(21) International Application Number:
PCT/SE2006/000909

(22) International Filing Date: 25 July 2006 (25.07.2006)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:


(72) Inventor; and
(75) Inventor/Applicant (for US only): ARBOIX, Esteban [FTVSE]; Gransgatan 1, S-172 78 Sundbyberg (SE).

(74) Agents: RAIVIO, Jaana et al.; Krensell & Wennborg KB, Box 27834, S-115 93 Stockholm (SE).

(51) International Patent Classification:
G09B 29/10 (2006.01) GO/5 5/14 (2006.01)


(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published: — with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: APPARATUS AND SYSTEM FOR DISPLAYING NAVIGATION INFORMATION

(57) Abstract: The invention is related to a projector for projecting images onto a projection surface. The projector 1 comprises means 2 for reception of navigation signals, and means 3 for processing the navigation signals into navigation information. The projector 1 is arranged to project the navigation information on the projection surface 5. The invention is also related to such system.
Apparatus and system for displaying navigation information

Field of the invention

The present invention is related to the field of displaying means, and in particular a projector comprising means for displaying navigation information.

Background of the invention

GPS (Global Positioning System) is a well-known system and includes a number of satellites orbiting the earth and constantly transmitting signals. The transmissions include time indications and enable a receiver on earth, receiving signals from several satellites, to calculate its position typically to within some metres by combining data received from different satellites. Other data, besides latitude and longitude, may also be calculated, for example velocity, distances and altitude. A general and much appreciated application of GPS is for navigation purposes. GPS navigators usually comprise a receiver unit with an antenna for receiving signals transmitted from the GPS satellites, a display for displaying a chart, navigation chart and/or directions to a certain destination, and software for performing said functions.

There is a multitude of different GPS receivers on the market. There are, for example, portable GPS receivers for use in boats and cars and the like. Generally, making an apparatus portable entails the wish to make them as small as possible, while maintaining them user-friendly, and, of course, ensuring that their functions and purpose are still being fulfilled. A portable GPS receiving unit including a display unit is rather small, and the viewing of for example a nautical chart can therefore be difficult. A larger display unit may be used, but
at the expense of making the GPS navigator larger and thus
less portable and consequently less attractive to bring along.
Moreover, when using a portable GPS at sea there is also the
risk of dropping it into the sea, particularly under stormy
weather.

There are also larger GPS navigation apparatuses for
stationary use, i.e. where the apparatus is fixedly mounted
in, for example, a boat or the like. The display unit can be
made larger and the viewing of charts and the like is thereby
facilitated. However, there are several drawbacks involved
when making the GPS navigators stationary. The user has to buy
several navigators, one for each application, e.g. the car,
the boat etc. Further, since they are expensive they are also
prone to be stolen, whereby the user often chooses to take
expensive precautions for preventing such thefts. Moreover,
the display, often a LCD, is sensitive to cold weather and may
be unreliable in cold environments.

Further yet, to fixedly mount the GPS including the display
gives a very inflexible solution. Mobile environments, such as
a boat, car or other vehicle, and in particular the steering
places of such mobile environments, are often small and have
little space for auxiliary mountings, such as a display.
Specific user requirements, for example specific distance from
the driver's place to the screen, corresponding angles, and
styling preferences may therefore be hard to comply with in
such environments.

Further, the GPS including the display should be mounted near
the driver enabling him or her to properly see the display.
The GPS apparatus is thus exposed to rain and seawater, often
salt water, and measures have to be taken to protect it and
make it watertight. This entails additional costs and inconvenience for the user.

It is also known to connect a GPS signal-receiving module having no display of its own to a separate display, such as a laptop. However, this entails having to bring along several pieces of equipment, and to interconnect them properly, which can be perceived as troublesome and time-consuming. Further, a laptop sized display, although having an acceptable and functional size, may still be perceived as rather limited. Further yet, this entails having to power several different pieces of equipment, and also involves several possible sources of errors and failures.

Thus, it would be desirable to provide improved navigation means, especially in mobile usages, such as boats, caravans and the like.

**Summary of the invention**

An object of the present invention is to provide an apparatus and system overcoming the above-described problems.

A further object of the invention is to provide a handy and portable all-in one device for facilitating navigation, especially on sea.

These objects, among others, are achieved by a projector as claimed in claim 1, and by a system as claimed in claim 7.

In accordance with the present invention the above-mentioned objects are achieved by a projector for projecting images onto a projection surface. The projector comprises means for receiving navigation signals and means for processing the navigation signals into navigation information. The projector is used for displaying the navigation information on a
projection surface. By means of this innovative modification of a state-of-the-art projector an excellent displaying means is provided, enabling a user to most conveniently bring along a small and handy portable navigation apparatus, having display means the size of which may be easily varied. The projector may be installed on a boat and used in order to display nautical charts or the like on an optional surface or screen. Further, the projector in accordance with the invention may be used for displaying other information, a movie or the like, thus used as a conventional projector. A very flexible navigation means is thus provided, having a multi-purpose advantage.

In accordance with an embodiment of the invention, the means for the reception of navigation signals and the means for processing the navigation signals are integrated into a single module, the module in turn integrated within the projector. Thereby a handy all-in-one device for displaying navigation information is provided, needing only to be connected to a power source and involving no interconnecting steps of connecting several different devices.

In accordance with another embodiment of the invention, the means for reception of navigation signals comprises a GPS receiving unit. In alternate embodiments the means comprises a Galileo, GLONASS or LORAN receiving unit. Accurate and readily available navigation signals are thus used, increasing the usability of the invention and providing great flexibility.

In accordance with yet another embodiment of the invention the projector comprises means for front projection and rear projection. Such dual-mode projector provides a multifunctional feature to the invention, in that it can be used for showing a movie or when surfing the Internet, as well as the displaying of nautical charts or the like. If using
such dual-mode projector it may be fixedly mounted and still be used for both applications. Further, the projector may be placed inside a boat, protected against wind and weather without having to take any additional measures to make it weatherproof, and still enabling the driver to see a nautical chart or the like when rear projection is used.

In accordance with yet another embodiment of the invention the processing of the navigation signals comprises converting the received navigation signals from a satellite-based reference system into a land-based reference system. A displaying of nautical charts or maps or the like is thereby enabled, providing the much appreciated GPS-application.

The present invention is also related to a system comprising such projector, by means of which advantages similar to the above described are achieved.

Further characteristics of the invention, and advantages thereof, will be evident from the following detailed description of preferred embodiments of the present invention and the accompanying figures 1-3, which are given by way of illustration only and are not to be construed as limitative of the present invention.

**Brief description of the drawings**

Figure 1 shows schematically the inventive projector.

Figures 2a-2b show schematically the dual-purpose function of the invention, applied in a boat.

Figure 3 shows the embodiment of figures 2a-b in another, partly cut away view.
Detailed description of preferred embodiments

With reference initially to figure 1, the basic, innovative idea of the present invention will be described. The projector 1 in accordance with the invention comprises, in conformity with a conventional projector, an optics system including a light source, illumination optics and projection lens. The one or more light source could for example be a monochrome or polychrome light source. The projector further comprises software and electronics, for example controlling the optical devices and the opto-electro-mechanical system of the projector and ultimately transforming the input signals to an image to be projected. This controlling comprises conventional processing, such as for example controlling gamma correction, as is well known within the field.

Further, a light modulator is included, for creating an image, for example DLP (digital light processing), LCoS (Liquid crystal on Silicon) or LCD (liquid crystal display). In a DLP projector, the image is created by microscopically small mirrors laid out in a matrix on a semiconductor chip, known as a Digital Micromirror Device (DMD). Each mirror represents one pixel in the projected image and the number of mirrors corresponds to the resolution of the projected image. The projector 1 also includes means for converting received image data to an image to be displayed on a projection surface.

The projector 1 in accordance with the invention has to be connected to a power source, for example connected to a wall socket or a car battery or a boat battery. It thus lacks a power source of its own. This is in contrast to handheld projectors or pocket projectors, which utilize an integrated special purpose battery, i.e. does not have to be connected to an external power source, hence their portability. The integrated special purpose battery often constitutes a very
large part of the total size of a portable device, such as a pocket-projector or mobile phone.

However, to project relatively large images with high luminance and high contrast with satisfactory quality, requires the luminous flux (measured in lumen), which is the product of illuminance (measured in lumen/m²) and image size (measured in m²), to be large enough. This luminous flux requirement translates to rather large power consumption. Therefore, the small handheld projectors do not have enough power to be able to display large images with high luminance and hence high power consuming applications. It is therefore not feasible to use a state of the art pocket-projector to display large high quality images, for example larger than about 20".

Stated differently, the small handheld projectors have much smaller light-intensities and are therefore not able to project an acceptable quality of the picture, for larger picture sizes. The light-sources of today have generally a relatively poor efficiency and the image quality is to a high degree proportional to the light-intensity. These pocket projectors therefore tend to project much smaller image sizes to compensate for the lack of power. This is in contrast to the present invention, which is able to project large high quality images. The projector 1 in accordance with the present invention is able to display larger picture sizes, for example 420 mm x 594 mm, with an acceptable image quality. With the current technologies it is not feasible to display a bright enough picture of such size by means of a pocket projector.

In view of the above, the projector 1 in accordance with the invention also comprises power supply unit means for handling the input power. The connection to and use of an external power source enables the projector 1 to be used for showing
large high quality images and other more power consuming applications. This is in contrast to pocket projectors, which lack the ability to display a large high quality image or be used for other applications requiring any large amounts of power, as explained above. The projector 1 may be arranged to operate on an input power of 12 V DC, 24 V DC or any other standard DC-value depending on the application in question. If a transformer is included, which transformer may be external or internal to the power supply unit, 110 V AC and/or 220 V AC may be utilized for the operation of the projector. In an embodiment, the projector is able to operate on input powers varying between 12 V DC and 24 V DC, preferably in addition to input powers of 110 V AC and 220 V AC. The projector is thus able to operate on a variety of different voltages. The projector 1 may thus be connected to an optional, external power source, such as the battery of a boat or a car. By means of this feature, the projector 1 can be brought along and used in several different environments.

The inventive projector 1 further comprises means 2 for receiving navigation signals. The reception means 2 may for example be arranged to receive navigation signals from the existing GPS system, indicated in figure 1 by the dashed line 8. The means 2 thus comprises a GPS receiving unit. DGPS (Differential GPS) may be used for providing higher accuracy, if desired. The projector 1 further comprises means 3 for processing the received navigation signals into navigation information suitable for being displayed on a projection surface 5. The processing means 3 may be any suitable processor unit or circuitry enabling such tasks to be performed. In a preferred embodiment, the reception means 2 and the processing means 3 are integrated into a single module 4, and the module 4 in turn is integrated with the projector 1.
In an alternative embodiment the means 2 for the reception of the navigation signals is located external to the projector 1. In this embodiment, the navigation signals are transferred to the projector 1 by connecting it to a simple GPS receiver having no processing intelligence, but merely the ability to receive and forward navigation information. In this embodiment the projector 1 then comprises the means 3 for processing the navigation signals received by the "dummy" GPS receiver. The navigation signals may be transferred to the projector 1 by means of an USB (Universal Serial Bus) connection, IR connection, Bluetooth connection or the like. In the figure the continuous line 9 schematically indicates such connection. The projector 1 may be adapted for the reception of a plug-in GPS receiver, this being an example of the external means 2 for receiving navigation signals, wherein the projector 1 then comprises interface means for the reception of such a plug-in device.

The projector 1 may further comprise a memory device (not shown) for storing nautical charts, maps and the like, easily downloadable into the projector by connecting the projector to a computer or the like, from which the nautical charts or maps are downloaded. Such memory device may be integrated with the processing means 3, or be connectable to the processing means 3 within the projector 1. It is realised that when a connectable, for example a plug-in, memory device is utilised, there is no need for connecting the projector to a computer also; the downloading of information into the memory has already been done in a prior step. Such memory device may be a USB-memory or the like.

The means 3 (or module 4, if integrated) comprises circuitry for processing the received navigation signals. For example, when performing positioning by means of satellites the
position information obtained from the satellites is related
to the reference system of the satellite system, being a
global one. The user presumably wants to display the position
in a local or national reference system and a transformation
to such system then has to be performed. In accordance with
the invention, this is performed within the inventive
projector 1. Other processing, such as adding road directions
in text, continuously updating and displaying velocity
information, etc. may also be performed.

Figure 1 also illustrates one possible use of the projector in
accordance with the invention, namely for displaying nautical
charts, which will be described more in detail later. In the
figure the current location is indicated by a cross, see arrow
10.

As was mentioned above, a projector comprises several power
consuming parts. The power needed is also a concern as
regarding GPS receivers. The more data that is being processed
in the GPS receiver the more power is consumed and, of course,
the more processing capacity is required. In accordance with
the present invention, the processing means needed for
calculations, such as calculating the position, is provided
integrated with the projector, namely by the means 3 or by the
integrated module 4. The power consumption of the projector 1
may be lessened by, for example, reducing the luminance of the
projector 1. Further, the means for receiving navigation
signals 2 and the processing means 3 may be housed within a
casing (not shown), preferably integrated within the projector
(in which case no special casing is needed), as mentioned
above, but may constitute a separate unit adapted to be
connected to the projector. If such external unit is employed,
it does not need to have a power source of its own, but may be
arranged to be powered by means of the projector when
connected to it. An USB-connection is one possible way to accomplish this. As mentioned earlier, the projector is connected to an external power source, and may be arranged to operate on 12 V DC and/or 24 V DC, preferably in addition to the usually selectable options of 110 V AC and 220 V AC.

With reference now to figures 2a-2b, the projector in accordance with the invention is preferably a projector 1 provided with means for rear projection (illustrated in figure 2a) and front projection (illustrated in figure 2b). Front projection is the most common type of projection, and comprises placing the projector in front of the screen or projection surface 5. The projector 1 may thus be used for showing movies or used as the display means when surfing the Internet or the like. In rear projection, also called back projection, the image is projected through a diffusion screen for example made of translucent or semitransparent material and the image is viewed from the side opposite to the projector, i.e. the imaged is projected onto the screen and viewed on the opposite side. The image obviously has to be reversed, and means to this end is then provided, for example software performing such reversal of the image or using a series of mirrors to project the image onto the screen. This mode is suitable for showing a nautical chart or the like, giving a very large image and greatly facilitating the navigation tasks performed by the driver. In accordance with the invention, such dual-mode projector is preferably used.

A projection surface suitable for rear projection is for example a diffusion screen, wherein a diffusing material is placed in the path of the light emitted from the projector and scatters it in different directions. An optical Fresnel screen may be utilized for rear projection, wherein the incoming light from the projector is angled towards the viewer by means
of Fresnel lenses. A higher perceived brightness may be obtained by a lenticular/Fresnel screen surface compared to a diffusion screen surface. Yet another alternative is to use a holographic screen. In a holographic screen all light passes through the screen as if it were a sheet of glass, except for some light that hits the screen at a specific angle. This light activates a holographic layer within the screen that scatters the light towards the viewer and thereby produces a viewable image.

In the system in accordance with the invention, any optional projection surface 5 may be used. In a preferred embodiment the projector 1 is mounted within the galley of a boat, as is shown in figures 2a-2b and figure 3, and preferably so as to be directed towards the steering place of the boat 6. The door to the galley, or parts of it, may be used as the projection surface, and should then be made of a material suitable for rear projection and/or front projection. An exemplary material to be used is semi-transparent or semi-matt plastics, such as polymethylmethacrylate (Plexiglas™), which is a material very suitable for use as a door in a boat, as well as being a material well suited for use as a projection surface. It is realised that a window, wall or the like, or parts of them, may serve as the projection surface as well. Several advantages are achieved; the door may be utilised as the projection surface, and no additional equipment is thus needed in the form of an expensive, portable screen or the like, i.e. not requiring a special wall or ceiling mounted screen. Further, the semi-matt door may be used for rear projection of a nautical chart, which is then visible for the user when steering the boat.

The ability of the projection surface or screen to reflect the image is important for achieving a high quality image, and a
surface having as smooth structure as possible is preferred. However, rear projection has a rather narrow viewing angle, and if choosing a screen giving a very high gain, the viewing angle is narrowed even further. Hence a compromise can be made in this regard, between image quality and viewing angle. Material having a rougher surface may be used as well, such as obscured glass.

In another embodiment of the system in accordance with the invention an autopilot feature is included. An autopilot module may then be coupled to the projector, whereby deviations from the set course are derived with the assistance of the means 2 for receiving navigation signals, and whereby the processing means 3 of the projector is utilised for steering the boat and bringing back the boat to the set course. This course correction is accomplished for example by having the processing means 3 sending instructions to the autopilot feature for execution thereby. Any other information may be shown, such as for example, depth, wind conditions, temperature etc.

The projector in accordance with the invention may to advantage be placed inside a boat, when used in such application, where it is protected against wind and weather. The driver is still enabled to see a nautical chart or the like, if rear projection is used, for example through the door or a window or the like, visible from the steering place. The projector is thus at the same time protected against potentially harmful water, and no protection measures has to be taken, as would be necessary when using a conventional GPS, where the display may have to be covered.

The invention has been described and shown in connection with a boat, which is a preferred application, but the invention is not restricted to such usage, it may be used in other mobile
applications as well. For example, the projector could be used in a caravan for displaying road maps and/or written directions to a specific destination on a suitable projection surface or screen, and for displaying movies and the like. In this case two different screens may be used. A large screen is presumably preferred when watching a picture, while a smaller screen may be preferred for showing road maps. The user may easily vary the size of the projection by zooming, and any available surface may be used. Other exemplary mobile environments in which the present invention may be utilised includes cars, trucks, helicopters, aeroplanes, trains and the like.

As was explained in the introductory part of the present application, fixedly mounted, large screen is not very practical and gives a very inflexible solution. In a car for example there are not much space for a large GPS to be installed. Further, to fixedly mount such equipment requires a stable mounting having a rugged construction, which requires further yet space. In accordance with the invention these problems are easily overcome. The projector in accordance with the invention, being small and handy, may be mounted as suitable for the specific application, and an image may be projected onto a space normally used for other purposes. For example, when used in a car the projector may be placed in the rear end of the car and be arranged to project onto the dashboard of the car. In one embodiment, the projector comprises circuitry for compensating and manipulating the image to be displayed, which circuitry may be used for utilizing any projection surface, even a non-flat projection surface may be used. Circuitry for image processing for other purposes may also be included, for example taking into account and correcting for effects on the displayed image when driving on a bumpy road.
However, it is to be noted that the projector in accordance with the invention may easily be fixedly mounted. It may nevertheless easily be demounted and brought along. The projector may include means for enabling such easy mounting and demounting. The projector may, for example, be provided with easily mountable/demountable means such as winged nut or lettrad nuts, or by a means enabling mounting by rails or the like. The site where the projector is to be mounted should of course then have corresponding means, for receiving the projector.

Navigation signals from a GPS satellite constellation is preferred, but it to be understood that other navigation systems could be used as well. GPS is a particularly preferred system, since the respective orbits of the satellites within the system are chosen so as to provide worldwide coverage, and since the radio signals are very accurate. However, other navigations systems, such as the future European system Galileo, or the existing Russian system, GLONASS (GLObalnaya NAvigatsionnaya Sputnikovaya Sistema) or the like, could be used as well. Further, terrestrial navigation systems, such as LORAN (LOng RAnge Navigation) could also be used as an alternative or as an additional' feature.

In summary, the present invention provides a small and handy projector yielding an improved system for the displaying of navigation information, and also, as a beneficial side effect, provides additional features. The size of the inventive projector can be made very small, having the external dimensions of a few decimetres in length, a few centimetres in height and width, for example 2 dm x 0,5 dm x 1 dm. Larger dimensions are of course conceivable, and also even smaller dimensions. The projector comprising an integrated GPS receiver also enables the user to display optional
information, usually displayed by means of a projector, besides a navigation chart or the like. The projector may be used for showing a movie, or surfing the Internet etc., when the user is in the galley of the boat, and used for viewing a nautical chart when steering the boat, without even having to move or rearrange the projector in any way. It is of course possible to display navigation information when being inside the boat, for example if an autopilot is used, and, similarly, watch a movie while sitting outside, i.e. the front projection usage is not restricted to movies and the rear projection is not restricted to displaying navigation information. Both projection modes may be used for all purposes, but the projector may nevertheless be fixedly mounted.
Claims

1. Projector for projecting images and movies onto a projection surface, said projector comprising means for converting image data to an image to be displayed on a projection surface, an optics system, a light source, and connecting means for connecting said projector (1) to an external power source, characterised in that said projector (1) comprises means (2) for reception of navigation signals, and circuitry (3) for processing said navigation signals into navigation information, wherein said means (2) for the reception of navigation signals and said circuitry (3) for processing said navigation signals are integrated into a single module (4) integrated with said projector (1) and whereby said projector (1) is arranged to project said navigation information on said projection surface (5), said projector (1) further comprising means for front projection and means for rear projection.

2. The projector as claimed in claim 1, wherein said means (2) for reception of navigation signals comprises a GPS receiving unit.

3. The projector as claimed in claim 1 or 2, wherein said connecting means comprises means for connection to a wall socket and/or a car battery and/or a boat battery, whereby said projector is arranged to operate on 12 V DC and/or 24 V DC and/or 110 V AC and/or 220 V AC.

4. The projector as claimed in any of claims 1-3, wherein said processing of said navigation signals comprises converting the received navigation signals from a satellite-based reference system into a land-based reference system.
5. The projector as claimed in any of the preceding claims, wherein said means (2) for reception of navigation signals comprises a Galileo, GLONASS or LORAN receiving unit.

6. System for projecting navigation information characterised in that said system comprises a projector as claimed in any of claims 1-5, and in that it further comprises a projection surface, wherein said projection surface is a projection screen (5) that enables front projection and/or rear projection.

7. The system as claimed in claim 6, wherein for said rear projection, a rear projection screen is included, said rear projection screen being a diffusion screen, for example made of semi-matt plastic material such as Plexiglas™.

8. The system as claimed in claim 6, wherein for said rear projection, a rear projection screen is included, said rear projection screen being an optical Fresnel screen or a holographic screen.

9. The system as claimed in any of claims 6 to 8, wherein said projection screen (5) is part of a galley door, window or wall of a boat.

10. The system as claimed in claim 9, wherein said projector (1) is provided to project said navigation information on said projection screen (5) through rear projection and to project other kind of content, such as movies or games, on said projection screen (5) through front projection.
**A. CLASSIFICATION OF SUBJECT MATTER**

<table>
<thead>
<tr>
<th>Classification of document</th>
<th>Relevance to claim No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>WO 02071777 A1 (DIGISLIDE INTERNATIONAL PTY LTD), 12 Sept 2002 (12.09.2002), page 5, line 6 - line 21, figures 2,3, abstract</td>
<td>1-10</td>
</tr>
<tr>
<td>US 20030184575 A1 (AKSELI REHO ET AL), 2 October 2003 (02.10.2003), figures 2,5, paragraph (0038), (0039), (0049), (0050)</td>
<td>1-10</td>
</tr>
<tr>
<td>US 5416478 A (KENICHI MORINAGA), 16 May 1995 (16.05.1995), column 1, line 34 - column 2, line 27, figures 1,2</td>
<td>1-10</td>
</tr>
</tbody>
</table>

Further documents are listed in the continuation of Box C.

See patent family annex.

**B. FIELDS SEARCHED**

- **IPC:** G01C, G01S, G03B, G09B

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

- SE, FI, NO classes as above

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

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

- **WO 02071777 A1 (DIGISLIDE INTERNATIONAL PTY LTD), 12 Sept 2002 (12.09.2002), page 5, line 6 - line 21, figures 2,3, abstract** Relevance to claim No. 1-10

- **US 20030184575 A1 (AKSELI REHO ET AL), 2 October 2003 (02.10.2003), figures 2,5, paragraph (0038), (0039), (0049), (0050)** Relevance to claim No. 1-10

- **US 5416478 A (KENICHI MORINAGA), 16 May 1995 (16.05.1995), column 1, line 34 - column 2, line 27, figures 1,2** Relevance to claim No. 1-10
<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 4652084 A (JURGEN DASZINNIES), 24 March 1987 (24.03.1987), abstract</td>
<td>1-10</td>
</tr>
</tbody>
</table>
International patent classification (IPC)

G09B 29/10 (2006.01)
G01S 5/14 (2006.01)

Download your patent documents at www.prv.se
The cited patent documents can be downloaded at www.prv.se by following the links:
  • In English/Searches and advisory services/Cited documents (service in English) or
  • e-tjanster/anförda dokument (service in Swedish).
Use the application number as username.
The password is J-MGNXARRUC.

Paper copies can be ordered at a cost of 50 SEK per copy from PRV InterPat (telephone number 08-782 28 85).

Cited literature, if any, will be enclosed in paper form.
Form PCT/ISA/210 (patent family annex) (April 2005)