable tubular bladder provided with a

series of longitudinally spaced pockets having open mouths to receive the ends of the slats to be supported.

Preferably, the bladder is formed of sheet plastics material with a longitudinal welded seam and the flap is
5 formed by a continuation of the sheet material of the bladder beyond the seam which is folded and heat welded to form the pockets so that the flap is integrally connected with the bladder at said seam.

The invention also provides a method of making an air
10 spring, comprising forming a tube of heat weldable sheet plastics material with a longitudinal heat welded seam and so as to leave a longitudinal spring of said sheet material projecting beyond the seam exteriorly of the tube, and folding and welding said strip of material to
15 form a tangential flap with longitudinally spaced pockets having open mouths spaced along a longitudinal edge of the flap.

In order that the invention may be more fully explained some particular embodiments and methods of manufacture
20 will be described with reference to the accompanying drawings in which :-

Figure 1 is a perspective view of part of a bed comprised of mattress support slats extending between a pair of air springs;

Figure 2 is an enlarged scrap view taken in the region 2 in Figure 1;

Figure 3 is a transverse cross-section through an upper part of one of the air springs;

5 Figure 4 is a side view of the upper part of the air spring in the direction of arrow 4 in Figure 3;

Figure 5 is a perspective view of a heat welding apparatus used in the form of the air spring illustrated in Figures 1 to 4 and shows a partly formed spring in
10 the process of manufacture;

Figure 6 illustrates a specially shaped heat welding bar which is fitted to the apparatus during a later stage of the forming process;

Figure 7 is a vertical cross-section through the
15 apparatus of the partly formed tube at the stage of the forming process illustrated in Figure 5;

Figure 8 is a vertical cross-section through the apparatus at a later stage of the forming process;

Figures 9 to 11 diagrammatically illustrate alternative
20 types of air spring constructed in accordance with the invention;

Figure 12 is a perspective view of part of an air spring of the general kind shown in Figure 2;

Figure 13 is a perspective view of an air spring of the general kind shown in Figure 10;

5 Figure 14 is a perspective view of a stabiliser for use with a bed according to the present invention;

Figure 15 is a perspective view of part of the bed shown in Figure 1 including the stabiliser shown in Figure 14 mounted thereon, and

10 Figure 16 is a cross-section taken on the line X-X of Figure 15.

Figure 1 illustrates a mattress support system for a bed comprising a series of parallel wooden slats 11 extending between a pair of elongate inflatable air
15 springs 12. The air springs 12 can be mounted in any convenient frame (not shown). Each air spring 12 comprises an elongate tube 13 formed with closed ends 14 and with a tangential flap 15 which is connected to the tube along a longitudinal connection line 16 at the
20 surface of the tube and has a series of longitudinally spaced pockets 17 with open mouths 18 located along one longitudinal edge of the flap to receive the respective ends of the slats 11.

Each tubular bladder is formed of heat welded sheet plastics material, the tube being closed by a longitudinal welded seam defining the connection line 16, and the flap is formed by a continuation of the sheet material of the bladder which is folded and welded to form the pockets so that the flap is integrally connected with the bladder at the seam. The ends of the tubes are closed by heat welds 19 and one end of each tube is fitted with an inflation valve 21.

As referred to above, in order to maintain lateral stability, the air springs 12 can be mounted in any convenient frame (not shown) which is usually of 'U'-shaped cross-section for at least a portion of its length. However, for certain applications, such as the provision of a portable bed or a design application where lateral stability is required without any constraint at the sides, the support system shown in Figure 1 incorporates a stabiliser arrangement as shown in Figures 14 to 16 and now to be described.

As shown in Figure 14, before fitting on the bed, the stabiliser comprises an open-ended, flattened tubular member 55 of sheet plastics material similar to the tubular bladders 13. The member 55 is of a length slightly greater than the overall width of the bed and is provided with spaced apertures 56 whose axes correspond, respectively, with the axes of the tubular

bladders 13. The diameter of the apertures 56 is slightly less than the diameter of the tubes 13 to provide a gripping action when the stabiliser is mounted on the tubes. One edge 58 of the tubular member 55 has a seam 57 formed by heat welding extending parallel to, but spaced slightly from the edge 58 to provide an elongate chamber 59 extending the length of the member.

In use, a predetermined slat 11a is removed from the bed and a rod 60 is accommodated in the chamber 59. The stabiliser is then positioned on the bed after removing slats 11 as necessary, by passing the tubular bladders 13, respectively, through the apertures 56 in the tubular member 55 until it reaches the location at which the predetermined slat 11a has been removed. The slat 11a is then passed into the upper portion of the tubular member 55 (see Figure 14) and its ends, respectively re-inserted into the pockets 17 formed in the tubular bladders 13 so that the cross-section of the stabiliser adopts a triangular configuration (see Figure 16).

Any desired number of stabilisers may be used but, in general, from one to five are sufficient to provide lateral stability of the bed depending on the use and manufacturing design.

It will be readily appreciated the stabilisers may take

other forms. For example, the lower rod 60 may be replaced by a slat 11 similar to the slat forming the support surface. In this arrangement, when positioned on the tubular bladders 13, the stabiliser cross-section is of rectangular configuration.

Alternatively, the upper slat 11 may be replaced by a rod similar to the lower rod 60. In this arrangement the stabiliser is positioned between adjacent slat 11. In a further embodiment, the stabilise comprises a single membrane of plastics material having rod-accommodating chambers forming along its upper and lower edges.

The method of manufacturing the air springs, and the heat welding apparatus employed, will now be described with particular reference to Figures 5 to 8.

Figure 5 shows a heat welding apparatus comprising a sliding table 22 slidable along a bench 23 beneath a vertically movable welding head 24 fitted with an elongate heat welding bar 25. A sheet 26 of heat weldable plastics material is wrapped around a backing bar 27 on table 22 to form a tube and this tube is closed by heat welding a longitudinal seam by bringing the welding head downwardly so that the overlapping layers of material between the welding bar 25 and the backing bar 27 are welded together. This step in the process is shown in cross-section by Figure 7.

As shown in Figures 5 and 7 a wide strip of the plastics material is allowed to project beyond the heat welded longitudinal seam exteriorly of the tube. This strip is subsequently folded and welded to form the pocketed flap. More specifically, the strip is double folded in the manner which will be apparent from Figure 3. Thus the sheet material extends from the seam to a first longitudinal side edge 31 of the flap where it is folded back at 32 to extend to the second longitudinal side edge 33 of the flap and it is there folded at 34 to extend to a free edge 35 at the first side edge 31. The thus folded strip is then laid flat on the table 22 as illustrated in Figure 8 for welding of the pockets. In order to weld the pockets, the welding bar 25 is replaced by the specially shaped welding bar 36 illustrated in Figure 6. This bar is formed with U-shaped projections 37 at intervals along its length and when the welding head is brought downwards, these projections weld the three layers of the sheet material between the longitudinal seam and the side edge 31 of the flap together to define the pockets. More particularly, the sliding bar produces U-shaped heat welds having limbs 38 sealing the edge of the flap between the pocket mouths and legs 39 extending from one another. The pockets are not completely sealed from one another since the welds do not extend across the full width of the flap but they do serve effectively as individual pockets to hold the slats apart. The flap

can move about the longitudinal seam and can flex so as to permit free flexure of the slats while the pockets provide the necessary restrains against shifting of slats.

- 5 After formation of the tube with the pocketed flap from a single sheet of plastics material in the manner described above the ends of the tube can be closed by simple heat welding and inflation valves also heat welded in place to complete the air spring.
- 10 Figures 9 and 12 illustrate an alternative construction in which a pocketed flap is formed by a single fold and welding operation rather than by double folding as described above. In this case the tube is again formed by producing a longitudinal seam with a strip of the
- 15 plastics material projecting beyond the seam. The strip is folded with a single fold at 41 so as to form a flap having only two layers of material and extending only to one side of the longitudinal seam. In this case the U-shaped welds 42 defining pockets may be produced by
- 20 gripping the material to be welded between the welding bar 36 and the backing bar 27.

Figures 10 and 13 illustrate the manner in which a flap may be formed so as to have pockets along both of its longitudinal edges. An air spring with such a double

25 pocketed flap may be used to support the ends of two

adjacent sets of mattress support slats, either as a central support spring in a double bed or, in some cases, as an additional central support in a single bed. In this case the flap 43 is initially formed in the same manner as the flap 15 of the construction illustrated in Figures 1 to 4 and the flap thus has a series of pockets 44 along one edge corresponding to the pockets 17 of the previous construction. However, an additional series of pockets 45 is formed along the other side of the flap by trimming off the folded edge of the flap at the line 46 and applying additional 'U'-shaped welds 47.

Figure 11 shows an alternative manner of producing a flap with pockets along both sides. In this case a separate sheet strip 51 of weldable material is laid over the folded strip 52 and the two welded together at the seam line and around the pockets.

The illustrated constructions are exemplary only and they can be modified or varied considerably. For example, the pockets could be formed by welding a strip of material to the surface of the tubular bladder so that the pockets are formed directly at the exterior surface of the tube. The pocket forming strip could be connected integrally with the tube and be folded back against the tube after the longitudinal seam has been welded or it could be a separate strip welded to the

tube. The pockets are formed in a tangential flap to avoid direct contact between the slats and the wall of the inflatable tube and the welding of the pockets directly to the tube wall entails the risk of pinholes and localized thinning of the tube wall which could give rise to blowouts. However, the alternatives are feasible.

CLAIMS

1. A air spring (12) for supporting ends of parallel slats (11) in a support system of the kind defined, which air spring (12) comprises an inflatable tubular bladder (13) provided with a series of longitudinal spaced pockets (17, 44) having open mouths (18) to
5 receive the ends of the slats (11) to be supported, characterised in that the pockets (17) are formed in a tangential flap (15, 43) connected to the tubular bladder (13) along a longitudinal connection line (16)
10 at the surface of the tubular bladder (13) such that the open mouths (18) of the pockets (17) are spaced along a longitudinal edge of the flap (15).

2. An air spring as claimed in claim 1, characterised in that said bladder (13) and the flap (15) are formed
15 of heat welded sheet plastics material.

3. An air spring as claimed in claim 2, characterised in that the bladder (13) has a longitudinal welded seam and the flap (15) is formed by a continuation of the sheet material of the bladder beyond the seam which is
20 folded and heat welded to form the pockets (17) so that the flap (15) is integrally connected with the bladder (13) at said seam.

4. An air spring as claimed in any one of claims 1 to

3, characterised in that the flap (15) extends laterally substantially equally to either side of the longitudinal connection line (16).

5 5. An air spring as claimed in any one of claims 1 to 4, characterised in that the flap (43) has an additional series of longitudinally spaced pockets (45) with open mouths spaced along the other longitudinal edge of the flap.

6. A method of making an air spring, comprising
10 forming a tube (13) of heat weldable sheet plastics material with a longitudinal heat welded seam (16) and so as to leave a longitudinal strip of said sheet material projecting beyond the seam (16) exteriorly of the tube (13), and folding and welding said strip of
15 material to form a tangential flap (15, 43) with longitudinally spaced pockets (17) having open mouths (18) spaced along a longitudinal edge of the flap (15, 43).

7. A method as claimed in claim 6, wherein said strip
20 is double folded such that the sheet material extends from the seam (16) to a first longitudinal side edge (31) of the flap where it is folded back (at 32) to extend to the second longitudinal side edge (33) of the flap where it is folded back (at 34) to extend to a free edge (35) at the first said edge (31) of the flap and

the three layers of the sheet material between the seam (16) and said first side edge (31) of the flap are heat welded together at intervals along the length of the flap to define the pockets.

5 8. A method as claimed in claim 7, wherein the flap extends substantially equally to either side of the longitudinal seam.

9. A support system of the type defined comprising spaced air spring (12) each as claimed in any of claims
10 1 to 5, a plurality of transversely extending slats (11) having their respective ends accommodated in the pockets (17, 44) of said air springs and stabiliser means interconnecting said air springs (12) to provide lateral stability.

15 10. A support system as claimed in claim 9, characterised in that said stabiliser means comprises a member (55) having spaced apertures (56) each accommodating, without clearance, one of the air springs (12).

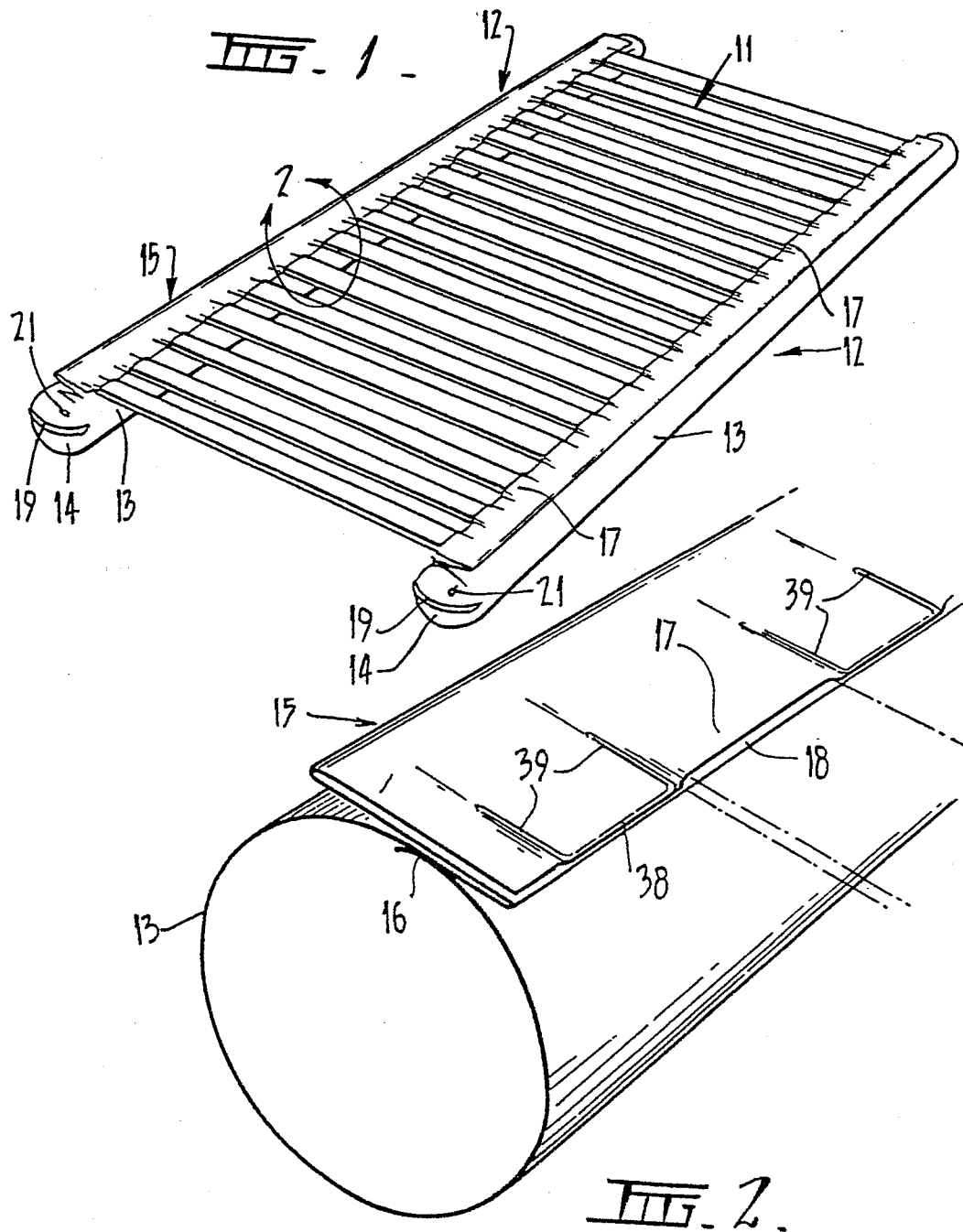
20 11. A support system as claimed in claim 9, characterised in that said member (55) is tubular and has one of said slats (11a) extending lengthwise along its upper portion and a rod (60) extending lengthwise along its lower portion so that the stabiliser, in

use, is of triangular configuration.

12. A support system as claimed in claim 9,
characterised in that said member (55) is tubular and
has one of said slats (11) extending lengthwise along
5 its upper portion and a further slat (11), not forming
part of the support surface, extending lengthwise along
its lower portion so that the stabiliser, in use, is of
rectangular configuration.

13. A support system as claimed in claim 9,
10 characterised in that said member (55) has spaced rods
(60) extending lengthwise, respectively, along its upper
and lower portions, said member (55) being positioned
between adjacent slats.

14. A support system as claimed in claim 13,
15 characterised in that said member (55) comprises a
single membrane having rod-accommodating chambers formed
along its upper and lower edges.



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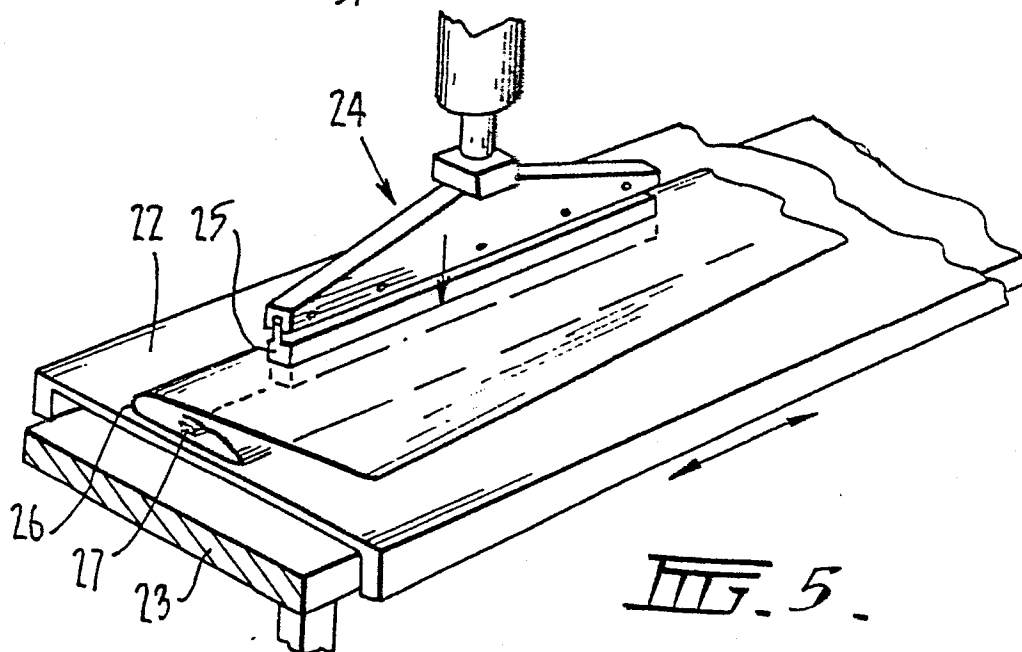
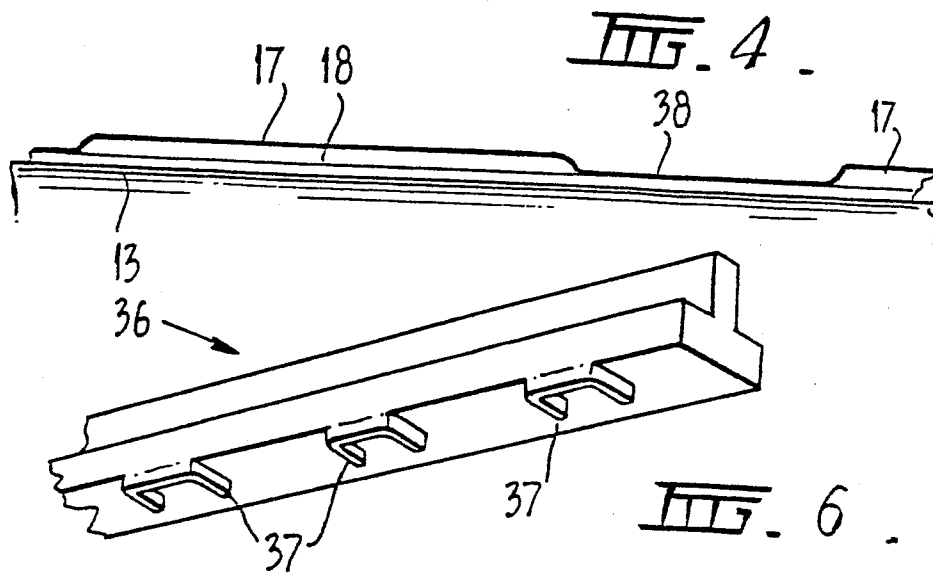
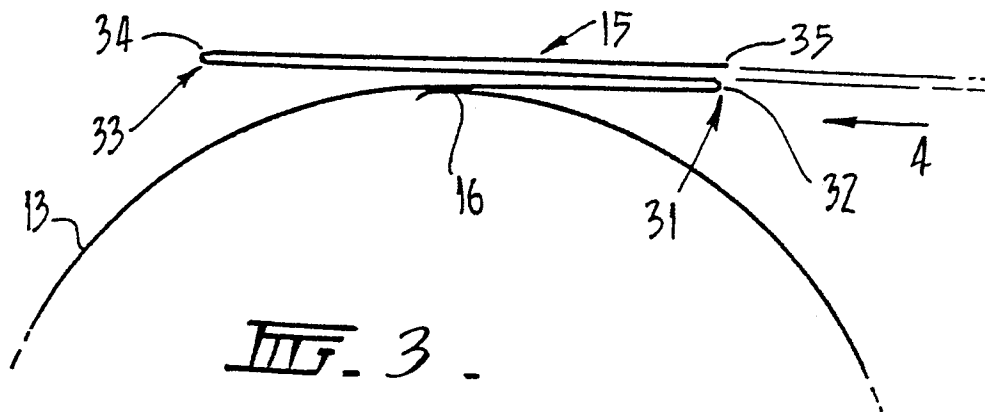
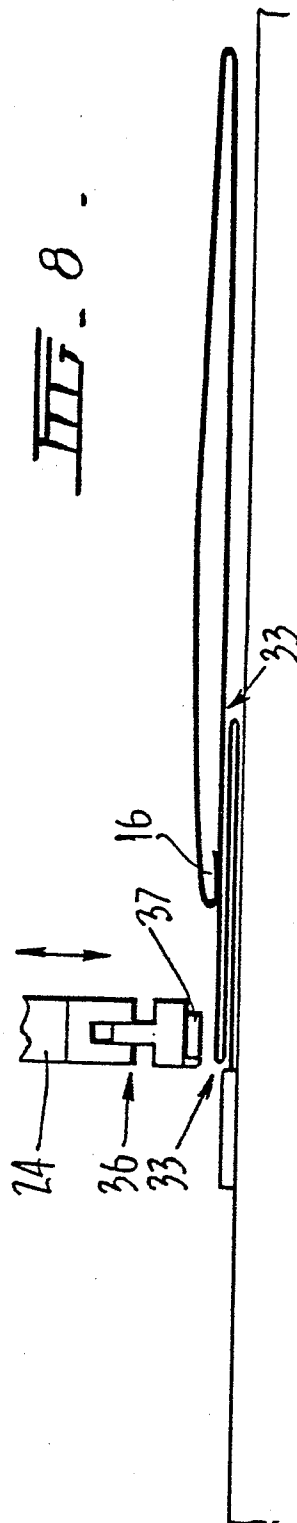
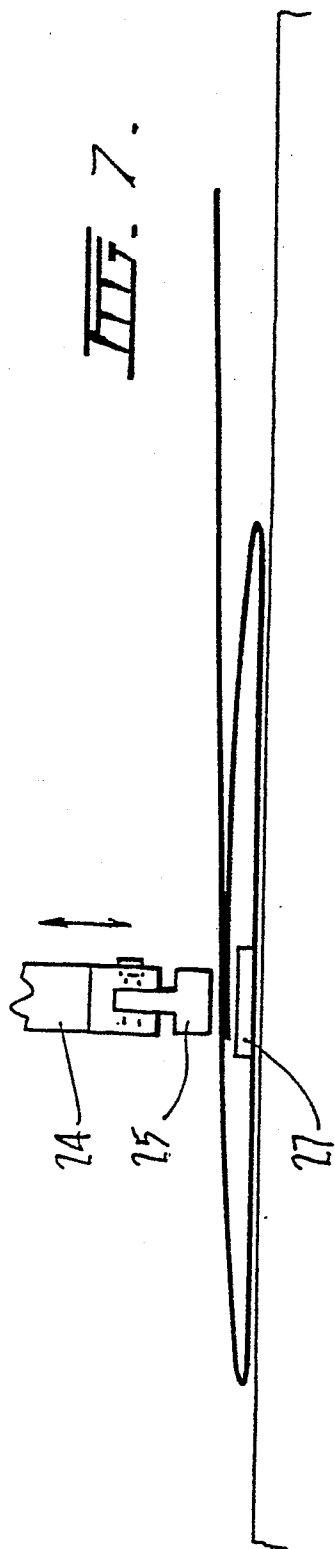


FIG. 6.



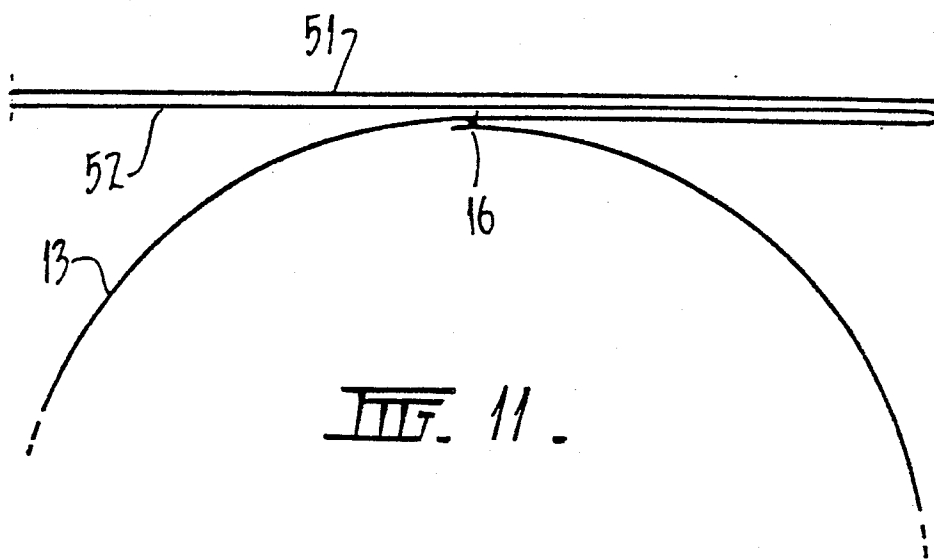
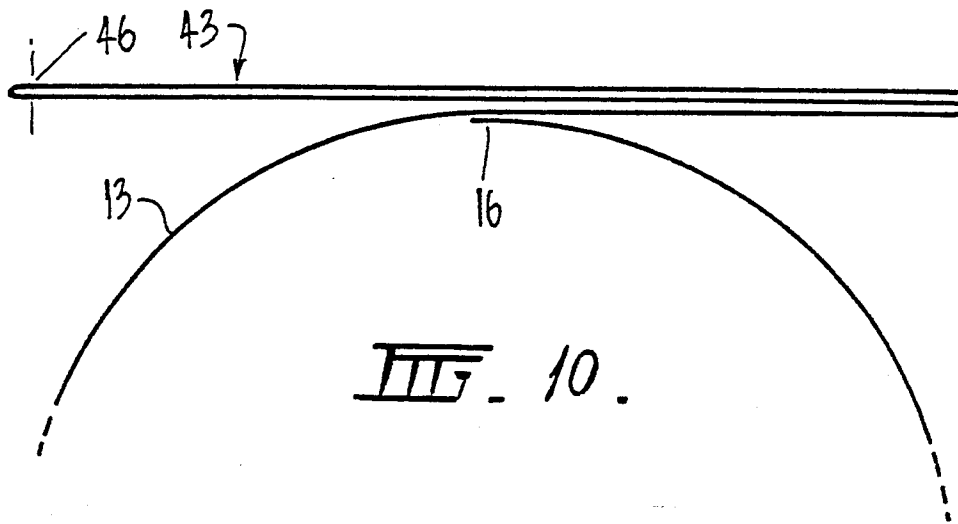
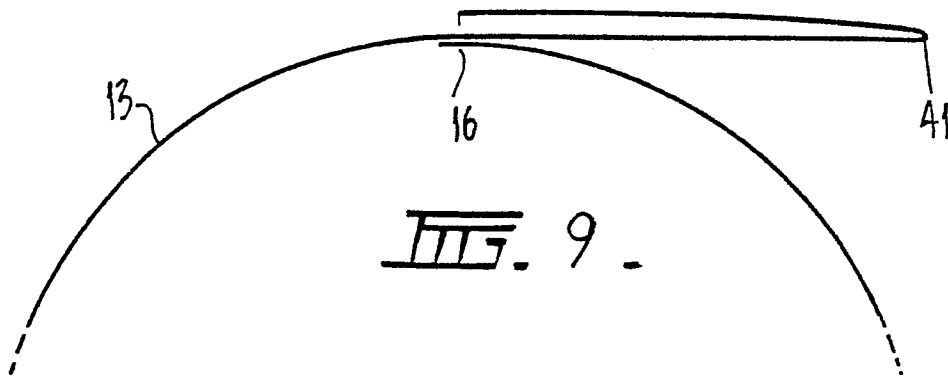
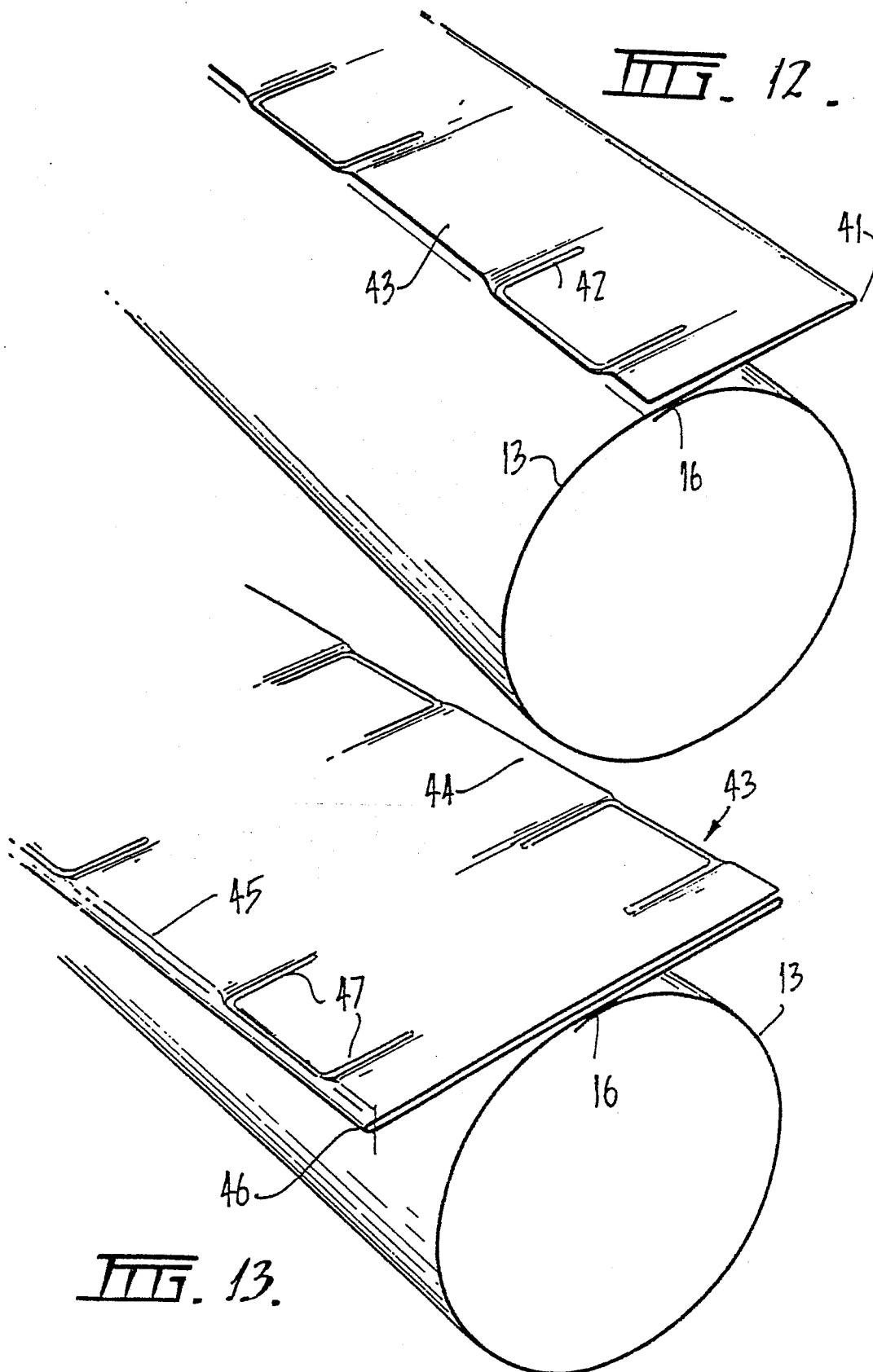
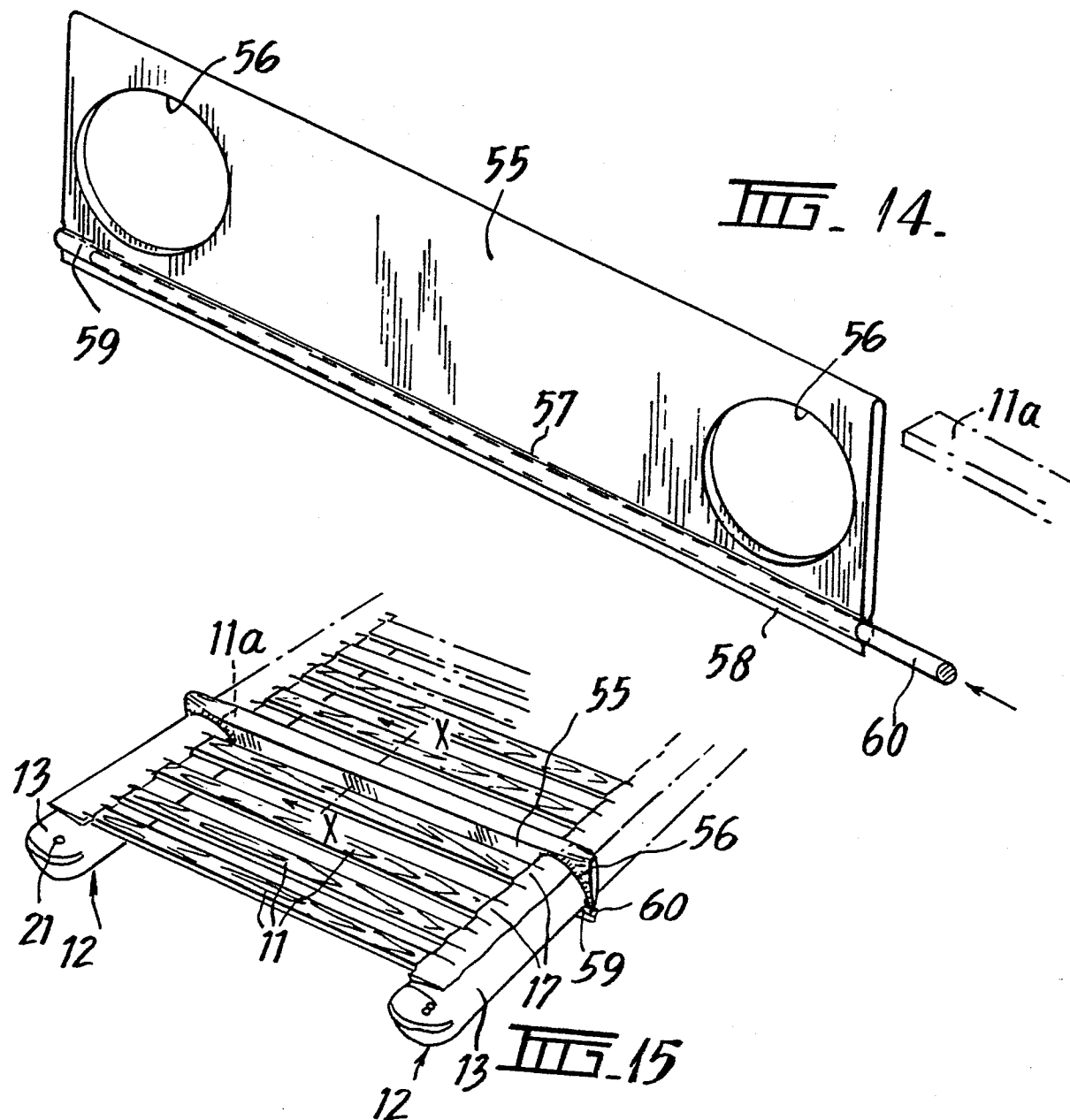


FIG. 12.





European Patent
Office

EUROPEAN SEARCH REPORT

0116237

Application number

EP 83 30 8034

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. 3)
A	DE-B-2 621 803 (EGGENWEILER) * Column 2, lines 40-52; figures *	1,2,9	A 47 C 23/06 A 47 C 23/30
A	DE-A-2 645 052 (MEYER) * Claims 1-3; page 3, paragraph 3; page 4, last paragraph; figures *	1,2,9	
A	US-A-3 067 438 (DEGEN) * Page 1, lines 43-47; figures *	1	
			TECHNICAL FIELDS SEARCHED (Int. Cl. 3)
			A 47 C
The present search report has been drawn up for all claims			
Place of search THE HAGUE		Date of completion of the search 09-04-1984	Examiner VANDEVONDELE J.P.H.
CATEGORY OF CITED DOCUMENTS		T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document	
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