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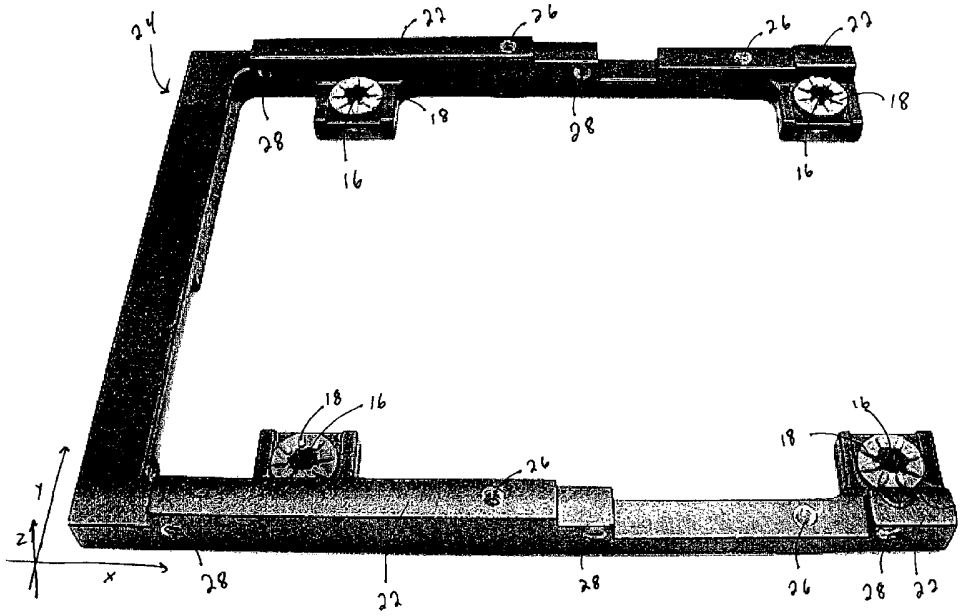
(54) Title: HARD DRIVE DISK ISOLATION APPARATUS AND METHOD



(57) Abstract: An in-form factor hard disk drive isolation device is described, including a bracket having an x-y planar dimension, the bracket comprising a rigid material supporting a plurality of isolation pieces, wherein said isolation pieces are configured in a first z dimension to engage a base plate member of a hard disk drive, and wherein said bracket is configured in said first z dimension such that it will not directly engage said base plate member, and further wherein said x-y planar dimension of said bracket is configured such that it does not exceed the specified form factor dimensions of a hard disk drive of which said base plate is a component.

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HARD DRIVE DISK ISOLATION APPARATUS AND METHOD

BACKGROUND

Hard disk drives are currently incorporated into most of the major types of electronics equipment, including computing devices and other electronics devices, where storage of data is required or desired. The technical industries, in an effort to promote conformity of design, e.g., structural design, airflow and cooling design, layout of electronic components and throughputs, usually agree on one or more "form factors" for use within those industries. These form factors specify such parameters as structure, airflow, layout of electronic components and throughputs, etc.

Due to common form factor requirements for disk drives that require the mounting holes to be very close to the edges of a disk drive, hard disk drives are isolated from the chassis outside the form factor. Such isolation may include isolation for noise, vibration and shock. However, isolation of the hard disk drive outside the form factor adds parts, complexity and size to whatever device the hard disk drive is being mounted in. What is needed in the art is an isolation solution without such additional parts, complexity and bulk.

SUMMARY

The above described disadvantages and problems are alleviated by the present hard disk drive isolation apparatus, which advantageously provides an in-form factor hard disk drive isolation device, which comprises a bracket having an x-y planar dimension, the bracket comprising a rigid material supporting a plurality of isolation pieces, wherein the isolation pieces are configured in a first z dimension to engage a base plate member of a hard disk drive, and wherein the bracket is configured in said

first z dimension such that it will not directly engage the base plate member, and further wherein the x-y planar dimension of the bracket is configured such that it does not exceed the specified form factor dimensions of a hard disk drive of which the base plate is a component.

The above described and other disadvantages and problems are also alleviated by the present method of isolation of a hard disk drive device within a hard disk drive device form factor, which comprises provision of a bracket having an x-y dimension, the bracket including a plurality of isolator pieces, the isolator pieces configured to engage a hard disk drive component in a first z-dimension, the bracket configured to mount to a chassis at mounting positions specified by a form factor endorsed by a hard disk drive industry.

The above description and other features and advantages of the present invention will be appreciated and understood by those skilled in the art from the following detailed description, drawings, and appended claims.

BRIEF DESCRIPTION OF DRAWINGS

Referring now to the drawings wherein like elements are numbered alike in the several FIGURES:

FIGURE 1 illustrates a top elevation view of a hard drive base plate; and

FIGURE 2 illustrates a top elevation view of a bracket in accordance with one embodiment of the specification, including isolator pieces and mounting apertures.

DETAILED DESCRIPTION

Referring now to FIGURE 1, an exemplary hard disk drive base plate is illustrated generally at 10. Generally speaking, the exemplary base plate includes substantially all of the drive, storage and read components of typical hard disk drives. Such base plate generally includes x-y planar dimensions that are in conformity with industry specified form factor requirements. Specifically, the base plate illustrated is a 3.5 inch hard disk drive constructed according to form factor requirements.

Of relevance, four female threaded apertures 12 are provided on a surface 14 of the hard disk drive. Such female threaded base plate apertures 12 are provided on the surface 14 according to the positions of apertures 16 of the exemplary isolator pieces 18, illustrated in FIGURE 2. Furthermore, the base plate 10 includes peripheral

contouring, generally shown at 20, that approximates contouring of the bracket, shown generally at 24, illustrated in FIGURE 2. It should be noted that such contouring 20, 22 is not critically important to the present invention, but instead is provided in the exemplary embodiments to improve aesthetic appeal and to further define the center of mass of the assembled product.

Referring still to FIGURE 1, the base plate 10 includes a pinout juncture 26, wherein such pinout juncture 26 communicates with at least one printed circuit board (not shown).

Referring now to FIGURE 2, a bracket is shown generally at 24. Such bracket 24 primarily includes a plurality of isolators 18. In the presently illustrated embodiment, four isolators 18 are positioned generally around the center of mass of the hard disk drive. The isolators are configured to wholly support the base plate and/or the base plate with associated printed circuit boards. Thus, the bracket 24 does not contact the base plate 24, except indirectly through isolators 18 (or the like).

The illustrated exemplary embodiment similarly provides the typical threaded mounting apertures specified by form factor requirements. Such requirements generally require one or both of vertical (z-axis) mounting apertures 26 and horizontal (x-y plane) mounting apertures 28. The vertical apertures 26, generally, attach to mounting blocks for mounting in 5.25 inch bays (not shown). The horizontal apertures 28, generally, attach either directly to the chassis of 3.5 inch bays (not shown) or attach to adapters for horizontal mounting within 5.25 inch bays. The present description of form factor requirements notwithstanding, it should be recognized that the present invention provides in-form factor isolation of hard disk drive components without specific reference to particular restrictive form factor requirements. In essence, isolation occurs within the typical hard drive package, and at least one user-end mounting option within any given hard disk drive form factor is not compromised.

The printed circuit board or boards (not shown) of the hard disk drive device attach to the pinout 26 provided on the base plate 10. Positioning of the printed circuit board(s) is not critical to the present invention. Isolation of the major drive components is provided by the bracket 10 and, more to the point, the isolator pieces 18. That being noted, the printed circuit board may be positioned and/or secured directly to the base plate 10 via fasteners (e.g., threaded fasteners passed through the printed circuit board(s) and secured into female threaded fasteners in the base plate 10; not

show). Alternately, the printed circuit board(s) may be secured via the isolator members 18 opposite or adjacent the base plate 10. Specifically fasteners provided through the aperture(s) 16 of the isolator members 18 may pass through apertures (not shown) in the printed circuit board(s) to be secured in the female threaded apertures 12 on the base plate 10. Finally, the printed circuit board may be secured to the bracket 10 via fasteners. Generally, fasteners and apertures need not be threaded fasteners and apertures, but instead may be any number of fasteners, removable or not, as may be found generally in the hardware art.

In an exemplary embodiment, the bracket 10 is generally a rigid member. The term rigid need not be specifically defined. Indeed, while more rigid support may be desired, particularly where isolators comprise damping materials, less rigid support may suffice in this capacity. Accordingly, metals, e.g., aluminum, steel, of whatever gauge, may be used. Similarly, various structural plastics, elastomeric materials, etc., may be used. Such material descriptions are not meant to be restrictive. Also, the bracket 10 is shown generally as a "C" or "U" shaped unitary member. This need not be the final or controlling shape of the bracket. Indeed, the bracket 24 may assume any convenient shape, or indeed, may comprise multiple pieces, providing the same overall function, that is, support for isolation of hard disk drive components within specified hard disk drive form factor dimensions.

Similarly, in an exemplary embodiment, the isolators 18 need not, indeed should not, be limited to particular materials. The point is that the isolators 18 and fasteners (not shown), and not the bracket 24, directly contact the base plate 10 and/or other hard disk drive components. The isolators may have apertures 16 provided therethrough, facilitating fastening therethrough, or the base plate may secure to the bracket via other (preferably) non-rigid or rigid fasteners. Furthermore, the isolators 18 may, where damping is required or desired, be materials having a hardness less than that of the bracket 24 and or the chassis (not shown). An excellent choice (not to be limiting) for such damping isolators are EAR Specialty Co.'s ISODAMP G-414 grommets. Also, the shape of the isolators need not be specified. While the ISODAMP grommets are illustrated in FIGURE 2, such isolators may take any shape, including bars provided on the bracket, stud mounts, cylinders, etc.). Furthermore, while four isolators 18 are illustrated, more or less are contemplated.

In another exemplary embodiment, the locations of the plurality of isolators 18 are such that they are symmetric about the center of gravity of the hard drive in the x-y plane, and are conveniently far away from the center of gravity (as it will aid performance in terms of isolation).

Finally, while form factor dimensions are generally described, it is intended that the bracket 24 with isolators 18 conform, such that the dimensions of the bracket 24/isolators 18 are within the form factor specifications for hard disk drives. However, it is recognized that hard disk drives have become more efficient, and likely will become more efficient in years to come. Accordingly, the space required for components has and may become less than was previously customary. While the overall drive components, including the base plate 10 and/or printed circuit boards may reduce in size, emphasis in the present disclosure should be that the bracket 24 for isolation of the hard disk drive components not exceed the size required by certain given form factor dimensions (that the bracket and isolators are within the hard disk drive package) rather than any such requirement that the bracket 24 be smaller than given drive components themselves.

In summary, the present disclosure advantageously provides in-form factor isolation of hard disk drive components by providing such bracket and isolator pieces within the hard disk drive package dimensions, as specified by given industry form factors. As such, the present disclosure takes advantage of unused space within the hard disk drive to provide isolation of drive components, without resort to external isolators and/or additional bulk.

While exemplary embodiments have been shown and described, various modifications and substitutions may be made thereto without departing from the spirit and scope of the invention. Accordingly, it is to be understood that the present invention has been described by way of illustration and not limitation.

What is claimed is:

CLAIMS

1. An in-form factor hard disk drive isolation device, comprising:

a bracket having an x-y planar dimension, said bracket comprising a rigid material supporting a plurality of isolation pieces, wherein said isolation pieces are configured in a first z dimension to engage a base plate member of a hard disk drive, and wherein said bracket is configured in said first z dimension such that it will not directly engage said base plate member, and further wherein said x-y planar dimension of said bracket is configured such that it does not exceed the specified form factor dimensions of a hard disk drive of which said base plate is a component.

2. The in-form factor hard disk drive isolation device of claim 1, wherein said isolation pieces include at least one aperture therethrough along a z-axis, and further wherein said isolation pieces are secured by at least one fastener extending through said at least one aperture and engaging said base plate member.

3. The in-form factor hard disk drive isolation device of claim 2, wherein said fastener is a male threaded fastener, and wherein said male threaded fastener is configured to extend through said at least one aperture and engage a female threaded base plate member.

4. The in-form factor hard disk drive isolation device of claim 1, wherein said isolation pieces are configured to engage at least one printed circuit board member.

5. The in-form factor hard disk drive isolation device of claim 4, wherein said isolation pieces are configured to engage said printed circuit board member in a second z-dimension.

6. The in-form factor hard disk drive isolation device of claim 5, wherein said isolation pieces include at least one aperture therethrough along a z-axis, and further wherein said isolation pieces are secured by at least one fastener extending through said at least one aperture and engaging said printed circuit board member and said base plate member.

7. The in-form factor hard disk drive isolation device of claim 6, wherein said fastener is a male threaded fastener, and wherein said male threaded fastener is configured to pass through an aperture in said printed circuit board member, extend through said at least one aperture and engage a female threaded base plate member.

8. The in-form factor hard disk drive isolation device of claim 1, wherein said bracket is configured to engage at least one printed circuit board member.

9. The in-form factor hard disk drive isolation device of claim 8, wherein said bracket is configured to engage said printed circuit board member in a second z-dimension.

10. The in-form factor hard disk drive isolation device of claim 9, wherein said bracket includes at least one female threaded aperture, and wherein a male threaded member is configured to extend through an aperture in said printed circuit board member to engage said at least one female threaded aperture.

11. The in-form factor hard disk drive isolation device of claim 1, wherein said base member is configured to engage at least one printed circuit board member, and wherein a fastener extends through said at least one printed circuit board member to engage said base member at a fastening position on said base member.

12. The in-form factor hard disk drive isolation device of claim 1, wherein said bracket includes a plurality of threaded mounting positions generally perpendicular to said z dimension, said plurality of threaded mounting positions located as specified by the design of said form factor.

13. The in-form factor hard disk drive isolation device of claim 1, wherein said bracket includes a plurality of threaded mounting positions generally along said z dimension, said plurality of threaded mounting positions located as specified by the design of said form factor.

14. The in-form factor hard disk drive isolation device of claim 1, wherein said bracket and said isolator pieces are configured such that the center of mass of the hard disk drive is substantially balanced.

15. The in-form factor hard disk drive isolation device of claim 1, wherein said form factor dimensions are selected from industry specified 3.5 inch hard disk drive form factor specifications.

16. The in-form factor hard disk drive isolation device of claim 1, wherein said bracket is a unitary piece, and wherein at least three isolator pieces are provided thereon.

17. The in-form factor hard disk drive isolation device of claim 16, wherein said bracket is generally configured in a "C" shape or a "U" shape.

18. The in-form factor hard disk drive isolation device of claim 16, wherein at least four isolator pieces are provided thereon.

19. The in-form factor hard disk drive isolation device of claim 1, wherein said isolator pieces comprise materials having a hardness less than the hardness of said bracket.

20. The in-form factor hard disk drive isolation device of claim 19, wherein said isolator pieces comprise an elastomer material, wherein the hardness of said elastomer material is selected to provide damping of vibration generated by the hard disk drive or transmitted from a chassis to said bracket.

21. A method of isolation of a hard disk drive device within a hard disk drive device form factor, comprising:

providing a bracket having an x-y dimension, said bracket including a plurality of isolator pieces, said isolator pieces configured to engage a hard disk drive base plate in a first z-dimension, said bracket configured to mount to a chassis at mounting positions specified by a form factor endorsed by a hard disk drive industry.

22. The method of claim 21, wherein said isolator pieces include at least one aperture provided therethrough along a z-axis, wherein said isolator pieces are configured to receive at least one fastener through said aperture, and wherein said fastener is configured to securely engage said base plate.

23. The method of claim 21, wherein said bracket includes a plurality of threaded female mounting positions provided in the x-y plane and positioned substantially in accordance with form factor requirements.

24. The method of claim 21, wherein said bracket includes a plurality of threaded female mounting positions provided along a plurality of z-axes and positioned substantially in accordance with form factor requirements.

25. A method of isolation of a hard disk drive device within a hard disk drive device form factor, comprising:

providing a bracket having an x-y dimension, said bracket including a plurality of isolator pieces, said isolator pieces configured to engage a hard disk drive component in a first z-dimension, said bracket configured to mount to a chassis at mounting positions specified by a form factor endorsed by a hard disk drive industry.

26. The method of claim 25, wherein said isolator pieces include at least one aperture provided therethrough along a z-axis, wherein said isolator pieces are configured to receive at least one fastener through said aperture, and wherein said fastener is configured to securely engage said hard disk drive component.

27. The method of claim 25, wherein said bracket includes a plurality of threaded female mounting positions provided in the x-y plane and positioned substantially in accordance with form factor requirements.

28. The method of claim 25, wherein said bracket includes a plurality of threaded female mounting positions provided along a plurality of z-axes and positioned substantially in accordance with form factor requirements.

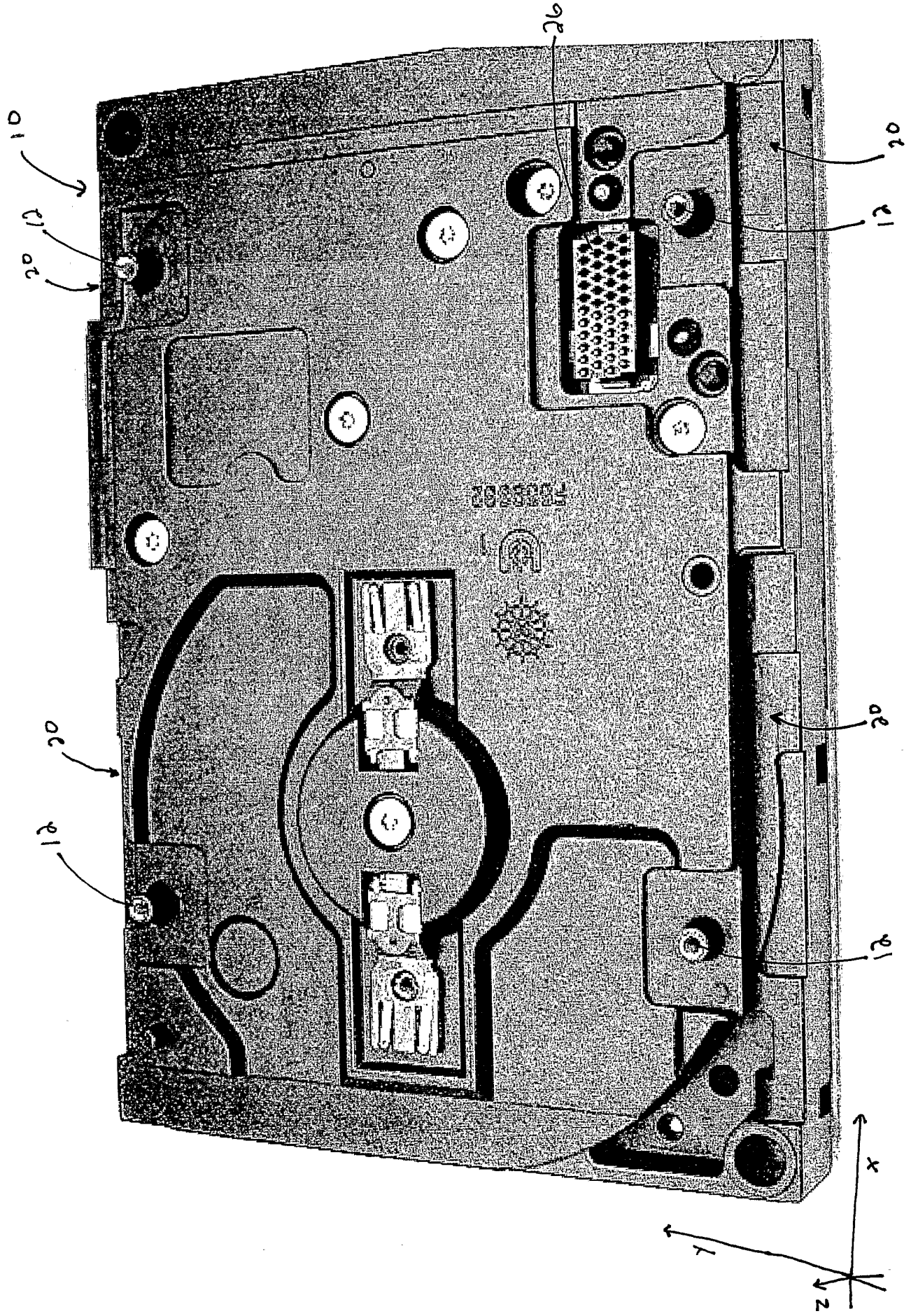

FIGURE 1

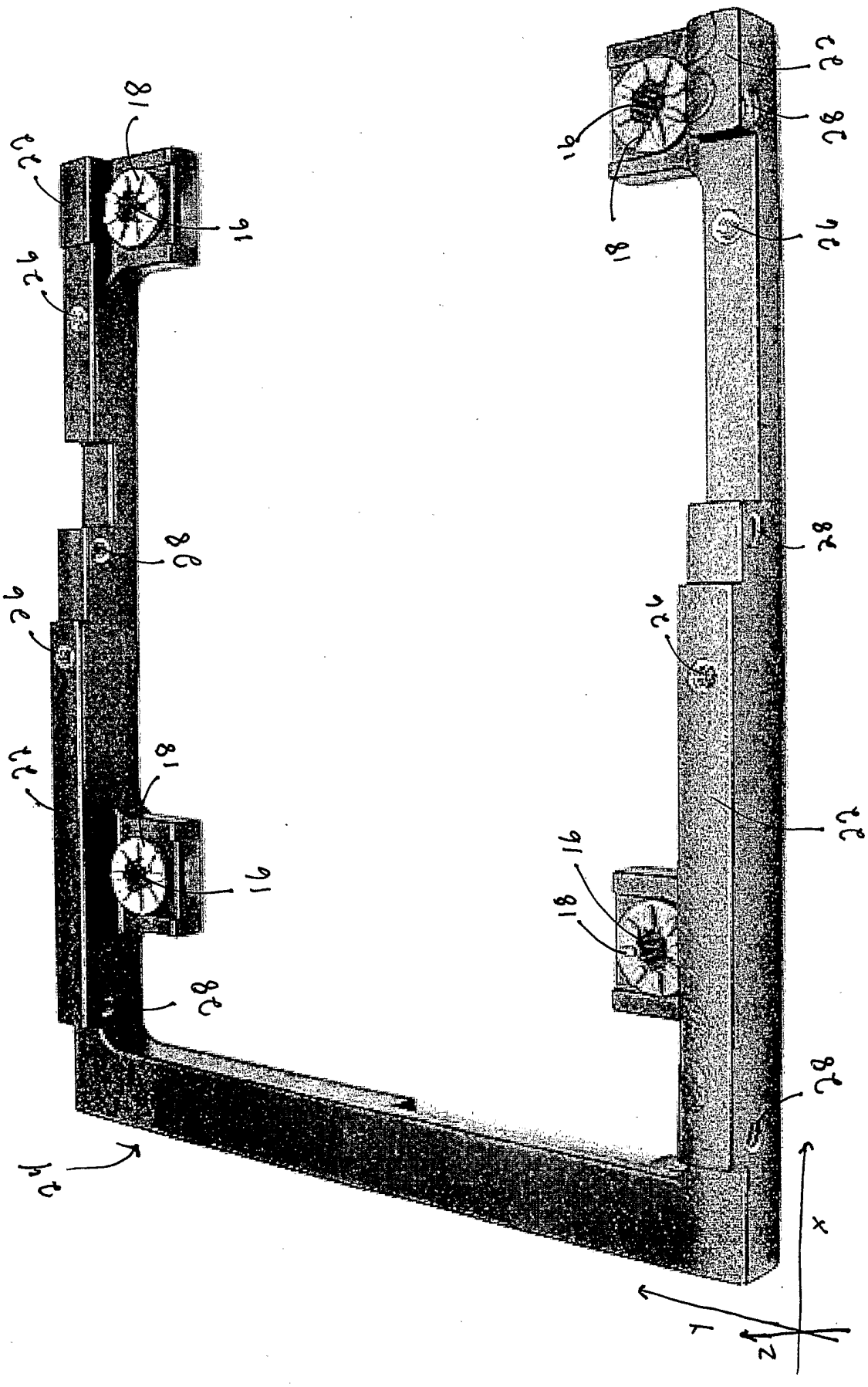

FIGURE 2

INTERNATIONAL SEARCH REPORT

International Application No
PCT/US 02/31454

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G11B33/08

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 7 G11B

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 practical, search terms used)
WPI Data, EPO-Internal, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 469 311 A (NISHIDA HIROSHI ET AL) 21 November 1995 (1995-11-21) column 3, line 35 -column 5, line 15; figures	1-28
X	US 5 721 457 A (KAWABATA KOJI ET AL) 24 February 1998 (1998-02-24) column 2, line 44 -column 3, line 39; figures	1-28
X	US 5 777 821 A (POTTEBAUM KENNETH L) 7 July 1998 (1998-07-07) column 4, line 46 -column 8, line 20; figures	1-28

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
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Name and mailing address of the ISA	Authorized officer
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Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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