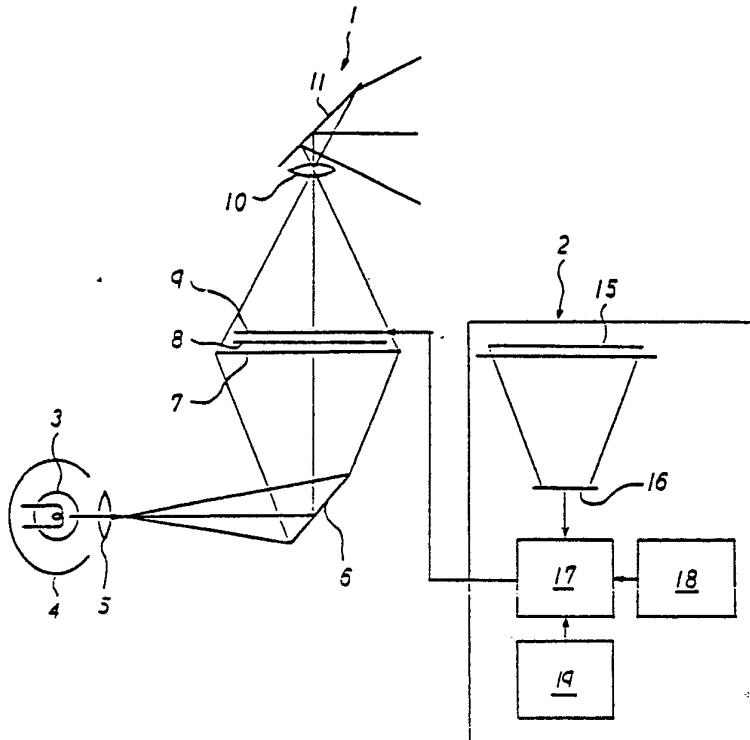




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

<p>(51) International Patent Classification⁴ : G03B 21/00</p>	<p>A1</p>	<p>(11) International Publication Number: WO 87/ 03384 (43) International Publication Date: 4 June 1987 (04.06.87)</p>
<p>(21) International Application Number: PCT/SE86/00540 (22) International Filing Date: 26 November 1986 (26.11.86) (31) Priority Application Number: 60/268217 (32) Priority Date: 28 November 1985 (28.11.85) (33) Priority Country: JP</p> <p>(71)(72) Applicants and Inventors: ÖSTBERG, Olof [SE/US]; Department of Industrial Engineering, University of Wisconsin-Madison, 1513 University Avenue, Madison, WI 53706 (US). TSUNEHIRO, Takeda [JP/JP]; TAKEO, Iida [JP/JP]; YUKIO, Fukui [JP/JP]; Industrial Products Research Institute, 1-1-4 Yatabe Higashi, Tsukuba Science City, Ibaraki 305 (JP).</p>		<p>(74) Agents: HOLMQVIST, Lars J., H. et al.; Lars Holmqvist Patenbyrå AB, P.O. Box 4289, S-203 14 Malmö (SE).</p> <p>(81) Designated States: AT (European patent), BE (European patent), CH (European patent), DE (European patent), DK, FI, FR (European patent), GB (European patent), IT (European patent), LU (European patent), NL (European patent), NO, SE (European patent).</p> <p>Published <i>With international search report.</i></p>

(54) Title: AN IMAGE SCANNING AND PROJECTING APPARATUS



(57) Abstract

An image detector (16) scans an original and input the image signal to a microprocessor (17) which is capable of conversion and edition of the image signals. By means of input means (18) and memory means (19) characters, figures etc. may be input to said microprocessor. A liquid crystal plate (9) is adapted to display an assembled image corresponding to the original image and the further characters, figures etc in accordance with output signals from said microprocessor for projecting the assembled image displayed on the liquid crystal plate (9) onto a screen. The microprocessor is adapted to process the image signals received from the detector (16) for correcting, changing and editing parts of the electronic image signals.

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AN IMAGE SCANNING AND PROJECTING APPARATUS

FIELD OF INVENTION

The invention relates to an apparatus for projecting an image or a picture on a screen.

5

PRIOR ART

For preparing educational papers and for flexibility in the presentation of data, overhead projectors are widely used in a variety of research institutes and educational organs. However, even though the overhead projector proves to be quite useful, it still
10 causes several problems, for example, distortion of figures or images projected onto a screen, and in addition, due to relatively large size of the overhead projector sheets, transport and control thereof also involves difficulty.

15

SUMMARY OF THE INVENTION

The object of the present invention is to provide a useful image projection and display device which is capable of easily projecting a wide variety of data while still retaining the functional convenience of the overhead projector itself and also is
20 provided with useful functions for preparing and storing a variety of data by using a built-in input device and memory. The projected image can also easily be changed or altered i.a. for preventing or correcting distortion induced by the optical elements.

According to the invention there is provided an image scanning
25 and projecting apparatus comprising an image detector for detecting

the image of an original; a microprocessor for inputting the original image from said image detector as an electronic input signal therein, said microprocessor being capable of conversion and edition of said image signals; input means and memory means for
5 inputting characters, figures etc into said microprocessor and storing signals used by the microprocessor; a liquid crystal plate for displaying an assembled image corresponding to the original image and said further characters, figures etc in accordance with output signals from said microprocessor; and an optical projecting
10 device for projecting said assembled image displayed on said liquid crystal plate onto a screen.

Preferably, the optical projecting device comprises a light source, a reflector mirror and a condensing lens; a Fresnel lens, a transparent heat absorbing sheet and a liquid crystal panel, said
15 three elements being combined into a group; and a projecting lens for projecting the image displayed on the panel on a distant screen. Moreover, the microprocessor may be adapted to process the image signals received from the detector for correcting, changing and editing parts of the electronic image signals.

20 Furthermore, the microprocessor may be adapted to store the image signals received from the detector and possibly processed as stated above in the memory means. The liquid crystal panel comprises a sufficient number of picture elements or pixels for allowing the original optical image to be clearly displayed.

25 The original document is first scanned by the image detector, thence converted into an electronically mapped image before being delivered to the microprocessor. The microprocessor synthesizes characters and/or figures delivered from the input means and memory means and then outputs the synthesized data signal containing the
30 images to the liquid crystal display panel of the optical image projector to allow the original to be displayed in the liquid crystal display panel. When light beams from the light source penetrate said liquid crystal display panel, a picture exactly matching the original is eventually formed on a screen for display.

35 Unlike the conventional overhead projector, the image projection and display device embodied by the present invention immediately scans the image without obliging the operator to prepare

any overhead sheet in advance before projection is implemented. This relieves the operator of conventional annoyance otherwise caused by transport and storage of overhead sheets which are needed only for projections.

5 Since the image projection and display device reflecting the present invention stores the original in the memory of the micro-processor in the form of an electronically mapped image before displaying it via the liquid crystal display panel, it is possible for the system to easily process the imaged content and specially
10 add overlapping characters and/or figures on the imaged content. Furthermore, by applying simple deformation, the projected image totally dispenses with distortion, thus eventually promoting overall usefulness of this image projecting system. In addition, by
effectively using the build-in recording media such as micro floppy
15 disks and IC cards, lecturers can easily carry drafts designated for projection and display.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be described below by means of a preferred
20 embodiment of the invention by reference to the appended drawing in which Fig. 1 is a schematic view of the apparatus according to the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

25 Referring now to Fig. 1, a preferred embodiment of the present invention will be described below.

Reference numeral 1 denotes the optical image projector device. Reference numeral 2 denotes an image signal generator. Image video signals generated by said signal generator 2 is eventually projected
30 against a screen (not shown).

The optical image projector 1 comprises the following items; a light source 3 which is interposed between a reflection mirror 4 positioned therebehind and a lens 5 positioned in front of it. A Fresnel lens 7, a transparent heat-absorbing sheet 8, and a liquid
35 crystal display panel 9 for displaying characters and figures, are respectively placed adjacent each other in a light-path from a mirror 6 which is placed in front of lens 5. Image projection means

comprising a lens 10 and a mirror 11 is placed in front of the Fresnel lens 7, the heat-absorbing sheet 8, and the liquid crystal display panel 9.

Accordingly, light beams emitted from the light source 3, pass
5 through liquid crystal display panel 9 before eventually being projected against a screen by mirror 11, while the assembled image is displayed on said liquid crystal display panel 9. Note that said liquid crystal display panel 9 comprises a specific number of picture elements, said number of elements or pixels being sufficient
10 for allowing the original optical image comprising characters and figures to be clearly displayed on the screen after the light beams passing through the panel 9.

The transparent heat-absorbing sheet 8 protects said liquid crystal display panel 9 from the heat of the light source 3. The
15 image signal generator 2 feeding signals to said liquid crystal display panel 9 generates electrical signals corresponding to the image of an original but may optionally be collected from a variety of other originals including books, pamphlets, overhead projector sheets, and slide films.

Said signal generator 2 comprises an image detector 16 which
20 has photographic elements converting the image 15 into electrical signals, the image detector 16 being connected to microprocessor 17 which is provided with data-input devices 18, such as keyboard and mouse means, and memory means 19 such as ROM, RAM, floppy disks, IC
25 card, etc.

Micro processor 17 synthesizes a wide variety of signals related to electronically mapped images of the designated original scanned by the image detector 16 as well as signals relating to characters and figures delivered from data-input device 18 and
30 memory means 19, and eventually outputs the synthesized or assembled image signals. In addition to the delivery of image signals converted from the original scanned by the image detector 16 and the incoming data signal from said data-input device 18 and memory means 19, the microprocessor 17 also corrects, changes, and edits part of
35 the image by executing a variety of operations. Furthermore, the microprocessor 17 eliminates distortion from the images otherwise being inherent to any conventional overhead projector image. In

addition, the microprocessor 17 causes memory means 19 to store all the images including characters and figures in any of said ROM, RAM, floppy disks, and IC cards. Since the microprocessor 17 is connected to the liquid crystal display panel 9 of the optical image projector 5 1, liquid crystal display panel 9 receives the image video signals from the microprocessor 17, and as a result, liquid crystal display panel 9 can correctly display the assembled image for the following projection.

In summary, when operating the image scanning and display 10 device embodied by the present invention, the image detector 16 first scans the image of the original 15. Then, the video signal denoting said original is delivered to microprocessor 17 in the form of an electronically mapped image. The microprocessor 17 receives character data from data-input device 18 as required before 15 synthesizing or assembling the designated input data into video signals to be displayed. These complete video signals are then delivered to liquid crystal display panel 9 for display.

On the other hand, beams from the light source 3 penetrate the liquid crystal display panel 9, and are then reflected by mirror 11 20 before the image displayed on the panel is eventually projected on a screen.

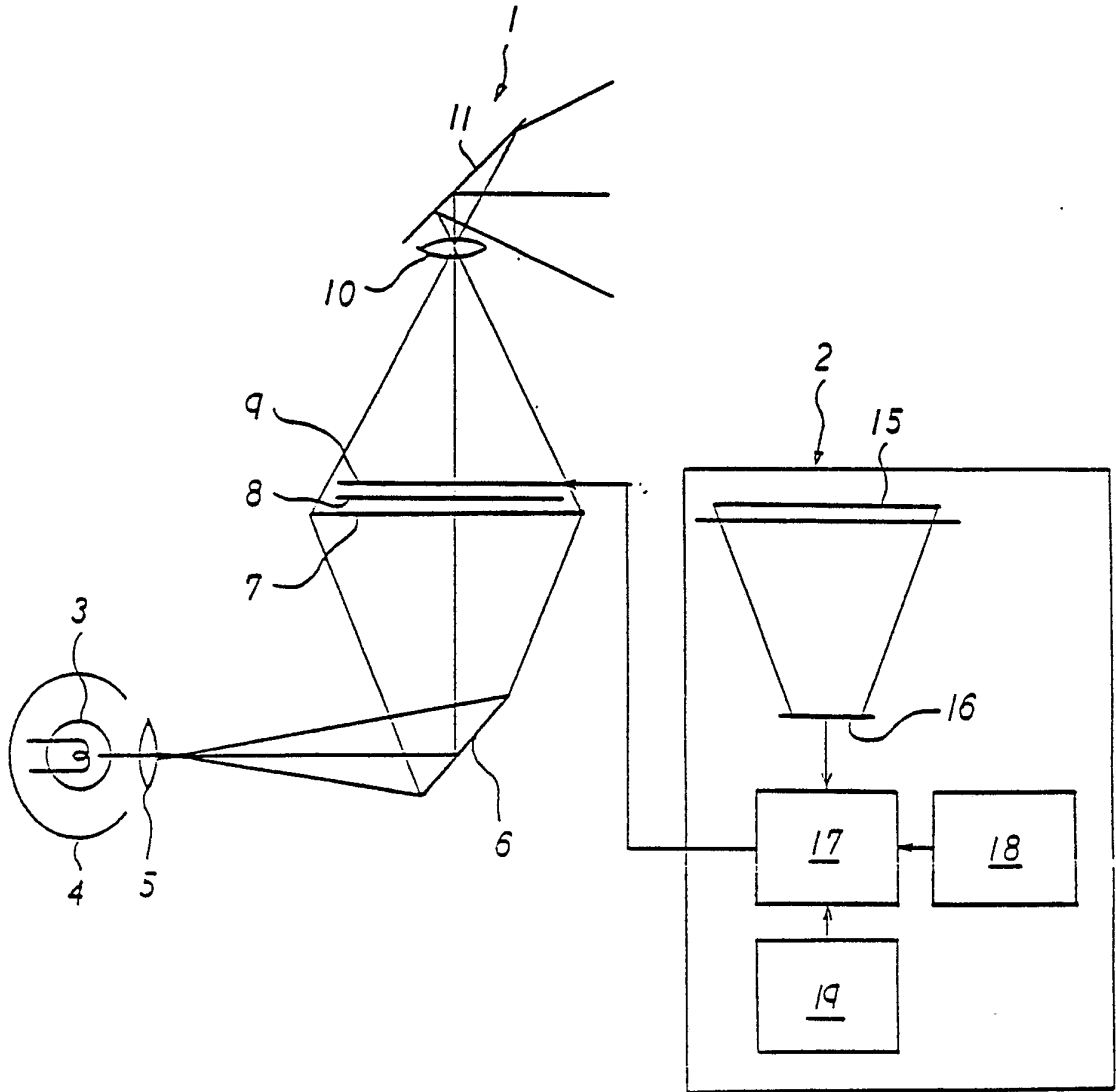
The image scanning and display device reflecting the present invention can also be simply and inexpensively constructed by modifying part of any conventional overhead projector and by 25 providing the modified unit with the image signal generator 2.

C L A I M S

1. An image scanning and projecting apparatus
c h a r a c t e r i z e d by
an image detector (16) for detecting the image of an original;
a microprocessor (17) for inputting the original image from the
5 image detector as an electronic input signal therein, said
microprocessor being capable of conversion and edition of the image
signals;
input means (18) and memory means (19) for inputting
characters, figures etc into said microprocessor and storing signals
10 used by the microprocessor;
a liquid crystal plate (9) for displaying an assembled image
corresponding to the original image and said further characters,
figures etc in accordance with output signals from said
microprocessor; and
15 an optical projecting device (1) for projecting said assembled
image displayed on said liquid crystal plate (9) onto a screen.
2. An apparatus according to claim 1, c h a r a c t e r i z e d
in that the optical projecting device (1) comprises:
a light source (3), a reflector mirror (4) and a condensing
20 lens (5);
a Fresnel lens (7), a transparent heat absorbing sheet (8) and
a liquid crystal panel (9), said three elements being combined into
a group; and
a projecting lens (19) for projecting the image displayed on
25 the panel (9) on a distant screen.
3. An apparatus according to claim 1 or 2,
c h a r a c t e r i z e d in that the microprocessor is adapted to
process the image signals received from the detector (16) for
correcting, changing and editing parts of the electronic image
30 signals.
4. An apparatus according to claim 1, 2 or 3,
c h a r a c t e r i z e d in that the microprocessor is adapted to
store the image signals received from the detector and possibly
processed according to claim 3 in the memory means.
- 35 5. An apparatus according to anyone of the preceeding claims,

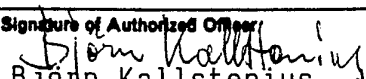
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c h a r a c t e r i z e d in that the liquid crystal panel
comprises a sufficient number of picture elements or pixels for
allowing the original optical image to be clearly displayed.



INTERNATIONAL SEARCH REPORT

International Application No PCT/SE86/00540

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all) ⁶		
According to International Patent Classification (IPC) or to both National Classification and IPC 4		
G 03 B 21/00		
II. FIELDS SEARCHED		
Minimum Documentation Searched ⁷		
Classification System	Classification Symbols	
IPC 4	G 03 B 21/00, -/08, /132, /134, /14, /26, /28, 27/28, /58-62	
US C1	353:20, 34, 37, 44, 50, 51, 63, 64, .../...	
Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched ⁸		
SE, NO, DK, FI classes as above		
III. DOCUMENTS CONSIDERED TO BE RELEVANT ⁹		
Category ⁹	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
A	US, A, 4 033 685 (KEIICHI UNO ET AL) 5 July 1977	
A	Patent Abstract of Japan abstract of JP 60-41032 (CANON KK) 4 March 1985	
<p>¹⁰ Special categories of cited documents:</p> <p>"A" document defining the general state of the art which is not considered to be of particular relevance</p> <p>"E" earlier document but published on or after the international filing date</p> <p>"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</p> <p>"O" document referring to an oral disclosure, use, exhibition or other means</p> <p>"P" document published prior to the international filing date but later than the priority date claimed</p> <p>"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</p> <p>"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step</p> <p>"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.</p> <p>"&" document member of the same patent family</p>		
IV. CERTIFICATION		
Date of the Actual Completion of the International Search	Date of Mailing of this International Search Report	
1987-02-04	1987-02-09	
International Searching Authority	Signature of Authorized Officer	
Swedish Patent Office	 Björn Kallstenius	

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

II

Fields Searched (cont).

US C1 353:66, 68, 73, 77, 78, 82, 83, 88,
89, 90, 97, 98, 99, 121, 122

V. OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE ¹

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

1. Claim numbers because they relate to subject matter not required to be searched by this Authority, namely:

2. Claim numbers 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. Claim numbers because they are dependent claims and are not drafted in accordance with the second and third sentences of PCT Rule 6.4(a).

VI. OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING ²

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

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims of the international application.
2. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims of the international application for which fees were paid, specifically claims:
3. 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 claim numbers:
4. As all searchable claims could be searched without effort justifying an additional fee, the international Searching Authority did not invite payment of any additional fee.

Remark on Protest

- The additional search fees were accompanied by applicant's protest.
- No protest accompanied the payment of additional search fees.