Abstract: A device supports a separate keyboard and flat panel electronic display, such as a tablet touch screen computer, on common arched member. The keyboard position and monitor orientation are each independently adapted on arched member, being support by a first and second mounting bracket respectively. The first mounting bracket is a key board tray that slidably translates along the arch to optionally dispose the keyboard between a first horizontal position ready for use at the lower portion of the arch, and a second position proximal to the top of the arch in which the keyboard and tray is vertical and disposed behind the second mounting bracket. The second mounting bracket accepts a flat panel monitor, tablet computer or a generally planar case protecting the same, and preferably includes a docking connector to provide signal connection between the monitor and the keyboard. A protective case for a tablet display device is sealed to prevent accidental ingestion of flammable gas by static charge. The protective case preferably includes a means for engaging the display device in a remote docking station in a safe location, for charging and/or connection with I/O device, without removing the display device. The protective case also preferably deploys a slightly conductive transparent cover for compatibility with capacitive touch screen table devices.
(84) Designated States (unless otherwise indicated, for every
Mod of regional protection available): ARIPO (BW, GH,
GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ,
UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ,
TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK,
EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU,
LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK,
SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ,
GW, KM, ML, MR, NE, SN, TD, TG).

**Declarations under Rule 4.17:**

— as to the identity of the inventor (Rule 4.17(i))
— as to applicant’s entitlement to apply for and be granted
  a patent (Rule 4.17(ii))
— as to the applicant’s entitlement to claim the priority of
  the earlier application (Rule 4.17(iii))
— of inventorship (Rule 4.17(iv))

**Published:**

— with international search report (Art. 21(3))

SD, SE, SG, SK, SL, SM, ST, SY, TH, TJ, TM, TN,
TR, TT, TZ, UA, US, UZ, VC, VN, ZA, ZM, ZW.
Specification for a PCT (International) Patent Application for:

PLANAR ELECTRONIC DISPLAY MOUNT
WITH ADJUSTABLE KEYBOARD TRAY

Cross Reference to Related Applications

The present application claims the benefit of priority to the US provisional patent application having serial number 61/658,018 for a "RUGGEDIZED MOBILE DIGITAL COMPUTER MOUNT HAVING INTEGRATED TABLET COMPUTER MOBILE DOCKING STATION AND RETRACTABLE KEYBOARD SLIDE" that was filed on June 11, 2012, and is incorporated herein by reference.

Background of Invention

The present invention relates generally to keyboard and electronic display mounting systems, including mobile data terminals for use in in-vehicle computing and fleet computing, and more particularly to ruggedized mobile data terminal mounting apparatus, and still more particularly to a ruggedized mobile data terminal mounting device for a mobile digital computer having an integrated tablet computer docking station easel and retractable keyboard clamp and slide.

Background Discussion: Ruggedized laptop and mobile digital computer systems are well known. The use of mobile digital computers in civilian agency vehicles, notably police, fire, and ambulance, requires systems that are secure, easy to deploy, extremely durable, and capable of operation in extremely harsh environments. Frequently, ruggedized systems are designed under military construction specifications (e.g., MIL-STD 810E) having
performance standards based on use in environments considerably more harsh
that those encountered in civilian environments.

[0004] Many mounting systems for ruggedized laptops and other mobile digital
computers have been devised. However, tablet computers having touch screen
interfaces for user input are increasingly used for in-vehicle and fleet
computing purposes, and touch screen input using touch screen keyboards or
keypads is mechanically inferior to input on a standard discrete physical
qwerty keyboard or keypad. Therefore, it would be desirable to have a mobile
docking station easel for displaying a tablet computer with touch screen
functionality along with a retractable keyboard slide assembly for input using
a standalone keyboard operatively connected to the tablet when it is mounted
on the docking station.
Summary of Invention

[0005] In the present invention, the first object is achieved by providing a ruggedized mobile data terminal mounting apparatus for an in-vehicle and fleet computing mobile digital computer, said mounting apparatus comprising a mounting bar having at least an arcuate portion; the arcuate portion having a lower portion that is substantially horizontal and an upper portion that is substantially vertical, a retractable keyboard clamp assembly slideably mounted on said mounting bar and having a fully retracted position and a fully deployed position and an indeterminate number of positions therebetween; and a tablet computer docking station easel disposed at an upper end of said mounting bar; wherein when said keyboard clamp assembly is in the fully retracted position, a keyboard mounted on said keyboard clamp assembly is positioned behind said tablet computer docking station in a generally vertical orientation, and when said keyboard clamp assembly is in the fully deployed position, a keyboard mounted on said keyboard clamp assembly is positioned under said tablet computer docking station in a generally horizontal orientation for easy user input.

[0006] A second aspect of the invention is planar display enclosure comprising a generally planar plate shaped receptacle having a cavity defined between an inner bottom surface and connected surrounding upright walls, and an outer bottom surface disposed opposite the inner bottom surface, wherein the upper surface of the upright walls provide a rim surrounding the cavity, and a transparent cover plate adapted for sealed engagement with the rim of the receptacle, a partially removable portal in the surrounding upright wall, which is responsive to an externally engaged actuator means coupled to partially open the portal.

[0007] Another aspect of the invention is a planar display docking system comprising a planar display enclosure having; a generally planar plate shaped receptacle having a cavity defined between an inner bottom surface and connected
surrounding upright walls, and an outer bottom surface disposed opposite the
inner bottom surface, wherein the upper surface of the upright walls provide a
rim surrounding the cavity, a transparent cover plate adapted for sealed
engagement with the rim of the receptacle, a partially removable portal in the
surrounding upright wall, an easel shaped docking station having adapter to
receive and support the planar display enclosure, the docking station having;
an upright support face having a front surface and an opposing rear surface, a
front ledge connected to extend orthogonally from the front surface of the
upright support face, a multi-pin connector disposed on the front ledge and
oriented with at least one of pins and sockets extending upward in the
direction of the upright support face, the front surface of the upright support
face having at least one of rails and channels that slidingly engage a
complimentary structure on the outer bottom surface of the receptacle, in
which the insertion of at least one rail in a channel urges an actuator means to
dispose at least a portion of the partially removable portal away from the
upright wall of the receptacle before the corresponding portion of the upright
wall contacts the multi-pin connector.

The above and other objects, effects, features, and advantages of the present
invention will become more apparent from the following description of the
embodiments thereof taken in conjunction with the accompanying drawings.
Brief Description of Drawings

[0009] FIG. 1A is an upper front left perspective view showing the mounting system of the present invention, showing the keyboard and keyboard slide in a fully retracted position.

[0010] FIG. 1B is the same view showing the system with the keyboard deployed fully forward;

[0011] FIG. 1C is a partially exploded upper front left perspective view showing the keyboard slide removed from the arcuate mounting bar;

[0012] FIG. 2A is a side view in elevation showing the keyboard in a fully retracted position, this view corresponding to FIG. 1A;

[0013] FIG. 2B shows the keyboard deployed fully forward, this view corresponding with FIG. 1B;

[0014] FIG. 3A is a front view in elevation corresponding to FIGS. 1A and 2A;

[0015] FIG. 3B is a front view in elevation corresponding to FIGS. 1B and 2B;

[0016] FIG. 4A is a top plan view corresponding to FIGS. 1A, 2A, and 3A; and

[0017] FIG. 4B is a top plan view corresponding to FIGS. 1B, 2B, and 3B.

[0018] FIG. 5 is a perspective exterior view of an alternative embodiment of the device supporting an enclosed tablet computer with an external keyboard.

[0019] FIG. 6 is a perspective exterior view of an alternative embodiment of the device supporting an enclosed tablet computer with an external keyboard in which the enclosed tablet is disposed in a landscape format.
FIG. 8A is a rear elevation view of the tablet computer enclosed in the protective case supported on the pivoting mount, whereas FIG. 8B is a cross-sectional elevation view thereof;

FIG. 9 is an exploded rear perspective view of the lower rear portion of the protective case.

FIG. 10A is a front perspective view of the pivoting mount, whereas FIG. 10B and 10C are front and side elevations views thereof respectively;

FIG. 11A is a rear perspective view of the pivoting mount, whereas FIG. 11B is a rear elevations views thereof;
Detailed Description

[0024] Referring now to FIGS. 1A through 1IB, wherein like numbers refer to identical elements in the various views, the present invention is a ruggedized mobile data computer mounting system having an integrated table computer easel and retractable keyboard slide.

[0025] In accordance with one aspect of the present invention, generally denominated herein, includes an arcuate mounting bar 12, having left and right side channels 14a, 14b extending from a bottom end 16 of the mounting bar to an upper portion 18 of the mounting bar. At the upper end 20 of the mounting bar, a tablet computer docking easel 22 is attached, the docking easel including an upper clamping member 24 affixed to the mounting bar for holding the upper edge 26 of a tablet computer 28, and a lower clamping member 32, including a shelf portion 34, and a retaining lip 36 for engaging and capturing the lower edge 38 of the tablet computer.

[0026] Incorporated in generally the middle of the shelf portion of the lower clamping member are a docking connector for coupling with the docking station receptacle in the tablet computer. These are well known and not shown in the views. Electronics for the docking station are disposed in the shelf and back support portions of the docking station easel, and wires for connecting the mobile data computer to in-vehicle peripheral devices, systems, and computers are routed over and/or through the mounting bar.

[0027] The mounting bar further includes a mounting boss 40 having a plurality of holes for coupling to a dash mount swing arm. Thus, ergonomics can be closely tailored to user needs.

[0028] The retractable keyboard slide assembly includes a right side 42 having a first sliding pin 44 fixed in the right side and an end portion 46 slidably inserted into the right side channel 14b of mounting bar 12. A left side 48 of the slide
assembly includes a second sliding pin 50 threadably inserted through the left side and an interior end portion 52 slidably extending from the left side and slidably disposed in the left side channel 14a of the mounting bar 12. An adjustment knob 54 coupled to an exterior end of the second pin enables a user to selectively loosen the slide assembly for any translation within the channels to any position along the length of the channels and thereafter to be fixed in the selected position, as is shown in the various views.

The slide assembly next includes a proximal clamping member 56 for engaging and capturing an upper edge 58 of a keyboard 60, and a distal clamping member 62 for engaging and clamping a lower edge 62 of the keyboard.

In this way, a mobile data computer can be provided with a fully retractable keyboard tray integrated with a table computer docking station for in-vehicle and fleet computing in a space-saving and ergonomically sound manner.

In another embodiment of the invention, illustrated in FIG. 5-11, the tablet shaped electronic display is contained in a ruggedized housing or protective case 100 that mounts on the easel portion 200 of the device. The housing 100 is adapted to accommodate the external access to the docking station receptacle of the electronic display or tablet computer, via a portal 130 that is optionally is partially removable, meaning that it swings, tilts or slides to at least partially open to allow access to the enclosed electronic device.

The protective case 100 has generally planar plate shaped receptacle 110 having a cavity 101 defined between an inner bottom surface 111a and connected surrounding upright walls 112, and an outer bottom surface 111b disposed opposite the inner bottom surface 111a, wherein the upper surface of the upright walls 112 provide a rim 113 surrounding the cavity 101 at the top thereof.

A transparent cover plate 120 is adapted for sealed engagement with the rim 113 of the receptacle. A partially removable portal 130 in the surrounding
upright wall 112 opens in response to an externally engaged actuator means. Gasket 134 is preferably disposed between the partially removable portal 130 and the outer bottom surface 111b or wall 112 of the receptacle 110.

The cover plate 120 of the receptacle has a bezel 121 with one of more contact switches 123 to engage complimentary switches on the display 28. Further, transparent material between the inner perimeter of the bezel 121 to form the front of the cover plate 120. In the case of capacitive touch screen display, this material is an at least semi-conductive transparent material is preferably Invisishield™ brand screen protectors available from ZAGG, Inc. 3855 So. 500 W. Suite B Salt Lake City, UT 84115-4279. Further, a supportive device cushion 119 is disposed the bottom of the cavity 101. Hence, display 28 is held between cushion 119 and bezel 121. Further, a gasket 124 is disposed between the cover plate 120 and the rim 113 to seal the cavity 101. The case 100 is optionally sealed closed by the insertion of nuts through a plurality of bolt receiving through 126 holes disposed about perimeter of the bezel of the transparent cover plate. The bolts then engage the threaded bores 116 disposed in a complimentary arrangement about the perimeter of the rim 113 of the receptacle. However, other closure means such as clamps and latches may be deployed.

A more preferred embodiment of the invention is a protective case 100 holding the tablet or planar display 28 which is adopted to be received in a mounting easel 200. In contrast to the other embodiment, rather the engaging the display or display protective case in top and bottom clamping members, the easel 200 includes one or more vertical rails or tracks that engage a complementary member on the display or a protective case for the display. More particularly, easel shaped mount 200 illustrated in FIG. IOA-IOC with a front ledge 211 connected to extend orthogonally from an upright support face 210. The front ledge includes a multi-pin connector 220. The upright support has at least one of rails and channels that slidingly engage the complimentary structure on the outer bottom surface of the receptacle. The insertion of at
least one rail and channel urges an actuator means to open a pivoting partially portal to open a bottom edge of the receptacle.

[0036] The easel 200 also provides a means for locking the receptacle or case 100 to the docking station. In one embodiment the locking means is an adjustable arm 260 connected in hinged engagement to the rear portion 210b of the upright support face 210. Arm 260 also includes an engaging lateral portion 261 which extends through a slot 262 in the supporting face of the easel into a notch or cavity 161 in the rear face 111b of the case 100.

[0037] The outer bottom surface of the receptacle 111b has a pair of linear outer channel 116a and 116b extending upward from the lower edges, with the partially removable portal 130 in hinged engagement between them having the opening face adjacent the lower edge. A central channel 115 is disposed above the hinged connection of the portal 130. The partially removable portal 130 in the surrounding upright wall 113 of the receptacle is connected by hinges 137.

[0038] An actuator is engaged when rails one of the rails enter one or more of the channels. A preferred actuator is provided in part by one or more linear channels on the outer bottom surface of the receptacle. The upright support 210 has outer rails 216a and 216b configured to slidingly engage the outer channels 116a and 116b. The outer channels 116a and 116b have fan shaped openings 116a’ and 116b’ at the lower edge of the receptacle 100, which aid to guide the display or tablet device housed in receptacle 110 downward such that the docking connector thereof is properly oriented to engage multi-pin connector 210. After the case 100 engages rails 216a and 216b, the portal 130 is urged open by the upper edge 215a of a central rail contacting the portion 130a of the door or portal 130 above hinge 137. After door 130 swings open, the central rail 215 engages the central channel 115. When the receptacle or case 100 is removed from support 200, the portal 130 swings closed in response to the torsion spring 136 coupled to the hinge axle 218. The hinge axle 118 is held in place by a pair of L-shaped brackets 270 that attach to the bottom edge of the case 100.
In another embodiment of the invention, illustrated in FIG. 5-11, the easel 200 clamping the display or tablet protective case 100 is connected to the arched mounted via a mounting member 300 that is adjustable to rotate by at least 90 degrees, and hence rotate the display between a portrait and landscape orientation. A preferred embodiment of the pivoting means provided by a pair of spaced apart columns 241 and 242 extending outward from the rear 210b of the upright support face 210 which extend through a pair of orthogonally disposed curved tracks 341 and 342 formed in a fixed support plate. The top of the columns 241 and 242 that extend through the tracks are capped by retaining disks 245. The pair of tracks are offset so that as the receptacle 100 and docking station 200 are rotated the columns 241 and 242 are urged to progress from a latched position at one end of the tracks 341 and 342 respectively to another latched position at the opposite end. The tracks 341 and 342 have a curvilinear shape that connects to offset linear section at opposing ends. The linear opposing ends of the tracks are orthogonally disposed in the plane of mount 300. Alternative pivoting means include a simple rotary connector with rotation limit stop to prevent the display from rotating at least beyond a full circle, and thus twist and hardwire connections to the multi-pin docking fixture.

While the invention has been described in connection with a preferred embodiment, it is not intended to limit the scope of the invention to the particular form set forth, but on the contrary, it is intended to cover such alternatives, modifications, and equivalents as may be within the spirit and scope of the invention as defined by the appended claims.
Claims

We claim:

[cl] A ruggedized mobile data terminal mounting apparatus for an in-vehicle and fleet computing mobile digital computer, said mounting apparatus comprising:

5  a) a mounting bar having at least an arcuate portion; the arcuate portion having a lower portion that is substantially horizontal and an upper portion that is substantially vertical,

b) a retractable keyboard clamp assembly slideably mounted on said mounting bar and having a fully retracted position and a fully deployed position and an indeterminate number of positions therebetween; and

c) a tablet computer docking station easel disposed at an upper end of said mounting bar;

d) wherein when said keyboard clamp assembly is in the fully retracted position, a keyboard mounted on said keyboard clamp assembly is positioned behind said tablet computer docking station in a generally vertical orientation, and when said keyboard clamp assembly is in the fully deployed position, a keyboard mounted on said keyboard clamp assembly is positioned under said tablet computer docking station in a generally horizontal orientation for easy user input.

[c2] The ruggedized mobile data terminal mounting apparatus of claim 1, further including a mounting boss for connection to a dash mounted swing arm.

[c3] The ruggedized mobile data terminal mounting apparatus of claim 1, wherein said mounting bar includes an arcuate portion and a generally straight portion.

[c4] The ruggedized mobile data terminal mounting apparatus of claim 1, wherein said mounting bar includes right and left channels, and said retractable keyboard clamp assembly includes right and left sides, a first pin disposed through one of said right or left sides and having an end extending from said side so as to be slidably inserted
into one of said right or left channels, a second pin threadly disposed through the
other of said right or left side and having an interior end extending from said side
and slidably disposed in the other of said right or left channels and an adjustment
knob disposed on an exterior end of said second pin, and clamps for capturing and
retaining a keyboard.

[c5] The ruggedized mobile data terminal mounting apparatus of claim 1, further
including a docking connector for coupling with a docking station receptacle in a
tablet computer or other connected device.

[c6] The ruggedized mobile data terminal mounting apparatus of claim 5, wherein
docking station mounting easel includes an upper clamping member and a lower
clamping member having a shelf portion, and wherein said docking connector is
disposed generally in the middle of said lower clamping member.

[c7] The ruggedized mobile data terminal mounting apparatus of claim 6, wherein wires
connecting said docking connector to in-vehicle peripheral devices, systems, and
computers are routed over and/or through the mounting bar.

[c8] A planar display enclosure comprising:
   a) A generally planar plate shaped receptacle having a cavity defined between an
       inner bottom surface and connected surrounding upright walls, and an outer
       bottom surface disposed opposite the inner bottom surface, wherein the upper
       surface of the upright walls provide a rim surrounding the cavity,
   b) a transparent cover plate adapted for sealed engagement with the rim of the
       receptacle,
   c) a partially removable portal in the surrounding upright wall, which is responsive
to an externally engaged actuator means coupled to partially open the portal.

[c9] A planar display docking system comprising:
   a) a planar display enclosure having:
      i) generally planar plate shaped receptacle having a cavity defined between
         an inner bottom surface and connected surrounding upright walls, and an
outer bottom surface disposed opposite the inner bottom surface, wherein the upper surface of the upright walls provide a rim surrounding the cavity,

ii) a transparent cover plate adapted for sealed engagement with the rim of the receptacle,

iii) a partially removable portal in the surrounding upright wall,

b) an easel shaped docking station having adapter to receive and support the planar display enclosure, the docking station having;

i) an upright support face having a front surface and an opposing rear surface, a front ledge connected to extend orthogonally from the front surface of the upright support face,

ii) a multi-pin connector disposed on the front ledge and oriented with at least one of pins and sockets extending upward in the direction of the upright support face,

c) the front surface of the upright support face having at least one of rails and channels that slidingly engage a complimentary structure on the outer bottom surface of the receptacle, in which the insertion of at least one rail in a channel urges an actuator means to dispose at least a portion of the partially removable portal away from the upright wall of the receptacle before the corresponding portion of the upright wall contacts the multi-pin connector.
A. CLASSIFICATION OF SUBJECT MATTER

G06F 1/16 (2006.01)

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)

G06F 1/16; H03M 11/00; H03K 13/00; H03K 17/94; B60R 7/00

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

Japanese utility models and applications for utility models

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

eKOMPASS/KIPO internal & Keywords: mount, planar display, keyboard tray, docking easel, slider.

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
<thead>
<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>US 2006-0071820 AI (LICHCEN WANG et al.) 06 April 2006</td>
<td>1-7</td>
</tr>
<tr>
<td></td>
<td>See paragraphs [0039] - [0040]; [0042]; [0044]; [0045]; [0049]; [0060]; and figs. 1A-1D, 2C-2D, 5A, 6A-6B, 17.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>US 2008-0285213 AI (MIN-LIANG TAN et al.) 20 November 2008</td>
<td>1-7</td>
</tr>
<tr>
<td></td>
<td>See paragraphs [0001H0011]; and figs. 8-10.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>US 6386413 BI (ROBERT H. TWYFORD) 14 May 2002</td>
<td>1-7</td>
</tr>
<tr>
<td></td>
<td>See column 1, lines 1-67; column 2, lines 1-29; and figs. 1-2.</td>
<td></td>
</tr>
<tr>
<td>X</td>
<td>US 2005-0243505 AI (LOUIS R. JACKSON JR.) 03 November 2005</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>See paragraphs [0016] - [0017]; [0019]; [0021]; [0020H0043]; and figs. 1-2, 8.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>See paragraphs [0006]; [0036]; [0037]; [0041]; and fig. 1.</td>
<td></td>
</tr>
<tr>
<td>A</td>
<td>US 06108200 A (ROBERT L. FULLERTON) 22 August 2000</td>
<td>8-9</td>
</tr>
<tr>
<td></td>
<td>See column 1, lines 12-67; column 2, lines 1-67; column 3, lines 1-17; and figs. 1, 6.</td>
<td></td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

Date of the actual completion of the international search

26 September 2013 (26.09.2013)

Date of mailing of the international search report

26 September 2013 (26.09.2013)

Name and mailing address of the ISA/KR

Korean Intellectual Property Office

189 Cheongsa-ro, Seo-gu, Daejeon Metropolitan City, 302-701, Republic of Korea

Facsimile No. +82-42-472-7140

Authorized officer

LEE Dong Yun

Telephone No. +82-42-481-8734

Form PCT/ISA/210 (second sheet) (July 2009)
**Box No. II  Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)**

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. □ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. □ Claims Nos.: because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. □ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

**Box No. III  Observations where unity of invention is lacking (Continuation of item 3 of first sheet)**

This International Searching Authority found multiple inventions in this international application, as follows:

1. □ Claims 1-7 relate to a mounting apparatus comprising a mounting bar, retractable keyboard clamp assembly, tablet computer docking station easel.
2. □ Claims 8-9 relate to a planar display docking station comprising planar display enclosure, easel shaped docking station.

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>□ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>□ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>□ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:</td>
<td></td>
</tr>
<tr>
<td>4.</td>
<td>□ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:</td>
<td></td>
</tr>
</tbody>
</table>

**Remark on Protest**

□ The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.

□ The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.

□ No protest accompanied the payment of additional search fees.
<table>
<thead>
<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
<th>Publication date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>US 2006-0192689 Al</td>
<td>31/08/2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 6999008 B2</td>
<td>14/02/2006</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 7479902 B2</td>
<td>20/01/2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CN 101356489 B</td>
<td>22/08/2012</td>
</tr>
<tr>
<td></td>
<td></td>
<td>KR 10-2008-0080159 A</td>
<td>02/09/2008</td>
</tr>
<tr>
<td></td>
<td></td>
<td>WO 2003-006873 A8</td>
<td>11/12/2003</td>
</tr>
<tr>
<td></td>
<td></td>
<td>US 2008-0024971 Al</td>
<td>31/01/2008</td>
</tr>
<tr>
<td>US 2007-0035917 Al</td>
<td>15/02/2007</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>US 06108200 A</td>
<td>22/08/2000</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>