Title: ADAPTER FOR A MEMORY CARD CONNECTOR TO ACCOMMODATE DIFFERENT SIZED MEMORY CARDS

Abstract: An adapter (20) is provided for a memory card connector (22) which includes a receptacle (24) for receiving a larger size standard memory card (26). The adapter includes a housing (28) having a size and shape on the order of that of the larger size standard memory card (26) for insertion into the receptacle of the connector. The housing includes a generally flat receiving area for receiving a smaller size standard memory card (32) for insertion with the housing into the receptacle. A clamping member (42) is provided on the housing for holding the smaller size standard memory card (32) in the receiving area of the housing. Interengaging members are provided between the housing (28) and the smaller size standard memory card (32) to prevent the card from pulling out of the receiving area.
SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:
— with international search report

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ADAPTER FOR A MEMORY CARD CONNECTOR TO ACCOMMODATE DIFFERENT SIZED MEMORY CARDS

Field of the Invention:

This invention generally relates to the art of electrical connectors and, particularly, to the art of memory card connectors. Specifically, the invention relates to an adapter for a memory card connector to accommodate different sizes of memory cards.

Background of the Invention:

Memory cards are known in the art and contain intelligence in the form of a memory circuit or other electronic program. Some form of card reader reads the information or memory stored on the card. Such cards are used in many applications in today’s electronic society, including video cameras, digital still cameras, smartphones, PDA’s, music players, ATM’s, cable television decoders, toys, games, PC adapters, multi-media cards and other electronic applications. Typically, a memory card includes a contact or terminal array for connection through a card connector to a card reader system and then to external equipment. The connector readily accommodates insertion and removal of the card to provide quick access to the information and program on the card. The card connector includes terminals for yieldingly engaging the contact array of the memory card.

With the ever-increasing miniaturization of electronic apparatus, the sizes of memory cards continue to be reduced. In the industry, memory cards of different standards have appeared in rapid succession, each card being smaller than the last standard card. This has caused considerable confusion with customers. In order to avoid these problems, new, miniaturized memory cards have been provided along with adapters which allow a smaller size standard memory card to be inserted into a connector designed for a larger size standard memory card.

Heretofore, such adapters have resilient contacts built therein for engagement with the contact pads of a smaller size standard memory card. In addition, the adapter has a signal relay circuit substrate installed therein. This increases the costs of the adapter and memory cards. They are complicated, comprise excessive parts, are unreliable in function and result in an

The present invention is directed to providing an improved, extremely simple adapter for a memory card connector which receives a larger size standard memory card. The adapter allows insertion of a smaller size standard memory card into the connector.

**Summary of the Invention:**

An object, therefore, of the invention is to provide a new and improved adapter for a memory card connector which includes a receptacle for receiving a larger size standard memory card.

In the exemplary embodiment of the invention, the adapter includes a housing having a size and shape on the order of that of the larger size standard memory card for insertion into the receptacle of the connector. The housing includes a generally flat receiving area for receiving a smaller size standard memory card for insertion with the housing into the receptacle. A clamping member is provided on the housing for holding the smaller size standard memory card in the receiving area of the housing. Interengaging means are provided between the housing and the smaller size standard memory card to prevent the card from pulling out of the receiving area.

As disclosed herein, the housing is fabricated of dielectric material. The clamping member is fabricated of metal material. The clamping member is spring loaded to bias the clamping member into engagement with the smaller size memory card.

According to one aspect of the invention, the clamping member is oriented to hold the smaller size memory card in a direction generally perpendicular to the generally flat receiving area of the housing. The interengaging means are oriented to prevent the smaller size memory card from pulling out of the flat receiving area in a direction generally parallel thereto. In the exemplary embodiment, the interengaging means comprise a projection on either the housing or the smaller size memory card positionable in a recess in the other of the housing or card.

According to another aspect of the invention, the generally flat receiving area is at one end of the housing. The receiving area is shallow and includes a dead end and an open end, along with opposite side walls extending between the ends. The clamping member is located at the dead end of the receiving area. The interengaging means are located at one side wall of the receiving area near the open end of the receiving area.
According to a further aspect of the invention, the clamping member has a generally flat clamping portion and a floor of the generally flat receiving area slopes downwardly from the open end to the dead end thereof. Therefore, the clamping portion of the clamping member does not extend excessively above the housing. Preferably, the clamping member has a width generally the same as the width of the smaller size memory card.

In the preferred embodiment, the clamping member is fabricated of spring metal material and includes a fixing portion fixed to the housing and an integral clamping portion for clamping onto the smaller size memory card. Specifically, the spring metal clamping member is generally L-shaped as defined by a pair of generally perpendicular legs forming the fixing and clamping portions of the clamping member.

Other objects, features and advantages of the invention will be apparent from the following detailed description taken in connection with the accompanying drawings.

**Brief Description of the Drawings:**

The features of this invention which are believed to be novel are set forth with particularity in the appended claims. The invention, together with its objects and the advantages thereof, may be best understood by reference to the following description taken in conjunction with the accompanying drawings, in which like reference numerals identify like elements in the figures and in which:

- FIG. 1 is a top plan view of a memory card adapter according to the invention;
- FIG. 2 is a vertical section taken generally along line A-A of FIG. 2;
- FIG. 3 is a front elevational view of the adapter;
- FIG. 4 is a rear elevational view of the adapter;
- FIG. 5 is a bottom plan view of the adapter;
- FIG. 6 is a side elevational view of the adapter, looking at the left-hand size of FIG. 1;
- FIG. 7 is a side elevational view of the adapter, looking at the right-hand side as viewed in FIG. 1;
- FIG. 8 is a bottom plan view of a smaller size standard memory card ("smaller card");
- FIG. 9 is a top plan view of the smaller card;
- FIG. 10 is a side elevational view of the smaller card, looking at the left-hand side of FIG. 9;
FIG. 11 is a side elevational view of the smaller card, looking at the right-hand side of FIG. 9;
FIG. 12 is a vertical section taken generally along line B-B in FIG. 8;
FIG. 13 is a top plan view of the adapter with the smaller card mounted therein;
FIG. 14 is a vertical section, on an enlarged scale, taken generally along line C-C in FIG. 13;
FIGS. 15(a)-15(c) are sequential views showing the smaller card in the process of being inserted into the adapter;
FIG. 16 is a view similar to that of FIG. 14, but with the smaller card inserted into the adapter in an erroneous orientation;
FIG. 17 is a top plan view showing the relationship of a memory card connector with a larger size standard memory card as well as the adapter of the invention mounting a smaller size standard memory card;
FIG. 18 is a top plan view showing the adapter and smaller card being inserted into the connector; and
FIG. 19 is a view similar to that of FIG. 18, but with the adapter and smaller card fully inserted into the connector.

Detailed Description of the Preferred Embodiment:

Referring to the drawings in greater detail, and first to FIGS. 1-7, the invention is embodied in an adapter, generally designated 20, for a memory card connector, generally designated 22 (Figs. 17-19), which has a receptacle 24 for receiving a larger size standard memory card ("larger card"), generally designated 26 (Fig. 17). The housing may be molded of plastic material.

Referring back to FIGS. 1-7, adapter 20 includes a dielectric housing, generally designated 28, which has a size and shape generally the same as larger card 26 as can be seen clearly in FIG. 17. The housing has a generally flat receiving area 30 which is shallow and includes a floor 30a, a pair of side walls 30b, an open end 30c and a closed or dead end 30d. The receiving area receives a smaller size standard memory card ("smaller card"), generally designated 32 (Figs. 8-12). The smaller card is inserted into receiving area 30 in the direction of arrow "D" in FIG. 1. A semi-circular engagement recess 34 is formed at one side of the
receiving area, and an engagement protrusion 36 is formed at an opposite side of the receiving area. A card guide arm 38 projects outwardly at the open end 30c of the receiving area.

Adapter 20 is grasped by an operator at a grasping end 40 of housing 28. To facilitate gripping the housing, a shallow area 40a is formed at the top of grasping end 40, and a deeper recess 40b is formed at a bottom of the grasping end. A clamping member, generally designated 42, is mounted on housing 28 for holding a smaller card 32 in receiving area 30 of the housing. The clamping member is fabricated of spring metal material and is mounted in a mounting section 44 of housing 28. Clamping member 42 is generally L-shaped in cross-section and includes a first leg which defines a clamping portion 42a and three fixing portions or legs 42b which extend generally at right angles to clamping portion or leg 42a. Clamping portion 42a is generally flat and has a width equal to the width "W1" of receiving area 30. The clamping portion is cantilevered from fixing portions 42b forwardly into receiving area 30. A pair of side resilient walls 42c are integral with and depend at right angles to clamping portion 42a at opposite side edges thereof. Fixing portions 42b are press-fit into three slits 46 in mounting section 44 of the housing. The clamping portion is formed with an integral stiffening rib 42d.

The floor 30a of receiving area 30 slopes downwardly from open end 30c toward dead end 30d to facilitate insertion of smaller card 32 into the receiving area and under clamping portion 42a of clamping member 42. In addition, the sloping of floor 30a prevents top surface 42d of clamping portion 42a from projecting above side walls 30b of the receiving area when the smaller card is inserted into the adapter. Finally, a recess 48 is formed in floor 30a and spans the width of the floor.

Referring to FIGS. 8-12, smaller size standard memory card 32 is generally rectangular and has a width "W2" (Fig. 8) generally equal to width "W1" (Fig. 1) of receiving area 30 in housing 28 of adapter 20. The smaller card has a top surface 50 and a bottom surface 52. A plurality of contact pads 54 are arranged in a parallel array in bottom surface 52 at the front of the smaller card. An engagement recess 56 is formed at one side of the card and a semicircular engagement recess 58 is formed at the opposite side of the card. A guide slot 60 for receiving guide arm 38 opens at the trailing edge of the card outside contact pads 54.

FIGS. 13 and 14 show smaller card 32 properly inserted into receiving area 30 of adapter 28 to form a memory card module, generally designated 62. It can be seen that the smaller card
is inserted under the spring loaded clamping portion 42a of clamping member 42. Contact pads 54 of the memory card are exposed at open end 30c of receiving area 30.

FIGS. 15(a)-15(c) show smaller card 32 being inserted obliquely in the direction of arrow “E” into receiving area 30 of adapter 20. The leading edge of the smaller card is inserted into recess 48 in floor 30a of the receiving area and under clamping portion 42a of clamping member 42. The leading edge of the smaller card is inserted in the direction of arrows “F” under the clamping portion while the trailing edge of the smaller card is pivoted downwardly in the direction of arrow “F” as seen in FIG. 15(c). Once fully inserted, the smaller card 32 is positioned within receiving area 30 as described above in relation to FIGS. 13 and 14. Clamping portion 42d of the spring metal clamping member 42 holds the smaller card down onto floor 30a within receiving area 30. Engagement protrusion 36 (Fig. 1) within receiving area 30 of housing 28 interengages within engagement recess 56 (Fig. 8) of smaller card 32 to prevent the card from pulling out of receiving area 30.

FIG. 16 shows smaller card 32 inserted into adapter 20 in an erroneous orientation (i.e., upside-down). When so wrongly inserted, engagement projection 36 prevents the memory card from seating onto floor 30a of the receiving area. This makes is quite apparent to an operator that the smaller card must be reoriented.

FIG. 17 shows memory card module 32, including adapter 20 and smaller card 32, alongside the larger size standard memory card 26. It can be seen that module 62 is substantially the same size and configuration as the larger card. Therefore, either the larger card can be inserted in the direction of arrow “G” into receptacle 24 of memory card connector 22, or module 62 can be inserted into receptacle 24 in the direction of arrow “H”. If either the large card or the module is inserted, the connector has an eject mechanism, generally designated 70, which engages within semi-circular recess 58 of the smaller card or a semicircular recess 72 of the larger card to eject the card or the module as is known in the art. The larger card has contact pads 74, like contact pads 54 of the smaller card, for engaging appropriate contacts within memory card connector 22.

FIGS. 18 and 19 show memory card module 62 in the process of being inserted into memory card connector 22 in the direction of arrow “T” (Fig. 18). The module is shown fully inserted into the connector in FIG. 19.
It will be understood that the invention may be embodied in other specific forms without departing from the spirit or central characteristics thereof. The present examples and embodiments, therefore, are to be considered in all respects as illustrative and not restrictive, and the invention is not to be limited to the details given herein.
CLAIMS:

What is claimed is:

1. An adapter for a memory card connector which includes a receptacle for receiving a larger size standard memory card, comprising:
   a housing having a shape on the order of that of the larger size standard memory card for insertion into the receptacle of the connector and including a generally flat receiving area for receiving a smaller size standard memory card for insertion with the housing into said receptacle;
   a clamping member on the housing for holding the smaller size standard memory card in said receiving area of the housing; and
   interengaging means between the housing and the smaller size standard memory card to prevent the card from pulling out of the receiving area.

2. The adapter of claim 1 wherein said clamping member is oriented to hold the smaller size standard memory card in a direction generally perpendicular to the generally flat receiving area.

3. The adapter of claim 1 wherein said interengaging means are oriented to prevent the smaller size standard memory card from pulling out of the generally flat receiving area in a direction generally parallel thereto.

4. The adapter of claim 1 wherein said housing is fabricated of dielectric material.

5. The adapter of claim 1 wherein said clamping member is fabricated of metal material.

6. The adapter of claim 1 wherein said clamping member is spring loaded to bias the clamping member into engagement with the smaller size standard memory card.
7. The adapter of claim 1 wherein said interengaging means comprise a projection on one of the housing or the smaller size standard memory card positionable in a recess in the other of the housing or card.

8. The adapter of claim 1 wherein said generally flat receiving area is at one end of the housing, the receiving area being shallow with a dead end, an open end and opposite side walls extending between the ends.

9. The adapter of claim 8 wherein said clamping member is located at the dead end of the receiving area.

10. The adapter of claim 9 wherein said interengaging means are located at one side wall of the receiving area.

11. The adapter of claim 10 wherein said interengaging means are located near the open end of the receiving area.

12. The adapter of claim 9 wherein said clamping member has a generally flat clamping portion, and a floor of said generally flat receiving area slopes downwardly from the open end to the dead end thereof so that said clamping portion does not extend excessively above the housing.

13. The adapter of claim 1 wherein said clamping member has a width generally the same as that of smaller size standard memory card.

14. The adapter of claim 1 wherein said clamping member is fabricated of spring metal material and includes a fixing portion fixed to the housing and an integral clamping portion for clamping onto the smaller size memory card.
15. The adapter of claim 14 wherein said spring metal clamping member is generally L-shaped defined by a pair of generally perpendicular legs defined by said fixing and clamping portions of the clamping member.

16. An adapter for a memory card connector which includes a receptacle for receiving a larger size standard memory card, comprising:
   
   a dielectric housing having a shape on the order of that of the larger size standard memory card for insertion into the receptacle of the connector and including a generally flat receiving area for receiving a smaller size standard memory card for insertion with the housing into said receptacle;

   a metal clamping member on the housing for holding the smaller size standard memory card in said receiving area of the housing, the clamping member being spring loaded to bias the clamping member into engagement with the smaller size standard memory card, and the clamping member being oriented to hold the smaller size memory card in a direction generally perpendicular to the generally flat receiving area; and

   interengaging means between the housing and the smaller size standard memory card to prevent the card from pulling out of the receiving area, said interengaging means being oriented to prevent the smaller size standard memory card from pulling out of the generally flat receiving area in a direction generally parallel thereto.

17. The adapter of claim 16 wherein said generally flat receiving area is shallow with a dead end, an open end and opposite side walls extending between the ends.

18. The adapter of claim 17 wherein said clamping member is located at the dead end of the receiving area.

19. The adapter of claim 18 wherein said interengaging means are located at one side wall of the receiving area.

20. The adapter of claim 19 wherein said interengaging means are located near the open end of the receiving area.
21. The adapter of claim 20 wherein said interengaging means comprise a projection on one of the housing or the smaller size standard memory card positionable in a recess in the other of the housing or card.

22. The adapter of claim 18 wherein said clamping member has a generally flat clamping portion, and a floor of said generally flat receiving area slopes downwardly from the open end to the dead end thereof so that said clamping portion does not extend excessively above the housing.

23. The adapter of claim 16 wherein said clamping member has a width generally the same as that of smaller size standard memory card.

24. The adapter of claim 16 wherein said clamping member includes a fixing portion fixed to the housing and an integral clamping portion for clamping onto the smaller size memory card.

25. The adapter of claim 24 wherein said spring metal clamping member is generally L-shaped defined by a pair of generally perpendicular legs defined by said fixing and clamping portions of the clamping member.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06K7/00  G06K19/077

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 G06K HOIR

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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
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<td>X</td>
<td>DE 93 10 093 U1 (ROH-WEDER, ROMAN, 47229 DUISBURG, DE) 19 August 1993 (1993-08-19) page 4, line 9 - page 5, line 33; figures 1-5</td>
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<td>X</td>
<td>DE 197 51 803 A1 (WIELER, TOBIAS, 82024 TAUFKIRCHEN, DE; KÖHN, THOMAS, 82024 TAUFKIRCHEN) 27 May 1999 (1999-05-27) abstract</td>
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Patent family members are listed in annex.

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Date of the actual completion of the international search: 11 February 2005

Date of mailing of the international search report: 21/02/2005

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