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(54) Title: RECONFIGURABLE HARNESS BOARD

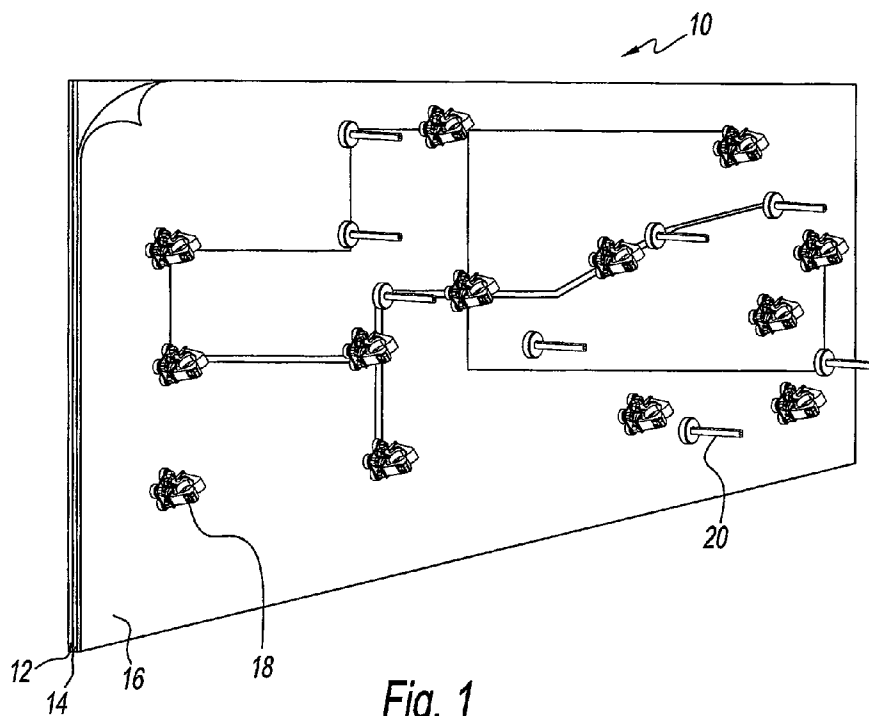


Fig. 1

(57) Abstract: An apparatus including a harness board and a clamp removably connected to the harness board with a magnetic field. The magnetic field permits the clamp to be removed from the harness board. Also, a post is removably connected to the harness board using a magnetic field, and the magnetic field permits the post to be removed from the harness board.

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RECONFIGURABLE HARNESS BOARD

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present disclosure relates to a board for an aircraft wiring harness. More particularly, the present disclosure relates to wiring harness board that can be reconfigured.

2. Description of the Related Art

[0002] For decades the only method for constructing aircraft wiring harnesses involved a laborious manufacturing process where fabricators built the harness based on drawings that were attached to a plywood harness board. Conventionally, the drawings, also called a harness plot, is placed over a sheet of plywood and attachments are mechanically fastened in appropriate locations on the plywood board.

[0003] An operator mechanically fastens each attachment to the plywood board using a fastening device such as a screw. These attachments are then used to form and secure a wiring harness as it is being built. When the board is built, it is carried from the board building area and delivered to the manufacturing area.

[0004] After the harness board has been delivered to the point of use (i.e. harness manufacturing area), it can be used to construct a harness. After assembly of the harness on the harness board, the harness is removed from the harness board. Then, the board is removed from the manufacturing area, and the attachments can be removed from the harness board, or the board can be placed into storage for later use. Harness boards are saved for future use in light of their cost.

[0005] The storage of the conventional harness boards requires a substantial amount of space. The time required to setup a new board is substantial considering each attachment must be mechanically attached to the harness board. The life span of harness boards that use mechanically attached attachments is short due to the wear and tear caused by repeated removal and reattachment of the mechanically attached parts.

[0006] The transport of conventional harness boards from a storage area to the point of use involves risk of injury from the constant rebuilding and transporting throughout the manufacturing area. Also, a substantial amount of time is expended transporting the harness boards from the storage area to the point of use, including the time spent tearing down a board for reuse.

[0007] Therefore, there exists a need for harness boards or methods of preparing a harness board that overcomes, mitigates, and/or alleviates one or more or other deleterious effects and deficiencies of the prior art.

SUMMARY OF THE INVENTION

[0008] The present disclosure provides an apparatus including a harness board and a clamp removably connected to the harness board with a magnetic field. The magnetic field permits the clamp to be removed from the harness board. Also, a post is removably connected to the harness board using a magnetic field, and the magnetic field permits the post to be removed from the harness board.

[0009] The present disclosure also provides an apparatus that includes a harness board having a metallic surface that is attracted to a magnetic field. A clamp is magnetically fastenable to the harness board. The clamp has a first magnetic base having a cup-shaped receptacle in which a first magnetic element is secured, and the clamp is capable of supporting a wiring harness. A post is magnetically fastenable to the harness board. The post has a second magnetic base having a cup-shaped receptacle in which a second

magnetic element is secured, and the post is capable of supporting a wiring harness.

BRIEF DESCRIPTION OF THE DRAWINGS

[0010] These and other advantages and benefits of the present disclosure will be more apparent from the following detailed description of the present disclosure, in conjunction with the accompanying drawings wherein:

[0011] FIG. 1 is a perspective view of an exemplary embodiment of the harness board according to the present disclosure;

[0012] FIG. 2 is a perspective view of a clamp that is attached to the harness board shown in FIG. 1;

[0013] FIG. 3 is an exploded view of the base for the clamp shown in FIG. 2;

[0014] FIG. 4 is a perspective view of a post that is attached to the harness board shown in FIG. 4; and

[0015] FIG. 5 is an exploded view of the post shown in FIG. 4.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0016] FIG. 1 is an exemplary embodiment of harness board 10 according to the present disclosure. Harness board 10 is shown having two layers, layer 12 and layer 14. Layer 12 can be constructed of plywood or a similar material, including, but not limited to particleboard or plastic sheeting. Layer 14 can be constructed from steel or another material demonstrating susceptibility to an external magnetic field. This substance chosen can be steel, or another substance containing iron, or another ferromagnetic material. In some embodiments, layer 14 can be constructed from other materials that are not susceptible to an external magnetic field, such as a plastic sheet.

[0017] Layers 12 and 14 can be connected along the planar surfaces of each layer using an adhesive, or fastening device known in the art. Alternatively, harness board 10 can be formed using a single layer (not shown), wherein layer 14 constructed of a material susceptible to magnetic fields is used to supply the single layer.

[0018] Harness board 10 uses a harness plot 16 that is placed on top of, and secured to layer 14 with a clamp, or another similar instrument. Harness plot 16 is generally a diagram or blueprint that plots the wiring harness layout. Harness plot 16 can also plot the positions of clamps 18 and posts 20, which are used to hold the wiring harness (not shown) as it is being built.

[0019] Clamps 18 and posts 20 can be equipped with magnets that enable clamps 18 and posts 20 to be attached to layer 14 with harness plot 16 placed between. In some embodiments, the magnetic material and magnets used in the presently disclosed apparatus are derived from permanent magnets. Clamps 18 and posts 20 equipped with magnets enables clamps 18 and posts 20 to be repositioned on harness board 10.

[0020] FIG. 2 is an enlarged perspective view of clamp 18 that is attached to harness board 10. Clamp 18 is included a clamping unit 22 that is comprised of prongs 22a and 22b. Prongs 22a and 22b can be flexible elements that can be separated to enable wire harness elements to be clamped between them. In some embodiments, prongs 22a and 22b can be attached to clamp 18 with a spring mechanism that enables the prongs to be flexed outward.

[0021] Clamping unit 22 is attached to base 24 using brackets 24. Brackets can be placed on either side of clamping unit 22. Attached to base 24 are several disks 28 that house magnets. Although several receptacles are shown, a single receptacle can be used to secure clamp 18 to harness board 10. In some embodiments, disks 28 are cup-shaped receptacles with hollow recesses in which a magnetic element can be secured.

[0022] FIG. 3 is an exploded view of base 24 for clamp 18 shown in FIG. 2. Base 24 shows that several disks 28 can be secured to plate 30 by inserting screws 32 through apertures 28a in disk 28 and apertures 30a in plate 30, and then securing threading nuts 34 unto screws 32. Alternatively, a washer 36 can be placed between the nuts 34 and plate 30. Disks 28 are shown as circular structures, but this element could be various shapes and sizes.

[0023] The attachment of disks 28 can also be accomplished using a weld, adhesive, rivets or another attachment means known in the art. Thus, screws 32 and nuts 34 can be eliminated as well as apertures 28a and 30a. In some embodiments, base 24 can be composed of a magnetic material and disks 28 can be eliminated. In such an embodiment, clamp unit 22 would be attached to base 24, which could be various shapes and sizes.

[0024] Disks 28 are intended to house magnets 38 within a hollow recess inside the receptacle. Magnets 38 can be secured inside the hollow recess of disks 28 using an adhesive. In some embodiments, disks 28 do not have hollow recesses, but instead are constructed of a permanent magnetic material, thus relieving the need to use separate magnets 38.

[0025] In some embodiments, a soft and/or cushioned material 40 can be attached to magnets 38 as circular patches, or in the alternative embodiment of clamp 18, in which magnets 28 are substituted by a magnetic base 24, base 24 can have a soft and/or cushioned material attached. Material 40 is intended to shielded harness plot 16, which is typically a paper plot, from damage that could ordinarily be caused by sharp edges on clamps 18 as they are attached and reattached to harness board 10.

[0026] FIG. 4 is a perspective view of post 20, which is attached to the harness board 10. Post 20 has a base 42 attached at one end of shaft 44. Base 42 is shown as a circular structure, but it should be understood that base 24 could be various shapes and sizes. FIG. 5 is an exploded view of post 20. In this view it is shown that base 42 has an aperture 42a through

which a screw 46 can be inserted through, and threaded into bore 44a of shaft 44. Shaft 44 can also be joined to base 42 using a weld, adhesive, a rivet or another fastening means known in the art. In some embodiments, base 42 is a cup-shaped receptacle with a hollow recess in which a magnetic element can be secured.

[0027] A magnet 48 can be fastened inside a recess in base 42, and a soft and/or cushioned material is attached to magnet 48 to prevent damage to harness plot 16 as post 20 is attached and moved about harness board 10. In some embodiments, base 42 is comprised of magnetic material and magnet 48 is eliminated.

[0028] Magnetic components on clamp 18 and post 20 enable one to construct harness board 10 needed to construct a wiring harness for an aircraft in a fraction of the time previously needed. Conventional harness boards that used attachments that were mechanically fastened to a plywood harness board, required 3-5 hours to construct. Harness board 10 eliminates the time normally spent fastening the attachments to the harness board, by implementing the magnetic elements and metallic harness board described herein.

[0029] Harness board 10 is also reusable innumerable times, while conventional plywood harness boards have a short half-life due to the wear that occurs from repeated fastening and unfastening of mechanically fastened attachments to and from the wooden board. A side benefit of using clamps 18 and posts 20, which are not mechanically fastened, is that the harness plot is not ripped or punctured during the prepping of the harness board for construction of a harness. Since clamps 18 and posts 20 are secured to harness board 10 using magnets, the underlying harness plot is not damaged.

[0030] Another benefit of harness board 10 is that clamps 18 and posts 20 can be attached and removed from harness board 10 quickly. Exerting enough force to break the magnetic bond between board 10 and clamp 18

and post 20 free the clamp or post to be used again. This enables harness board 10 to remain at the point of use since new harness plots can be secured to board 10 repeatedly without any alteration of the board. The necessary clamps 18 and posts 20 can be secured to harness board 10 is a matter of moments. Thus, countless harnesses can be constructed with the same harness board 10, by applying a new harness plot 16 and reconfiguring clamps 18 and posts 20.

[0031] While the instant disclosure has been described with reference to one or more exemplary embodiments, it will be understood by those skilled in the art that various changes may be made and equivalents may be substituted for elements thereof without departing from the scope thereof. In addition, many modifications may be made to adapt a particular situation or feature to the teachings of the disclosure without departing from the scope thereof. Therefore, it is intended that the disclosure not be limited to the particular embodiment(s) disclosed as the best mode contemplated for carrying out this disclosure, but that the disclosure will include all embodiments falling within the scope of the disclosure.

CLAIMS

What is claimed is:

1. An apparatus, comprising:
 - a harness board;
 - a clamp removably connected to said harness board with a magnetic field, wherein said magnetic field permits said clamp to be removed from said harness board; and
 - a post removably connected to said harness board using a magnetic field, wherein said magnetic field permits said post to be removed from said harness board.
2. The apparatus of claim 1, further comprising a harness plot positioned between said harness board and said clamp and post.
3. The apparatus of claim 2, wherein said harness plot has indicia upon the surface of said harness plot that illustrates the position to place said clamp, said post and wiring harness components.
4. The apparatus of claim 1, wherein said harness further comprises a first layer comprised of wood and a second layer comprised of a material attracted to a magnetic field.
5. The apparatus of claim 4, wherein said second layer is steel.
6. The apparatus of claim 1, wherein said clamp is arranged to support wiring harness components.
7. The apparatus of claim 1, wherein said post is arranged to support wiring harness components.

8. The apparatus of claim 1, wherein said clamp has a base and magnetic material is attached to said base.
9. The apparatus of claim 1, wherein said post has a base and magnetic material is attached to said base.
10. The apparatus of claim 1, wherein said clamp has a first prong and a second prong that are flexible.
11. The apparatus of claim 1, wherein said clamp and post can be fastened to every point on the surface of said harness board.
12. The apparatus of claim 1, wherein a plurality of said clamps and a plurality of said posts are magnetically fastenable to said harness board.
13. A apparatus, comprising:
 - a harness board having a metallic surface that is attracted to a magnetic field;
 - a clamp magnetically fastenable to said harness board, wherein said clamp has a first magnetic base having a cup-shaped receptacle in which a first magnetic element is secured, wherein said clamp is capable of supporting a wiring harness; and
 - a post magnetically fastenable to said harness board, wherein said post has a second magnetic base having a cup-shaped receptacle in which a second magnetic element is secured, wherein said post is capable of supporting a wiring harness.
14. The apparatus of claim 13, wherein said first magnetic element emits a magnetic field sufficient to fasten said clamp to said harness board, and still enable said clamp to be removed from said harness board.

15. The apparatus of claim 13, wherein said second magnetic element emits a magnetic field sufficient to fasten said post to said harness board, and enable said post to be removed from said harness board.

16. The apparatus of claim 13, wherein said second magnetic element is a permanent magnet.

17. The apparatus of claim 13, wherein said second magnetic element is a permanent magnet.

18. The apparatus of claim 13, further comprising a harness plot positioned between said harness board and said clamp and post.

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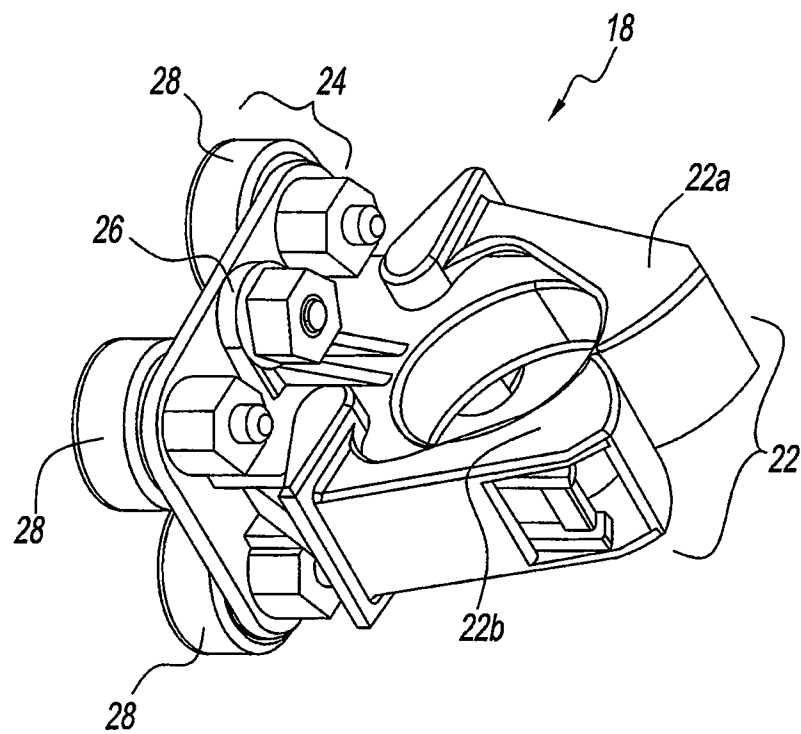
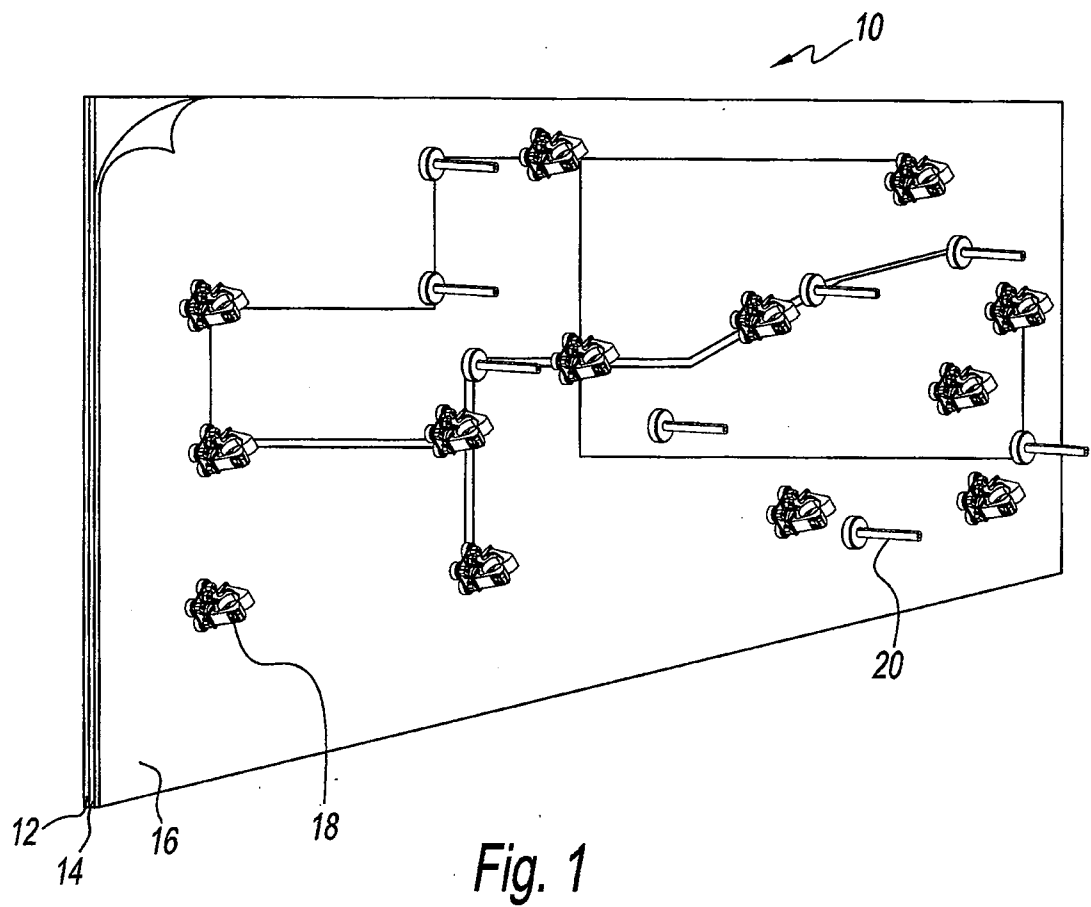


Fig. 2

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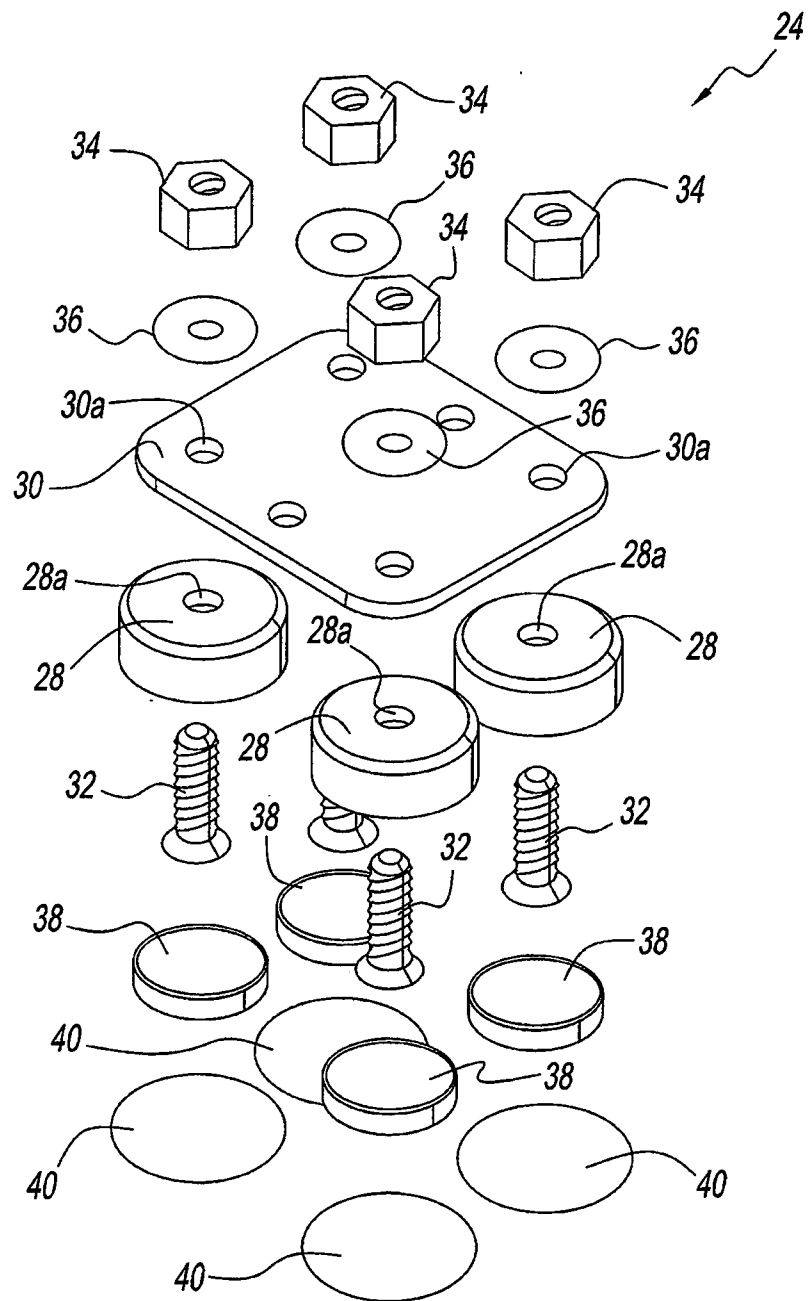


Fig. 3

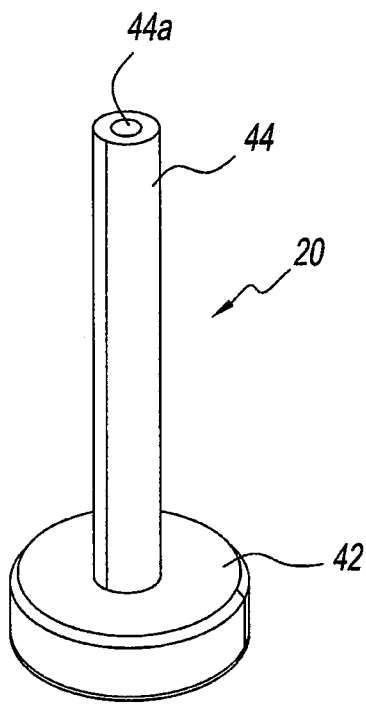


Fig. 4

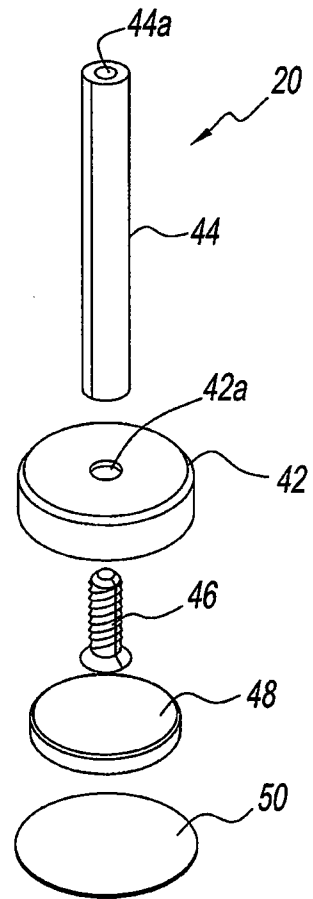


Fig. 5

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2008/051044**A. CLASSIFICATION OF SUBJECT MATTER****B64D 47/00(2006.01)i, H01B 13/00(2006.01)i**

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)

IPC 8 : B64D 47/00, H01B 13/00

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

Korean Utility models and applications for Utility models since 1975

Japanese Utility models and applications for Utility models since 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

eKIPASS (KIPO internal) & keywords: harness board, wire, magnet, clamp and similar terms

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4593452 A (SAMMIE G. KEAHEY et al.) 10 June 1986 See column 2, line 50 - column 3, line 8; and figure 2.	1-18
Y	KR 10-0452745 B1 (KIA MOTORS CORP.) 04 October 2004 See claims 1-2 and; figures 3&4.	1-18
A	US 5168904 A (RONALD M. QUINKERT) 08 December 1992 See column 6, line 45 - column 6, line 69; claim 1; and figure 10.	1-18
A	US 5915424 A (JOHN R. FRANKS et al.) 29 June 1999 See figures 5-6.	1-18
A	JP 54-134382 A (MITSUBISHI ELECTRIC CORP.) 18 October 1979 See figure 7.	1-18

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

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)

"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

"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

"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

"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

"&" document member of the same patent family

Date of the actual completion of the international search

16 MAY 2008 (16.05.2008)

Date of mailing of the international search report

16 MAY 2008 (16.05.2008)

Name and mailing address of the ISA/KR

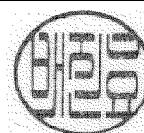
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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/US2008/051044

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
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KR 10-0452745 B1	04.10.2004	None	
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US 5915424 A	29.06.1999	None	
JP 54-134382 A	18.10.1979	None	