



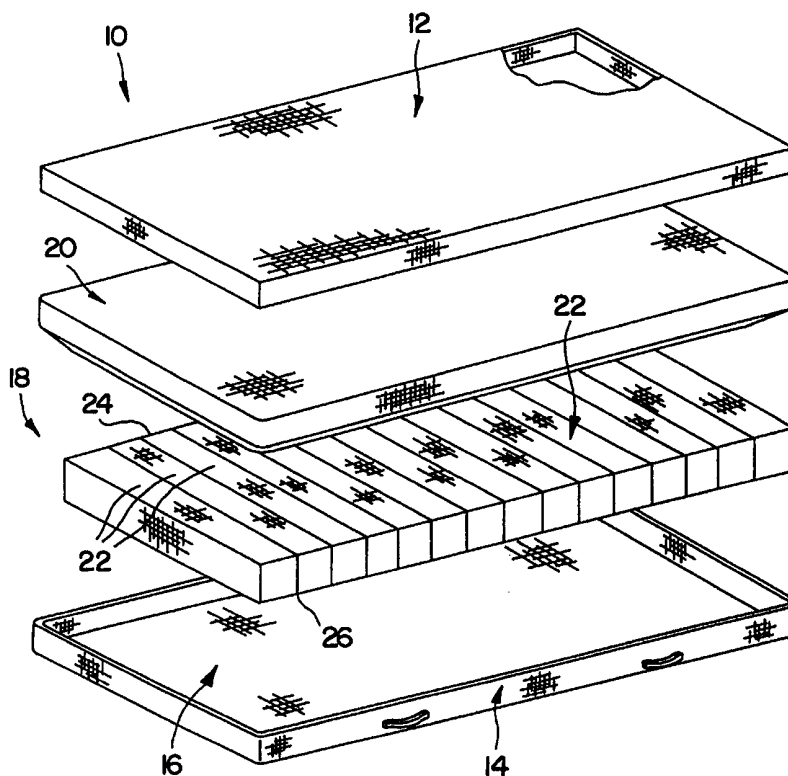
INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification ⁶ : A47C 27/00, 27/10, 27/15</p>	<p>A1</p>	<p>(11) International Publication Number: WO 99/29213 (43) International Publication Date: 17 June 1999 (17.06.99)</p>
<p>(21) International Application Number: PCT/US98/26295 (22) International Filing Date: 11 December 1998 (11.12.98) (30) Priority Data: 60/069,097 11 December 1997 (11.12.97) US (71) Applicant (for all designated States except US): HILL-ROM, INC. [US/US]; 1069 State Route 46 East, Batesville, IN 47006-9167 (US). (72) Inventor; and (75) Inventor/Applicant (for US only): STOLPMANN, James, R. [US/US]; 1011 Travers Drive, Charleston, SC 29412 (US). (74) Agent: NIEDNAGEL, Timothy, E.; Barnes & Thornburg, 11 South Meridian Street, Indianapolis, IN 46204 (US).</p>	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report.</i></p>	

(54) Title: MATTRESS STRUCTURE

(57) Abstract

A mattress structure (10) includes a cover (12, 14) configured to define an interior region (16) and a mattress core (18) including a shear material formed to include a plurality of adjacent sleeves (22). The mattress core (10) is located in the interior region (16). The mattress structure (10) also includes a support element (30, 36, 56) located within each of the plurality of sleeves (22) to provide support for a patient.



FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	ES	Spain	LS	Lesotho	SI	Slovenia
AM	Armenia	FI	Finland	LT	Lithuania	SK	Slovakia
AT	Austria	FR	France	LU	Luxembourg	SN	Senegal
AU	Australia	GA	Gabon	LV	Latvia	SZ	Swaziland
AZ	Azerbaijan	GB	United Kingdom	MC	Monaco	TD	Chad
BA	Bosnia and Herzegovina	GE	Georgia	MD	Republic of Moldova	TG	Togo
BB	Barbados	GH	Ghana	MG	Madagascar	TJ	Tajikistan
BE	Belgium	GN	Guinea	MK	The former Yugoslav Republic of Macedonia	TM	Turkmenistan
BF	Burkina Faso	GR	Greece	ML	Mali	TR	Turkey
BG	Bulgaria	HU	Hungary	MN	Mongolia	TT	Trinidad and Tobago
BJ	Benin	IE	Ireland	MR	Mauritania	UA	Ukraine
BR	Brazil	IL	Israel	MW	Malawi	UG	Uganda
BY	Belarus	IS	Iceland	MX	Mexico	US	United States of America
CA	Canada	IT	Italy	NE	Niger	UZ	Uzbekistan
CF	Central African Republic	JP	Japan	NL	Netherlands	VN	Viet Nam
CG	Congo	KE	Kenya	NO	Norway	YU	Yugoslavia
CH	Switzerland	KG	Kyrgyzstan	NZ	New Zealand	ZW	Zimbabwe
CI	Côte d'Ivoire	KP	Democratic People's Republic of Korea	PL	Poland		
CM	Cameroon	KR	Republic of Korea	PT	Portugal		
CN	China	KZ	Kazakistan	RO	Romania		
CU	Cuba	LC	Saint Lucia	RU	Russian Federation		
CZ	Czech Republic	LI	Liechtenstein	SD	Sudan		
DE	Germany	LK	Sri Lanka	SE	Sweden		
DK	Denmark	LR	Liberia	SG	Singapore		
EE	Estonia						

MATTRESS STRUCTURE

Background and Summary of the Invention

The present invention relates to mattress structures, and particularly to
5 a mattress replacement for use on any deck for a bed. More particularly, the present
invention relates to a mattress structure having a core support structure that is shaped
and configured to provide improved support and firmness characteristics.

The illustrated embodiment of the present invention includes a mattress
structure having a cover configured to define an interior region, and a mattress core
10 including a shear material formed to include a plurality of adjacent sleeves. The
mattress core is located in the interior region. The apparatus also includes a support
element located within each of the plurality of sleeves to provide support for a patient.

In one illustrated embodiment, the support element includes at least one
elongated foam cylinder. In another illustrated embodiment, the support element
15 includes three elongated foam cylinders stacked within each of the plurality of sleeves.

In yet another illustrated embodiment, the support element includes a
woven thermoplastic material. The woven thermoplastic material may be formed to
include spring indentions or into any desired shape. The support elements may also
include a plurality of preinflated air bags.

In still another illustrated embodiment, the support element includes a
20 foam insert having a bottom foam section with a first ILD and a top foam section
coupled to the bottom foam section. The top foam section has a second ILD less than
the first ILD. End foam blocks may be coupled to opposite ends of the top and
bottom foam sections. The illustrated end foam blocks have a third ILD greater than
25 the first ILD.

In the illustrated mattress core, the plurality of sleeves are formed by a
continuous sheet of material tacked to a bottom sheet at spaced apart locations. A
web is coupled between adjacent sleeves to keep the sleeves upright and help control
the firmness of the mattress core.

30 Additional features of the invention will become apparent to those
skilled in the art upon consideration of the following detailed description of illustrated

embodiments exemplifying the best mode of carrying out the invention as presently perceived.

Brief Description of the Drawings

5 The detailed description particularly refers to the accompanying figures in which:

 Fig. 1 is an exploded perspective view of a mattress structure of the present invention;

 Fig. 2 is a perspective view of a bottom sheet and a plurality of
10 transversely extending fabric sleeves for receiving material therein to provide a support surface for the mattress structure;

 Fig. 3 is a sectional view taken through an illustrative heel section insert;

 Fig. 4 is a perspective view of the heel section insert of Fig. 3;

15 Fig. 5 is a sectional view taken through a portion of the support structure of Fig. 2 after support elements have been installed into the sleeves; and

 Fig. 6 is an illustration of another insert material configured to be loaded within the sleeves of Fig. 2, the insert material being made from a thermoformable woven thermoplastic material.

20

Detailed Description of the Drawings

 Referring now to the drawings, Fig. 1 illustrates a mattress structure 10 of the present invention. The mattress structure 10 includes a top cover 12 and a bottom cover 14. The top and bottom covers 12 and 14 are connected together to
25 form an interior region 16 of the mattress structure 10. Illustratively, the top and bottom covers 12 and 14 are formed from an impermeable and wipable or cleanable material.

 The mattress structure 10 further includes a support core 18 and a shear material liner 20 located over the support core 18. The shear liner 20 is illustratively
30 made from a low friction material so that the top cover 12 slides easily relative to the support core 18. Support core 18 includes a plurality of transversely extending sleeves 22 discussed in detail below with reference to Figs. 2 and 5. Firmer sections such as

foam side bolsters or air bolsters may be positioned adjacent side edges 24 and 26 to provide stiffer supports adjacent side edges 24 and 26 of the mattress structure 10, if desired.

As illustrated in Fig. 2, the sleeves 22 are formed from a shear material which is coupled to a base sheet of material 28. Each sleeve 22 provides a separate region configured to receive support elements such as foam cylinders 30. Illustratively, three foam cylinders 30 are loaded into each of the sleeves 22 to provide support for a person resting on the mattress structure 10. The foam cylinders 30 are illustratively two inch (5 cm) diameter cylinders. The density of the foam material can be selected depending upon the particular desired firmness characteristics. The firmness is made different in different regions of the mattress structure 10 by selecting different firmnesses of insert material, such as the foam cylinders 30. The head end of the mattress is located at end 32 and the foot end is end 34.

An illustrative foam configuration and location includes cylinders 30 or other support elements having an ILD of about 17-21 in sleeves 1-8, shown in Fig. 2, with a support factor of 2.4. Support elements in sleeves 9-12 illustratively have an ILD of about 23-27 with a support factor of 2.4. Support elements in sleeves 13-15 illustratively have an ILD of 17-21 with a support factor of 2.4. Support elements in sleeves 16-20 include supports having separate top and bottom sections 37 and 39 such as heel logs 36 shown in Figs. 3 and 4. Top section 37 has an ILD of about 7-10. Bottom section 39 has an ILD of about 11-15. Both top and bottom sections have a support factor of 2.4.

Figs. 3 and 4 illustrate the heel section logs 36. If desired, an operator can determine the location of the patient's heels near foot end 34 of mattress 10 and remove any inserts in sleeves 22 located beneath the patient's heels to provide extra pressure relief for the heels. Fig. 4 illustrates the heel section insert 36 having foam end blocks 40 and 42 having different densities which can be located within sleeves 22. End blocks 40 and 42 illustratively have an ILD of about 35-39.

As illustrated in Fig. 3, the top foam section 37 may be sliced along the longitudinal axis of the foam section 36 to soften the top section 37. Different textures may be provided to further control the firmness of the foam sections 36. The sections may be diced or waffled, if desired.

Additional details of the formation of sleeves 22 are illustrated in Fig. 5. Sleeves 22 are formed by a continuous sheet of shear material 44. The material 44 is stitched or RF welded to the base material 28 at spaced apart locations 46. The material is looped upwardly to form the sleeve 22 and then stitched at locations 46 as best illustrated in Fig. 5. Illustratively, the overall depth of sleeves 22 is about six inches (15.2 cm) as illustrated by dimension 48 in Fig. 6. Sleeves 22 have a width of about two inches (5.1 cm) to about four inches (10.2 cm) as illustrated by dimension 50. The adjacent sleeves 22 are tacked together by a web 52 using suitable stitching or RF welding. This web 52 helps to maintain each of the sleeves 22 upright. Illustratively, the tack stitch or web 52 is located a dimension of about one inch (2.5 cm) from a top surface of the sleeves 22 as illustrated by dimension 54 in Fig. 5. The web 52 can be at any desired location. The higher the web 52, the firmer the support surface. If the web 52 is too low, the sleeves 22 can spread open.

Fig. 6 also illustrates the foam logs 30 located within the sleeves 22. As discussed above, the foam logs 30 have various different ILDs depending upon the position of the foam logs 30 within the mattress core 18.

Instead of foam logs 30, other structural elements having desired load-deflection characteristics may be used within the sleeves 22. One example of such a structural element is illustrated in Fig. 6. This is a woven thermoplastic material 58 which has been thermoformed to form a cylinder 56. Illustratively, material 58 is Spacenet woven thermoplastic material available from Hoerscht Celanese disclosed in U.S. Patent No. 5,731,062 which is incorporated herein by reference.

It is understood that the material 58 may be formed into other structural shapes which include spring indentations, spirals, or other suitable shapes instead of the cylinder 56 of Fig. 6. The thermoformable material 58 may be formed into an hourglass or elliptical shape. Shapes are selected to provide desired load-deflection characteristics. Materials having different fiber densities may be used in different sleeves 22 of the mattress core 18.

By providing structural elements to produce desired load-deflection characteristics, each sleeve 22 can be loaded with a desired load-deflection characteristic element. In addition, the mattress core 18 using the thermoformable woven material 58 is launderable or cleanable using an autoclave.

It is understood that other elements could be inserted into the shear sleeves 22 of mattress core 18. For instance, preinflated air bags or bags coupled to a pressure source may be used. A combination of various filling materials may also be used. For instance, air bags or gel packets may be positioned over a foam layer within
5 the sleeves 22. Different material may be selected based upon the weight distribution of the patient. Bead or air filled bellows or bags, or other suitable insert materials, may be loaded within the sleeves 22 to support the person resting on the mattress structure
10.

Although the invention has been described in detail with reference to
10 certain illustrated embodiments, variations and modifications exist within the scope and spirit of the invention as described and defined in the following claims.

CLAIMS:

1. A mattress structure comprising:
a cover configured to define an interior region;
a mattress core including a shear material formed to include a plurality
5 of adjacent sleeves, the mattress core being located in the interior region; and
a support element located within each of the plurality of sleeves to
provide support for a patient.
2. The apparatus of claim 1, wherein the support element includes
at least one elongated foam cylinder.
- 10 3. The apparatus of claim 1, wherein the support element includes
at least two elongated foam cylinders stacked on top of each other within the sleeves.
4. The apparatus of claim 1, wherein the support element includes
three elongated foam cylinders stacked within each of the plurality of sleeves.
5. The apparatus of claim 1, wherein the support element includes
15 a woven thermoplastic material.
6. The apparatus of claim 5, wherein the woven thermoplastic
material is formed to include spring indentions.
7. The apparatus of claim 1, wherein the support element includes
a plurality of preinflated air bags.
- 20 8. The apparatus of claim 1, wherein the support element includes
a foam insert having a bottom foam section with a first ILD and a top foam section
coupled to the bottom foam section, the top foam section having a second ILD less
than the first ILD.
9. The apparatus of claim 8, wherein the second layer is sliced
25 along its longitudinal axis.
10. The apparatus of claim 8, wherein the first ILD is about 11-15
and the second ILD is about 7-10.
11. The apparatus of claim 8, further comprising end foam blocks
coupled to opposite ends of the top and bottom foam sections, the end foam blocks
30 having a third ILD greater than the first ILD.
12. The apparatus of claim 11, wherein the third ILD is about 35 to
about 39.

13. The apparatus of claim 1, further comprising a shear liner located over the mattress core and beneath the cover.

14. The apparatus of claim 1, wherein the plurality of sleeves are formed by a continuous sheet of material tacked to a bottom sheet at spaced apart
5 locations.

15. The apparatus of claim 14, further comprising a web coupled between adjacent sleeves.

16. The apparatus of claim 15, wherein the sleeves have a height of about 6 inches and the web is located about 1 inch from a top surface of the sleeves.

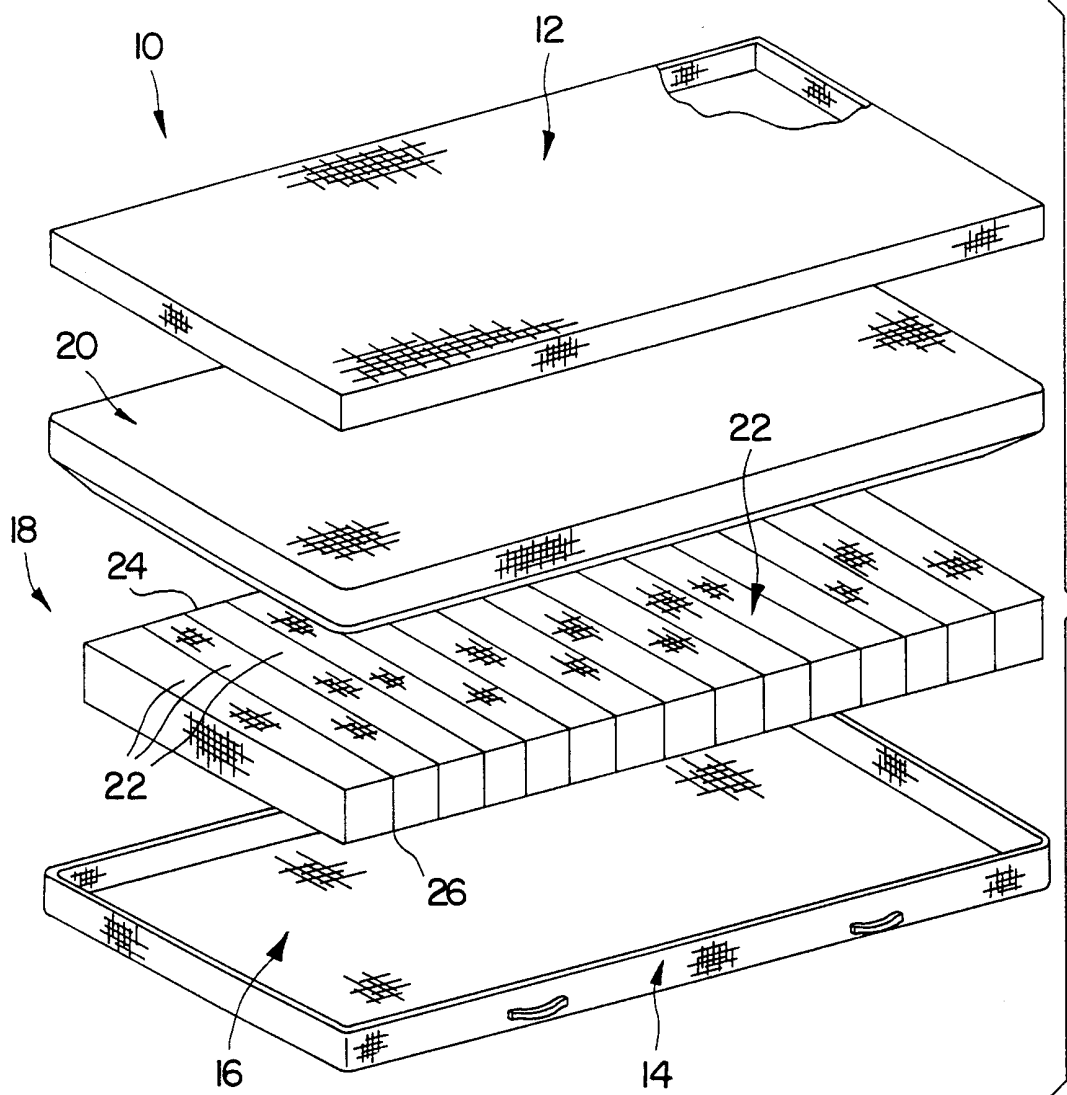


FIG. 1

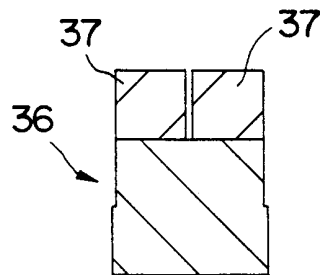


FIG. 3

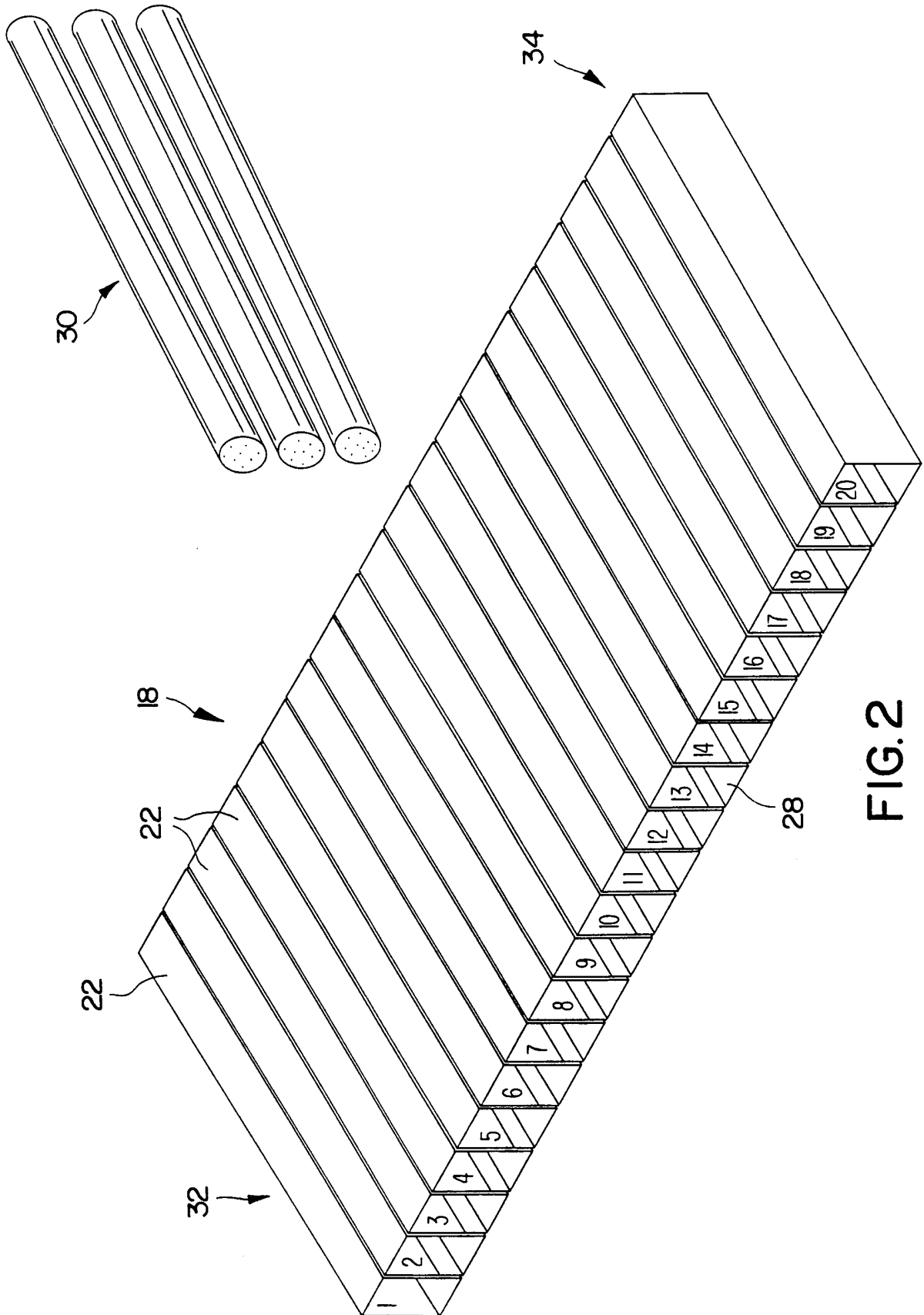


FIG. 2

3 / 3

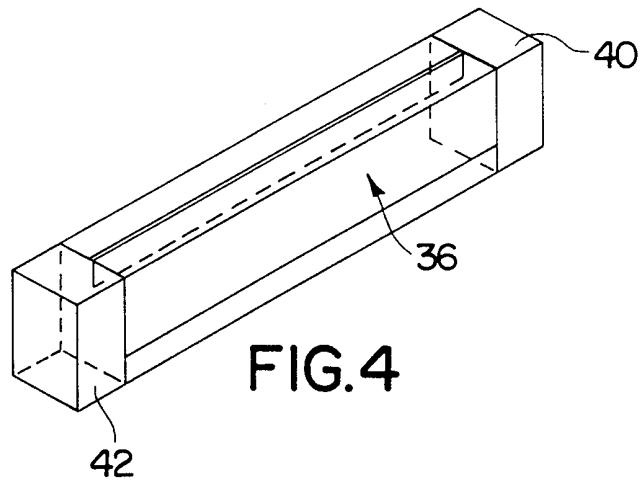


FIG. 4

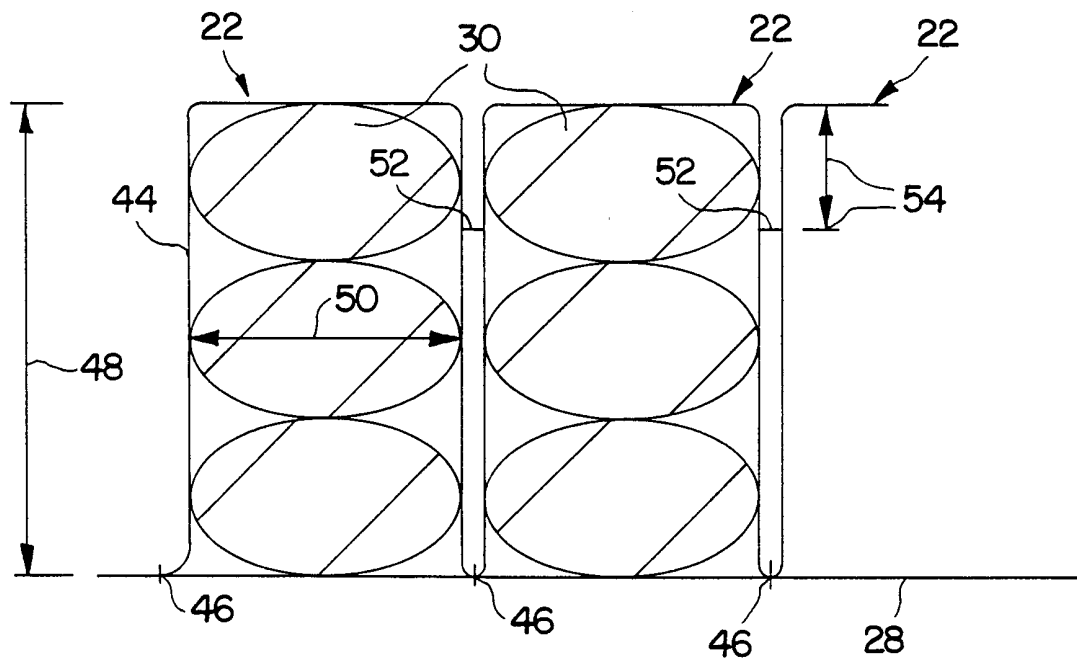


FIG. 5

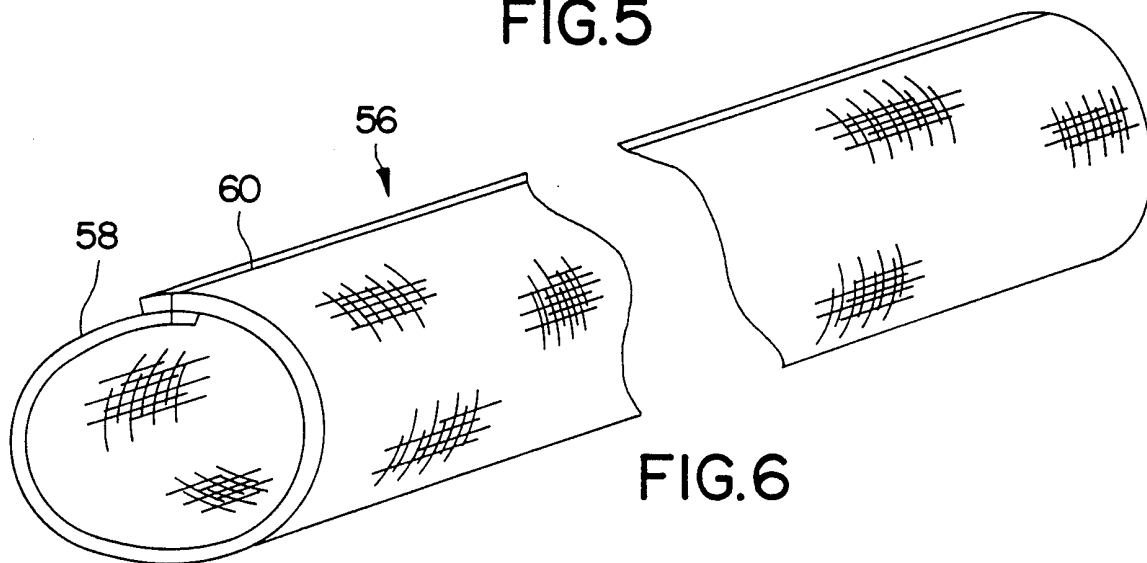


FIG. 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/26295

A. CLASSIFICATION OF SUBJECT MATTER
 IPC(6) :A47C 27/00, 27/10, 27/15
 US CL :5/710, 738, 740
 According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
 Minimum documentation searched (classification system followed by classification symbols)
 U.S. : 5/706, 710, 727, 737, 738, 740, 953

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
 APS
 search terms: ILD, foam, 5/clas

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X ----- Y	US 4,682,378 A (SAVENIJE) 28 July 1987 (28/07/87), see column 4, lines 13-14 & 34-57.	1, 7, 13 ----- 2-6, 8-10
X ----- Y	US 4,928,337 A (CHAUNCEY) 29 May 1990 (29/05/90), see column 2, lines 30-44 & 53-58.	1, 13 ----- 2, 8-10
X	US 5,090,077 A (CADEN ET AL) 24 February 1992 (24/02/92), see column 5, lines 55-68, column 6, lines 1-27.	1, 7, 13
Y	US 5,031,261 A (FENNER, SR) 16 July 1991 (16/07/91), see column 3, lines 8-11, 23-26, & 58-65.	8, 10

Further documents are listed in the continuation of Box C. See patent family annex.

- | | |
|---|--|
| * Special categories of cited documents: | *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention |
| *A* document defining the general state of the art which is not considered to be of particular relevance | *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone |
| *E* earlier document published on or after the international filing date | *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art |
| *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) | *&* document member of the same patent family |
| *O* document referring to an oral disclosure, use, exhibition or other means | |
| *P* document published prior to the international filing date but later than the priority date claimed | |

Date of the actual completion of the international search 08 FEBRUARY 1999	Date of mailing of the international search report 01 APR 1999
---	--

Name and mailing address of the ISA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <i>Robert G. Santos</i> ROBERT G. SANTOS Telephone No. (703) 308-2168
--	---

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US98/26295

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 3,512,190 A (BUFF) 19 May 1970 (19/05/70), see column 2, lines 17-38, column 3, lines 16-31.	9
A	US 1,746,709 A (MARSHALL) 11 February 1930 (11//02/30).	1
A	US 1,307,825 A (MARSHALL) 24 June 1919 (24/06/19).	1
A	US 5,044,027 A (MOON) 03 September 1991 (03/09/91).	2
A	US 5,311,623 A (HENDI) 17 May 1994 (17/05/94).	3
A	US 5,022,111 A (FENNER, SR) 11 June 1991 (11/06/91).	8, 10
A	US 4,975,996 A (EVANS ET AL) 11 December 1990 (11/12/90).	8, 10
A	US 4,086,675 A (TALBERT ET AL) 02 May 1978 (02/05/78).	8, 10
A	US 5,025,519 A (SPANN ET AL) 25 June 1991 (25/06/91).	9
A	US 4,903,359 A (ROGERS) 27 February 1990 (27/02/90).	9