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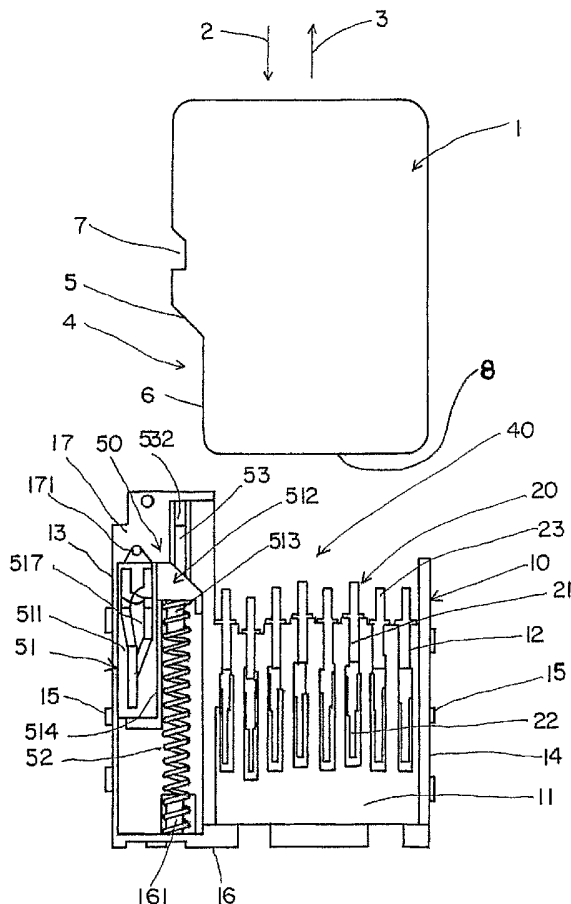
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(54) Title: CARD CONNECTOR



(57) Abstract: A card connector assembly includes a housing having a cavity (40) for receiving a card (1). A slide member (51) disposed on one side of the cavity (40) for engaging a side edge of the card (1). A spring member (52) positioned between the slide member (51) and a back wall of the housing. The spring member (52) being contained between a side wall of the slide member (51) and the edge of the card (1) thereby preventing the spring member (52) from laterally deforming and minimizing the overall width of the card connector assembly.

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CARD CONNECTOR

BACKGROUND OF THE INVENTION

The present invention relates to a card connector for use in connecting a memory
5 card, an IC card and any other card-like medium to a printed circuit board.

A variety of card connectors are known in the art, and among others the ones
equipped with a push/push type of card ejection mechanism are widely used in cellular
phones and other portable devices. For example, see Japanese Patent Laid-Open
No.2001-361735 (FIGS.1 and 2) and Japanese Patent Laid-Open No.2003-243090
10 (FIGS.1 and 2). The push/push type of card ejection mechanism typically uses a heart
cam structure.

FIG. 8 shows a prior art card connector equipped with a push/push type of card
ejection mechanism. The housing 83 supports terminals and a shell cover (not shown),
and the card cavity 82 is defined on the bottom of the housing 83. A card 81 can be
15 inserted in the card cavity 82 in the direction indicated by arrow 84, and can be ejected
from the card cavity 82 in the direction indicated by arrow 85. As seen from the
drawing, a slide member 86 is slidably attached to one longitudinal side of the housing
83 next to the card cavity 82. A coiled spring 87 is placed ahead of the slide member 86
and is yieldingly compressed by the slide member 86 when it is moved forward.

20 The slide member 86 moves back and forth as the card 81 is ejected and inserted.
The card 81 can be retained on one longitudinal side by the slide member 86 so that the
card 81 and the slide member 86 may move together as a whole. When the slide member
86 moves with the card 81 in the insertion direction 84, the coiled spring 87 will be
resiliently compressed, storing the repulsive energy, which can be released to drive the
25 card-and-slide combination in the ejection direction 85 as the card is removed.

The push/push type of card ejection mechanism is so constructed that the pin rod
89 is pivotably fixed to the housing 83, and is retained by the free end in the heart cam
groove 88 of the slide member 86.

When the advancing card 81 compresses the coiled spring 87 to store the
30 repulsive energy for ejection, the coiled spring 87 is likely to bow. To prevent the coiled
spring 87 from bowing, it is positioned that one side of the coiled spring 87 faces the
confronting side wall of the housing 83 or shell cover (not shown), and that the other side
of the coiled spring 87 faces the guide wall 90 integrally formed on the slide member 86.
Thus, the coiled spring 87 is sandwiched between the side wall of the housing or shell

cover and the guide wall 90, so that the coiled spring 87 is kept straight while the card 81 is inserted into the card cavity 82. The coiled spring 87 is vertically sandwiched between the bottom of the housing 83 and the ceiling plate of the shell cover, thus preventing the coiled spring 87 from bowing vertically. The guide wall 90 of the slide member 86,
5 however, constrains the miniaturization of the card connector.

SUMMARY OF THE INVENTION

One object of the present invention is to provide a card connector whose size is reduced to a minimum. Another object of the present invention is to provide a card
10 connector including a slide member on one side of its card cavity, and a spring responsive to insertion of a card into the card cavity to be yieldingly compressed. The slide member has means to catch the card by one longitudinal side when it is inserted into the card cavity to provide an integral slide-and-card combination which can slide both in the card-insertion and card-ejection directions. The spring is yieldingly
15 compressed in response to the advance of the card in the card-insertion direction to store the resilient energy, which can be released to eject the card from the card cavity.

Another objective of the present invention is to provide a spring that is positioned so that one side of the spring faces the side wall of the slide member, and the other side of the spring faces the side of the card, thus sandwiching the spring therebetween and
20 preventing the spring from bowing when the card is being inserted into the card cavity.

Absence of the guide wall extension from the slide member permits the lateral size-reduction of the card connector (horizontal direction in FIG. 8), and absence of the spring ahead of the slide member permits the longitudinal size-reduction (vertical direction in FIG. 8).
25

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be described in detail with reference to the accompanying drawings, in which:

FIG. 1 is a plan view of a card connector according to one embodiment of the
30 present invention with its shell cover removed, prior to insertion of a card;

FIG. 2 is a plan view of the card connector with the card partially inserted into the card cavity;

FIG. 3 is a similar plan view of the card connector with the card fully inserted in the card cavity;

FIG. 4 is a perspective view of the shell cover of the card connector;

FIG. 5 is a cross section of the card connector taken along the line A-A in FIG.2;

FIG. 6 illustrates the engagement hook of the slide member;

FIG. 7 is a plan view of a card connector according to another embodiment of the
5 present invention with a card fully inserted in the card cavity; and

FIG. 8 is a plan view of a prior art card connector with its shell cover removed.

DESCRIPTION OF THE PREFERRED EMBODIMENT

FIG. 1 shows a card 1, and a card connector according to the first embodiment of
10 the present invention with its shell cover 30 (FIG. 4) removed. The card connector has a plurality of terminals 20 mounted in its housing 10, and the shell cover 30 covers the housing 10.

The housing 10 is formed from an insulating material and is molded into the shape as shown. A plurality of terminals 20 are press-fitted in terminal slots 12 formed
15 in the bottom surface 11 of the housing 10. Each terminal 20 is stamped out of a thin conductive sheet, comprising a base 21 to be press-fitted in a selected terminal slot 12, a cantilever-like contact 22 extending from one end of the mount base 21 and a soldering tail 23 extending from the other end of the mount base 21. When each terminal 20 is press-fitted in a selected terminal slot 12, the contact 22 slopes above the bottom surface
20 11, and the soldering tail 23 lies at a level below the bottom surface 11.

A metal sheet such as stainless steel is stamped and formed into the shell cover 30 as shown in FIG. 4, comprising a rectangular top surface 31 large enough to cover the bottom surface 11 of the housing 10, and two side surfaces 32 and 33 extending downward from the opposite longitudinal sides of the top surface 31. Each side surface
25 has window openings 34 to catch respective projections 15 formed on opposite side walls 13 and 14 of the housing 10 (see FIG. 5). The housing 10 and the shell cover 30 are assembled together to form the card connector body.

The shell cover 30 is assembled to the housing 10 to form the card cavity 40 between the bottom surface 11 of the housing 10 and the top surface 31 of the shell cover
30 30. A card 1 can be inserted in the direction indicated by arrow 2, and ejected in the direction indicated by arrow 3.

The push/push card ejection mechanism 50 and the slide member 51 are placed on one longitudinal side of the card cavity 40. The heart cam groove 517 formed in the

slide member 51, a spring 52 and an associated pin rod together make up the card ejection mechanism 50.

The slide member 51 comprises a rectangular block 511 arranged along the side wall 13 of the housing 10 and a flat, triangular engagement portion 512 whose shape is complementary with the edge 5 of the chamfered corner 4 of the card 1. The main block 511 of the slide member 51 is disposed on the inside of the side wall 13 allowing it to move along the side wall 13 in the insertion and ejection directions 2 and 3.

The spring 52 is placed between the triangular engagement portion 512 of the slide member 51 and the rear wall 16 of the housing 10, extending in the card insertion or ejection direction. Specifically, the slide member 51 has a round rod 513 fixed to the triangular engagement portion 512 and the housing 10 has a counter round rod 161 fixed on the rear wall 16 of the housing. The spring 52 is attached to the slide member 51 and the housing rear wall 16 by inserting the round rods 513 and 161 into opposite ends of the spring 52, so that the spring 51 extends between the round rods 513 and 161.

As seen from FIGS.2, 3 and 5, the spring 52 is positioned between the side surface 514 of the slide member 51 with a gap 515 therebetween, and the edge 6 of the chamfered side of the card 1 with a gap 516 therebetween. The spring 52 is vertically retained by the top surface 31 of the shell cover 30 and the bottom 11 of the housing 10. In the preferred embodiment, the spring 51 is a helical or coiled compression spring, but any type of spring may be used.

A retainer block 17 is formed at the front of the housing 10 and retains the slide member 51 in the slide path. The retainer block 17 and the side wall 13 are integrally formed and extend the bottom surface 11 of the housing 10. The retainer block 17 has a pivot hole 171 formed in its top surface to pivotally hold one end of the pin rod (not shown), and of which the other free end of the pin rod is disposed in the heart cam groove 517 of the rectangular block 511 of the slide member 51.

Additionally, the slide member 51 has a cantilever engagement hook 53 extending from its triangular engagement portion 512. As seen from FIG. 6, the engagement hook 53 has a lead-in portion 532 formed on its tip end. The lead-in portion 532 of the engagement hook has an angled surface 531, and the advancing card 1 makes the cantilever-like engagement hook 53 resiliently deflect as shown in FIG. 6. Once the card is fully inserted into the cavity, the engagement hook returns to the original position to engage the notch 7 of the card 1, thus locking the card 1 to the slide member 51.

Once the card 1 is inserted in the card cavity 40, the angled surface 5 of the

advancing card 1 abuts the triangular engagement portion 512, and simultaneously, the lead-in portion 532 of the engagement hook 53 engages the notch 7 on the card 1 to provide a card-and-slide member integral combination. Further advancement of the card 1, compresses the spring 52 in the card insertion direction. The spring 52 is positioned
5 between the side surface 514 of the slide member 51 and the adjacent side 6 of the card 1 thereby preventing the spring 52 from bowing and allowing straight longitudinal compression.

This arrangement requires no guide wall as in the prior art structure, and instead, just the gap 516 is left between the spring 52 and the card 1 and therefore the overall
10 lateral size of the card connector can be reduced accordingly. Additionally, by arranging the spring 52 laterally next to the rectangular body 511 of the slide member 51 instead of longitudinally ahead of the slide member, the distance "X" between the leading edge 8 of the card 1 and the rear wall 16 of the housing 10 is reduced to a minimum. Accordingly, the card connector is reduced both laterally and longitudinally in size.

15 FIG. 7 is similar to FIG. 3, but showing a card connector according to another embodiment of the present invention. In the first embodiment the engagement hook 53 is placed so that it may extend under the lower surface of the card 1. In the second embodiment the engagement hook 54 extends along the adjacent longitudinal side of the card 1, thereby allowing the lead-in portion 542 to catch the adjacent side of the card 1.
20 The other elements of the second embodiment as shown in FIG. 7 are similar to those of the first embodiment and therefore, detailed descriptions are omitted, but like reference numerals are used.

While the preferred embodiment of the invention has been shown and described, it will be apparent to those skilled in the art that changes and modifications may be made
25 therein without departing from the spirit of the invention, the scope of which is defined by the appended claims.

CLAIMS

What is claimed is:

- 5 1. A card connector comprising:
 an insulating housing which at least in part defines a card-receiving cavity for
 receiving a card therein;
 a plurality of conductive terminals mounted on the housing for engaging
 appropriate contacts on said card when said card is inserted into the card-receiving
10 cavity;
 a slide member positioned along said card-receiving cavity and being movable
 between a first card receiving position at which said card is inserted into said card-
 receiving cavity and a second card engaging position at which said card is retained
 within said card-receiving cavity, the slide member having a side wall generally parallel
15 to and spaced from the card-receiving cavity and an engagement member configured to
 engage the card when the card is inserted into the card-receiving cavity such that the
 slide member and the card move together as said card moves between said first position
 and said second position within the card-receiving cavity; and
 a spring oriented within said connector such that the spring is resiliently
20 compressed upon movement of said card from said first position to said second position,
 said spring being positioned between the side wall of said slide member and a side edge
 of the card-receiving slot such that upon insertion of said card into said cavity and
 movement of said card from said first position to said second position said spring may
 contact a side edge of said card.
- 25 2. The card connector of claim 1 wherein said slide member includes an opening
 therein extending along the side edge of said card-receiving slot and between said side
 wall of said slide member and said side edge of said card-receiving slot.
- 30 3. The card connector of claim 2 further including a cover that in part defines
 said card-receiving cavity.
4. The card connector of claim 3 wherein said cover is made of sheet metal.

5. The card connector of claim 4 wherein said cover, said side wall of said slide member and the side edge of said card inserted into said card receiving cavity define a spring support structure for operatively supporting and maintaining said spring within said spring support structure.

5

6. A card connector comprising:

an insulating housing which at least in part defines a card-receiving cavity for receiving a card therein;

a plurality of conductive terminals mounted on the housing for engaging appropriate contacts on said card when said card is inserted into the card-receiving cavity;

a slide member positioned along a side of said card-receiving cavity and being movable between a first card receiving position at which said card is inserted into said card-receiving cavity and a second card engaging position at which said card is retained within said card-receiving cavity, the slide member having a side wall generally parallel to and spaced from the side of said card-receiving cavity; and

a spring having an axis and being resiliently compressible upon movement of said card from said first position to said second position, said spring being positioned between the side wall of said slide member and a side edge of the card when said card is inserted into said card-receiving cavity,

whereby upon insertion of said card into said cavity and movement of said card from said first position to said second position said spring may contact the side edge of said card to reduce non-axial displacement of said spring.

7. The card connector of claim 6 wherein said slide member includes an opening therein extending along a side edge of said card-receiving slot and between said side wall of said slide member and the side edge of said card-receiving slot.

8. The card connector of claim 7 wherein said slide member further includes an engagement member configured to engage the card when the card is inserted into the card-receiving cavity such that the slide member and the card move together as said card moves between said first position and said second position within the card-receiving cavity.

9. The card connector of claim 7 further including a cover that in part defines said card-receiving cavity.

10. The card connector of claim 9 wherein said cover is made of sheet metal.

5

11. The card connector of claim 10 wherein said cover, said side wall of said slide member and said side edge of said card inserted into said card receiving cavity define a spring support structure for operatively supporting and maintaining said spring within said spring support structure as said card is moved from said first position to said
10 second position.

12. A card connector comprising:

an insulating housing which in part defines a card-receiving cavity for receiving a card therein;

15 a plurality of conductive terminals mounted on the housing for engaging appropriate contacts on said card when said card is inserted into the card-receiving cavity;

a slide member positioned along said card-receiving cavity and being movable between a first card receiving position at which said card is inserted into said card-receiving cavity and a second card engaging position at which said card is retained
20 within said card-receiving cavity, the slide member having a side wall generally parallel to and spaced from the card-receiving cavity, said slide member further including an engagement member configured to engage the card when the card is inserted into the card-receiving cavity such that the slide member and the card move together as said card
25 moves between said first position and said second position within the card-receiving cavity;

a cover which in part defines said card-receiving cavity; and

a spring resiliently compressible upon movement of said card from said first position to said second position, said spring being positioned and operatively retained
30 within a spring support structure, said spring support structure being defined in part by each of the side wall of said slide member, the cover and a side edge of said card upon movement of said card to said second position.

13. The card connector of claim 12 wherein said slide member includes an opening therein extending along a side edge of said card-receiving slot and between said side wall of said slide member and the side edge of said card-receiving slot.

5 14. The card connector of claim 13 wherein said cover is made of sheet metal.

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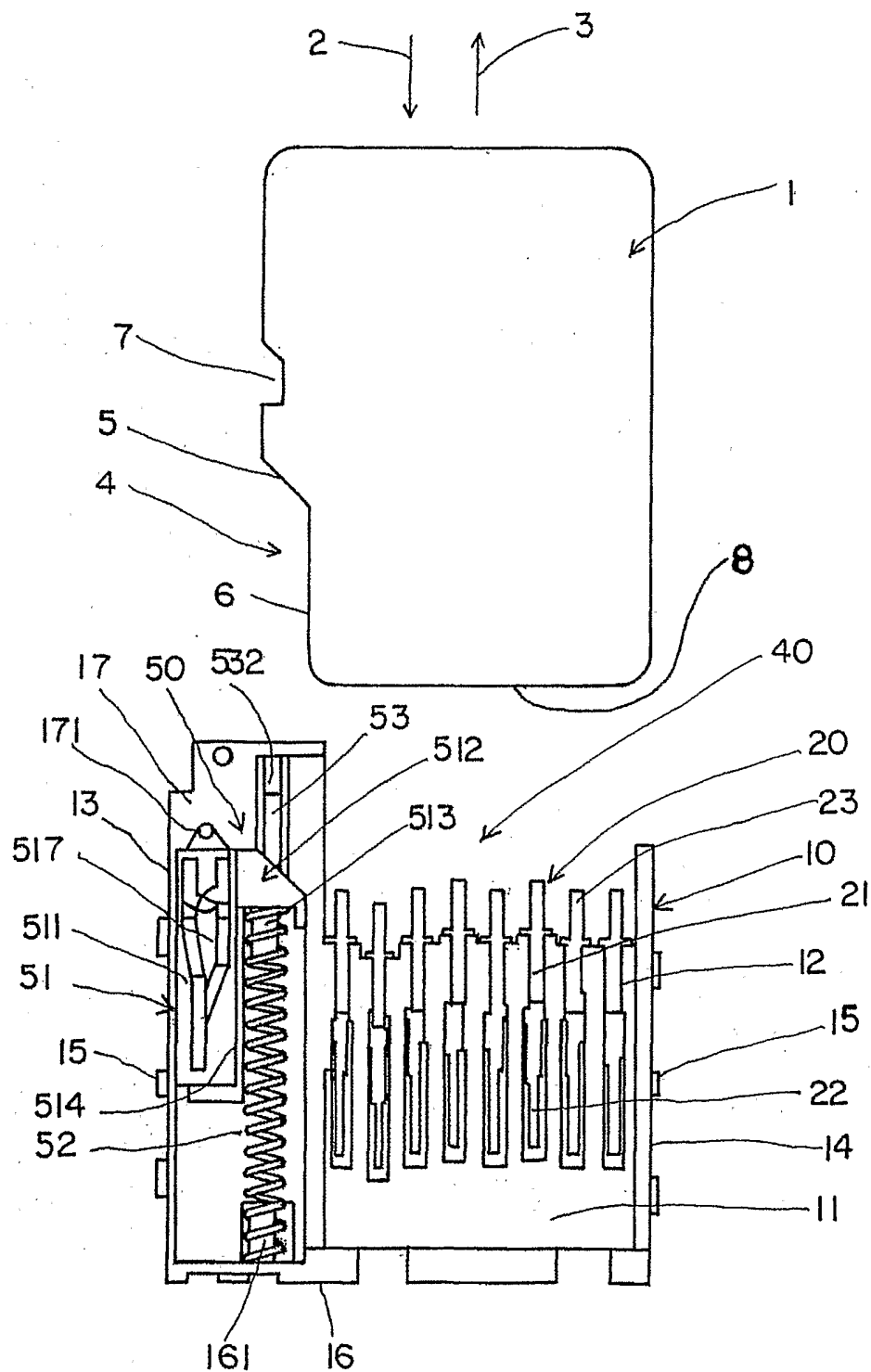


FIG. 1

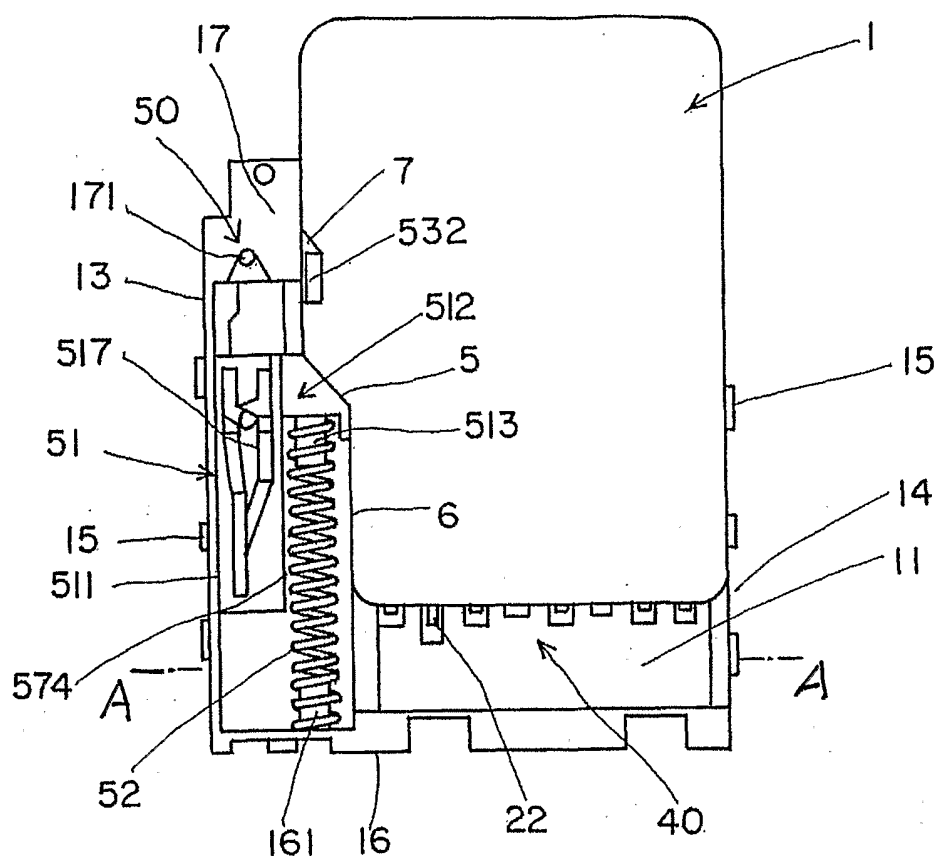


FIG. 2

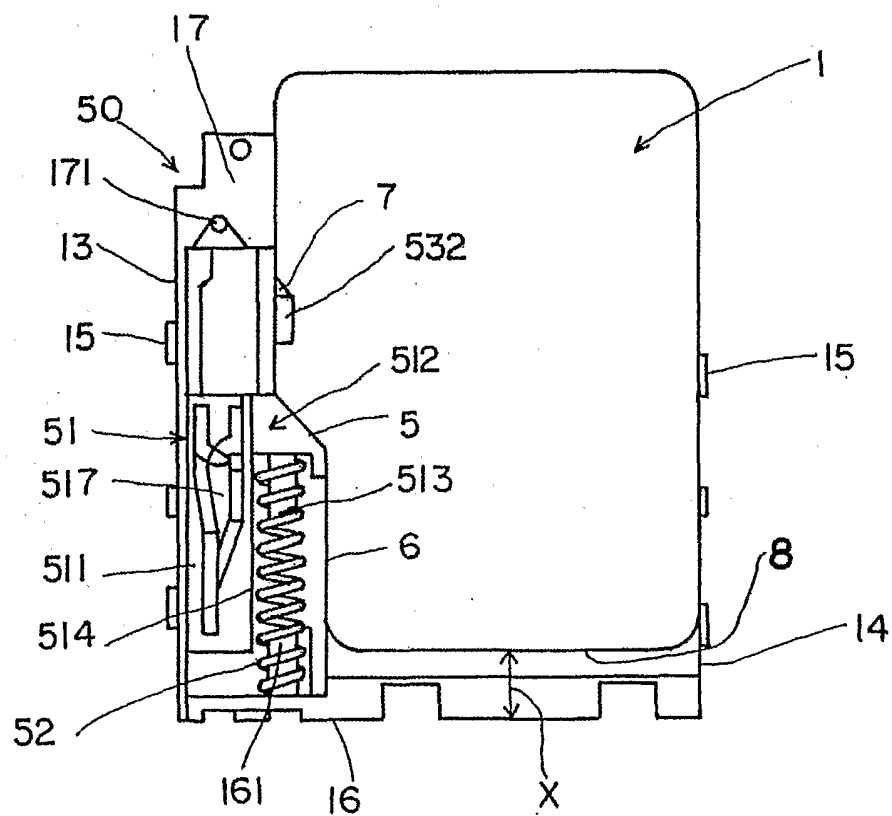
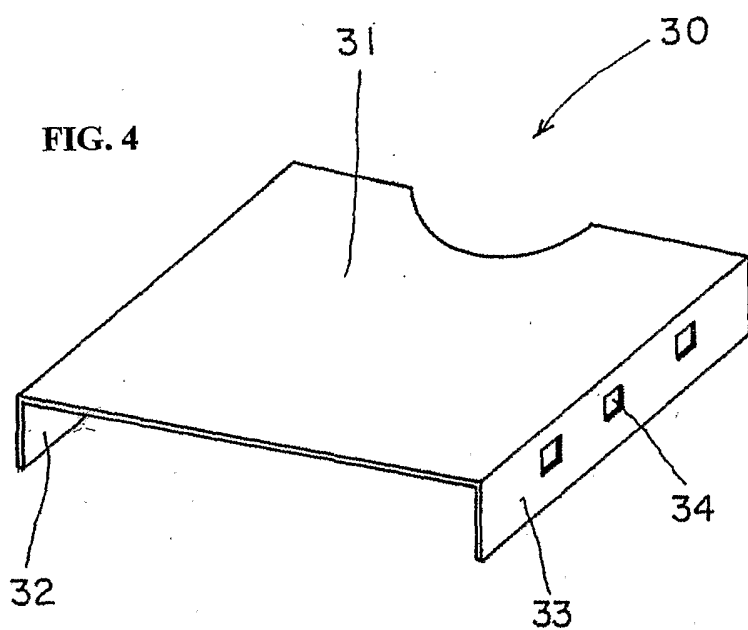
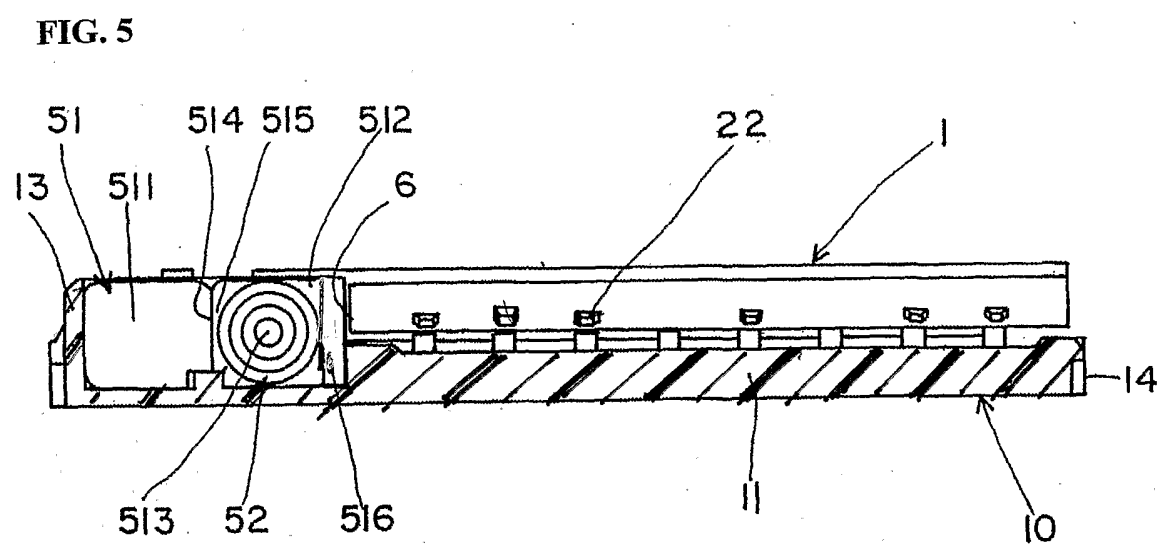
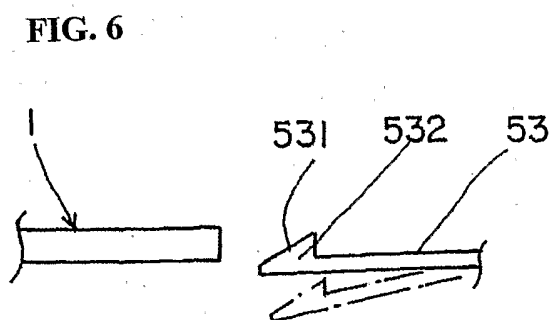


FIG. 3

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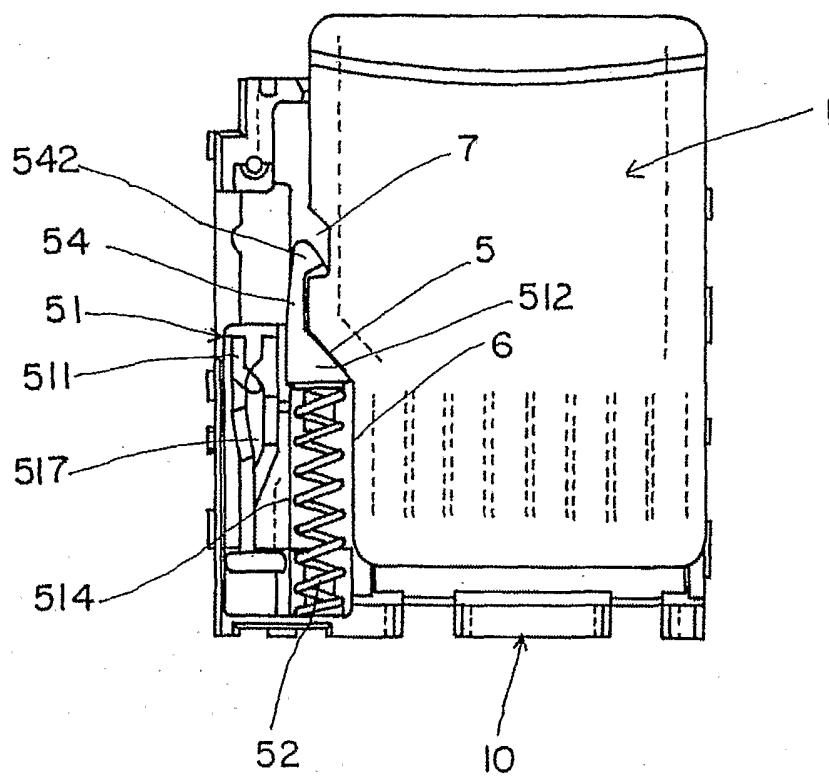


FIG. 7

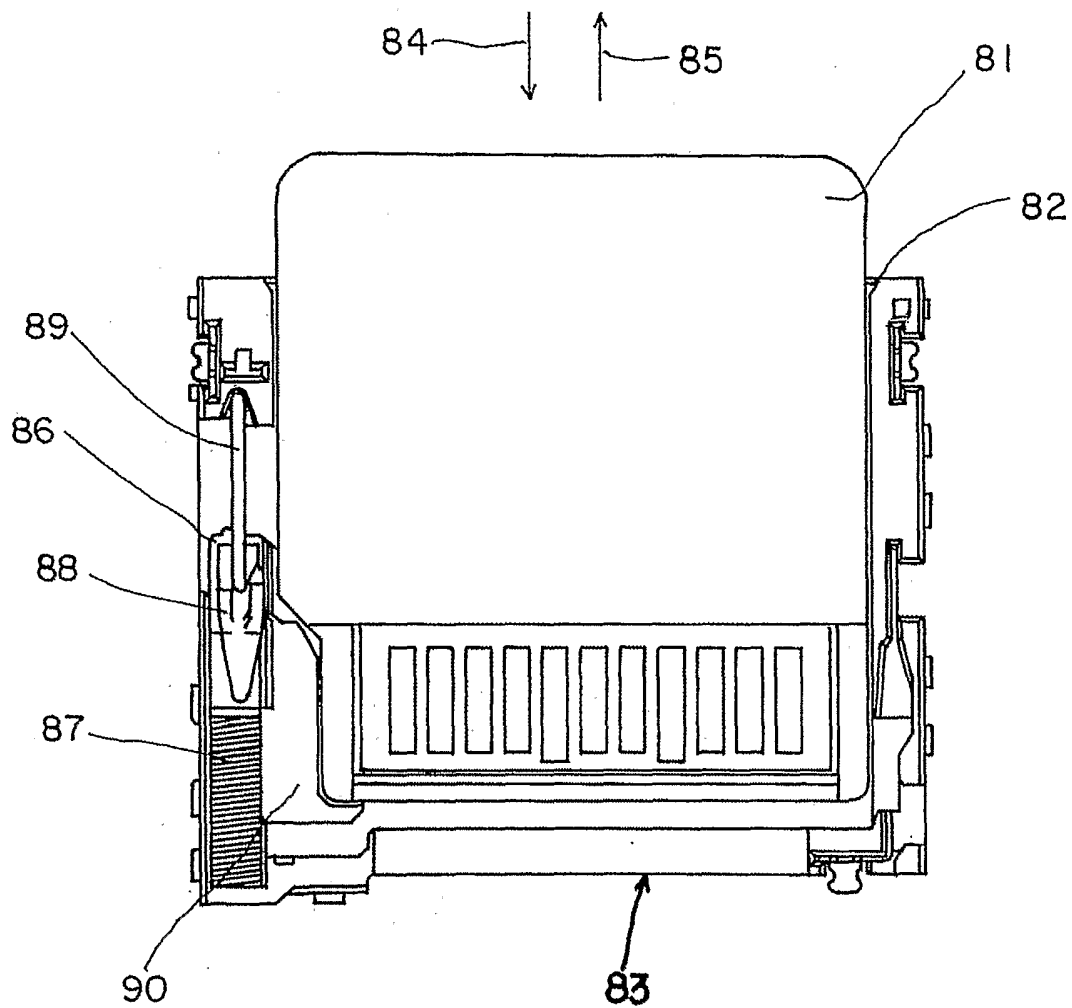


FIG. 8
(PRIOR ART)

INTERNATIONAL SEARCH REPORT

International application No

PCT/US2006/000190

A. CLASSIFICATION OF SUBJECT MATTER

INV. G06K7/00

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)

G06K

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)

EPO-Internal, PAJ, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2003/068911 A1 (OOYA MASAOKI ET AL) 10 April 2003 (2003-04-10) paragraph [0036] - paragraph [0039]; figure 3	1-14
A	US 2003/151901 A1 (NOGAMI DAISUKE) 14 August 2003 (2003-08-14) cited in the application paragraph [0029] - paragraph [0030]; figures 1-3	1-14
A	US 6 382 995 B1 (BRICAUD HERVÉ GUY ET AL) 7 May 2002 (2002-05-07) paragraph [0112]; figure 18	1-14



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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