(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) Publication number: **0 210 274**
A1

(12) # EUROPEAN PATENT APPLICATION

published in accordance with Art. 158(3) EPC

(21) Application number: **85900756.9**

(51) Int. Cl.[4]: **G 09 F 9/33**

(22) Date of filing: **26.01.85**

Data of the international application taken as a basis:

(86) International application number:
PCT/JP85/00034

(87) International publication number:
WO86/04439 (31.07.86 86/17)

(43) Date of publication of application:
04.02.87 Bulletin 87/6

(84) Designated Contracting States:
AT BE CH DE FR GB LI LU NL SE

(71) Applicant: **JAPAN TRAFFIC MANAGEMENT TECHNOLOGY ASSOCIATION**
3, Kojimachi 3-chome
Chiyoda-ku Tokyo 102(JP)

(71) Applicant: **KOITO INDUSTRIES, LTD.**
100, Maeda-cho Totsuka-ku
Yokohama-shi Kanagawa 244(JP)

(71) Applicant: **Stanley Electric Co., Ltd.**
9-13, Nakameguro2-chome
Meguro-ku Tokyo 153(JP)

(72) Inventor: **TSUZAWA, Masami**
14-15, Minamitsukushino 4-chome
Machida-shi Tokyo 194(JP)

(72) Inventor: **TOMINAGA, Muneharu**
2-47-102, Shiohama 4-chome
Ichikawa-shi Chiba 272-01(JP)

(72) Inventor: **KATO, Hiroshi**
3447, Fukaya
Ayase-shi Kanagawa 252(JP)

(72) Inventor: **MORIKAWA, Tadahiro**
1184-2, Daigiri
Fujisawa-shi Kanagawa 251(JP)

(72) Inventor: **UCHIYAMA, Yoshinori**
16-22, Tsurukawa 3-chome
Machida-shi Tokyo 194-01(JP)

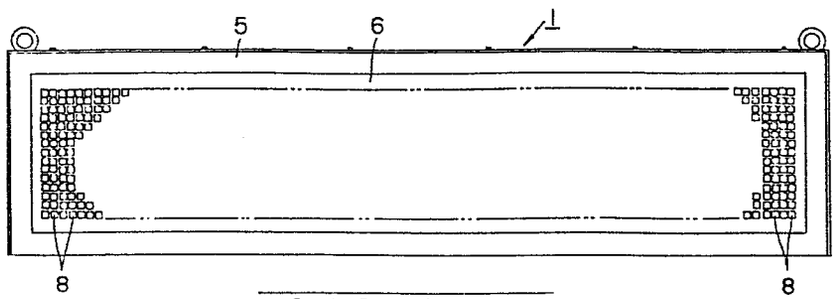
(72) Inventor: **WAKI, Osamu**
1-18, Kitano 1-chome
Mitaka-shi Tokyo 181(JP)

(74) Representative: **Dreiss, Hosenthien & Fuhlendorf**
Gerokstrasse 6
D-7000 Stuttgart 1(DE)

(54) **INFORMATION BOARD APPARATUS.**

(57) An information board apparatus has a display mechanism unit formed by arranging multiplicity of multicolor light-emitting members in a grid pattern, each of the members being constituted by a plurality of light-emitting diodes housed in a lamp case which has a heat-dissipating bore formed in its side plate portion at which the respective lead portions of the diodes are located.The display mechanism unit is attached to the front frame of the body of the apparatus. When this apparatus is employed for displaying, for example, road traffic information, the apparatus strongly attracts attention and permits the displayed information to be clearly seen.

FIG.1

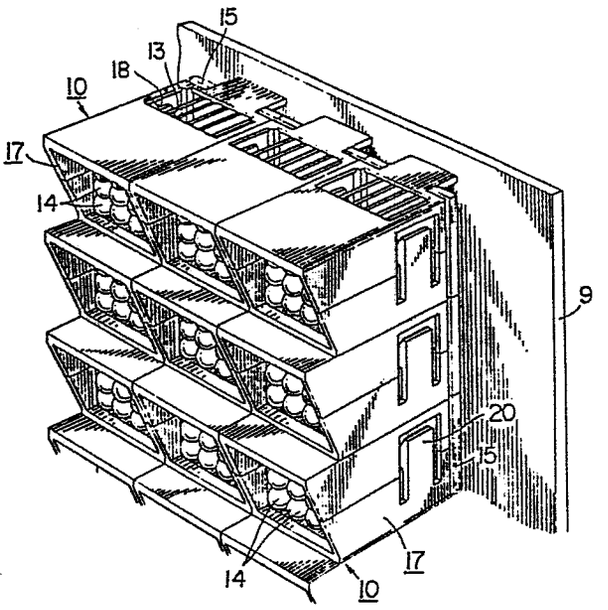


EP 0 210 274 A1

Croydon Printing Company Ltd

./...

FIG.5



DESCRIPTION

AN INFORMATION DISPLAY APPARATUS

FIELD OF THE INVENTION

This invention relates to an information display apparatus which uses a large number of multicolored light emitting devices as display elements to enhance visibility, visual attractivity, and attention evocativeness.

BACKGROUND OF THE INVENTION

So far information display boards have been proposed that are constructed to show specific display patterns by lighting many groups of light emitting devices, such as electric bulbs or light emitting diodes (LEDs), which are arranged in the checkerboard pattern to form specific display patterns.

Although the light emitting devices which are used for conventional information display boards only light electric bulbs or LEDs, and control their brightness or flicker them, they cannot emphasize the display detail visually beyond the above-mentioned level of their functions. Therefore, if various information boards of lighting type flood in display area, their visibility, visual attractivity, and attention evocativeness will be relatively reduced. Under such a condition, in order to attract special attention to the display of a specific information board, it is necessary not only to light specific display patterns and control their brightness or

flicker them, but to change their lighting color properly. To satisfy such requirements, this invention uses "multi-colored light emitting devices", which were deviced previously by the same inventors as those of this invention, and applied to Japan Patent Office as Japan Utility Model Application No. 55-117524. The "multicolored light emitting device" represents a light emitting device in combination of one or more LEDs of different colors, such as red, yellow and blue, arranged on a substrate, connected with wires and fixed to a base shell having pins or a metal base to form a single device that can emit one color, or more colors simultaneously as required, and change the color to be emitted.

Further, this invention improves the above-mentioned device so that many devices can be arranged in a checkerboard pattern as a display unit of information board. That is, if plural LEDs of different colors are merely arrayed in groups and fixed on substrates in such structure that the LED groups are only fixed with base shell after wiring connection of them, the LED groups heat up during use and, the temperature rise lowers brightness of the LEDs and particularly shortens the life of LEDs, thus causing a breakdown of multicolored light emitting devices and also of the information display board. Furthermore, these multicolored light emitting devices require dust- and water-proof properties for outdoor use.

The purpose of this invention is, in view of the above-mentioned disadvantages of the prior art, to provide an information display apparatus that maintains a high level of visibility, visual attractivity and attention evocativeness by lighting specific display patterns, as needed, in a display unit in which many light emitting devices as display elements are arrayed in a checkerboard pattern, while changing the brightness of the patterns and flickering them, and also by changing the lighting colors of the patterns.

Another purpose of this invention is to provide an information display apparatus having a display unit in which multicolored light emitting devices, composed of many light emitting diodes contained in lamp cases in the structure that can dissipate heat from leads of devices whose temperature is liable to excessively rise, are arrayed in a checkerboard pattern, thus enabling effective dissipation of hot air in the lamp cases.

Further another purpose of this invention is to provide an information display apparatus that can serve efficiently for out door use by making the exposed part on the front of multicolored light emitting devices dust- and water-proof.

DISCLOSURE OF THE INVENTION

An information display apparatus in accordance with the present invention is provided with a display unit that comprises many multicolored light emitting devices arrayed in a checkerboard pattern over the whole area of the opening of the front flame

constructing the main body of the information display apparatus. Multicolored light emitting devices have such structure that when they are arrayed in a checkerboard pattern in a display unit, heat dissipation holes formed in the side plates of the lamp cases along leads of LEDs whose temperature is liable to rise are alinged in vertical and horizontal directions and provide air paths that can circulate air in the display. Further, a transparent cover is mounted on the front of each lamp case, that is, on the light emitting side of LEDs, to provide the dust- and water-proof properties to the lamp case to prevent dust and water intrusion from the outside of the apparatus.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a front elevation of information display apparatus embodying the present invention;

Fig. 2 is a plan view;

Fig. 3 is a side view, showing the inside structure of a lamp case with the shading hood partly cut off;

Fig. 4 is an enlarged view of section A shown in Fig. 3;

Fig. 5 is an enlarged perspective illustration which shows an example of display unit comprising arraying many multi-colored light emitting devices in a checkerboard pattern;

Fig. 6 is a plan view showing an embodiment of multicolored light emitting device;

Fig. 7 is a plan view thereof;

Fig. 8 is a bottom plan view thereof;

Fig. 9 is a side view thereof;

Fig. 10 is a cross-sectional view of B-B line in Fig. 9;

Fig. 11 is a cross-sectional view of C-C line in Fig. 9;

Figs. 12(a) and (b) are side views of a side plate of lamp case;

Fig. 13 is a front elevation showing other embodiment of the multicolored light emitting device;

Fig. 14 is a front view thereof;

Fig. 15 is a cross-sectional view of D-D line in Fig. 13;

Fig. 16 is a partial sectional view showing modified embodiment other than mentioned above; and

Fig. 17 is a reference drawing showing examples of display patterns.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

An information display apparatus according to the present invention will be hereinafter described with reference to the accompanying drawings.

In Figs. 1 to 12, the main body of an information display apparatus 1 according to the present invention is composed of an enclosure 2 and a front frame 5 which is fitted to the bottom edge of enclosure 2 by means of hinge 3 so as to turn freely but usually fixed with clamps 4 to the top edge of the

front opening of enclosure 2.

The front flame 5 of main body 1 is fitted with a display board 6, and a hood 7 which interrupts rays of light from incidence on a display board 6 beyond the circumference of the board, especially from the upper side and both the right and left sides of the enclosure. The display board 6 is provided with many shading windows 8 which are arrayed in a checkerboard pattern over the whole face of the displayboard 6, and behind the shading windows 8 in main body 1, sockets or a base board 9 is arranged and many multicolored light emitting devices 10 are installed on this socket or base board 9 so that light emitting parts of multicolored light emitting devices 10 come to the same positions with shading windows 8.

If desired, a transparent plate 11 for dust- and water-proofing can be arranged between the back face of display board 6 and the light emitting part of multicolored light emitting devices 10, which are energized to flicker by a printed circuit board 12 for the energization.

Meanwhile, multicolored light emitting devices 10 have respectively such structure that LEDs 14, two or more for each of different colors, are arrayed and fixed on the surface of a substrate 15 and wired on the back face of substrate 15, which is provided with a specific number of electrodes 16 projecting out of the substrate.

In illustrated embodiment, diodes 14 of two different colors are used and arranged alternatively by color in groups of the square form in which two or more LEDs of each color are arrayed in every line. The number of LEDs 14, kinds of lighting color, combination of colors, etc. can be arbitrarily selected and changed in response to the purpose of using the information display board composed of the multicolored light emitting devices 10 but not limited to the above. Around the periphery of each group of LEDs 14 formed as above, a lamp case 17 is fitted to construct a multicolored light emitting device 10. The lamp case 17 is provided with heat dissipation holes 18 in the side plates of the lead section 13 of lamp case in which leads of the LEDs 14 are contained, so that when many multicolored light emitting devices 10 are arrayed in a checkerboard pattern to construct a display unit of the information display apparatus, the heat dissipation holes 18 of the light emitting devices 10 arrayed in a line can communicate with the adjacent hole. The high-temperature air generated in the section of leads 13 of LEDs 14 passes the heat dissipation holes 18 upward, preventing the temperature rise in the display unit of the information display apparatus. The lamp case 17 is composed of two side plates 17a and 17b that form a cross section in the shape of " ", and these side plates 17a and 17b are combined to form a square lamp case. Namely, side plates 17a and 17b are respectively provided with the above-mentioned heat dissipation

hole 18 in the side plate which is not devided and with a groove 19 at the bottom of the side plate so that an edge of a substrate 15 can be fitted to the groove 19. Furthermore, of the two divided side plate, which form a single side plate for the lamp case 17 in close contact with each other, one divided part 17a has a hooking tongue 20 at the edge of its divided face and another divided part 17b a hooking edge 21, which catches the hooking tongue 20.

When the lamp case 17 is formed of divided side-plate parts 17a and 17b, the above-mentioned hooking tongue 20 is fitted to hooking edge 21 while making both divided faces come to close contact from the right and left, and a hook 20 provided at the edge of hooking tongue 20 is engaged with the end part of hooking edge 21.

When the lamp case 17 is divided, hook 22 is separated from the end part of hooking edge 21 by pushing hooking tongue 20 to the outside of side plate 17a, and thus side plates 17a and 17b can be parted.

For such assembly and separation, a guide piece 23 is fixed to either of divided side-plate parts 17a and 17b and a guide groove 24 is cut on other side of the divided side-plate parts 17a and 17b and fitted to the above-mentioned guide piece 23.

The lamp case 17 may be constructed in a shape of cylinder. In this case, a group of plural LEDs 14 is inserted into a lamp case 17 from the rear end of the case, and the edge of

the substrate 15 is fitted to the groove 19 of the lamp case 17, while widening the rear edge of lamp case. Heat dissipation holes 18 may be formed in all the side plates of the lamp case 17 so that the high-temperature air generated by leads 13 of LEDs 14 can flow in the horizontal direction as well.

Further, if desired, an opaque plate or filter for adjusting the lighting color of each LED group, or a lens (not illusrated) for enlarging the visible area of the LED group may be installed in the front opening of the lamp case.

In this invention, the lamp case 17 has a function as hood at the same time.

When the LEDs which constitute a multicolored light emitting device 10 receive irradiation of external light, it is liable to halation, depending on the irradiating direction, and if they are energized in such condition, the external light reduces the visibility of them remarkaly. Generally, although the external light is shaded by the shading windows 8 of the display board 9, it can be also prevented also by making the edges of lamp case 17 project forward from the LED group 14. The length of the projection of the edge of lampcase 17 should be decided definitely according to the condition to use multicolored light emitting devices 10. However, generally the projection in the direction of irradiating external light is enough in the length of 10 to 15 mm.

Using the multicolored light emitting device 10 of such structure permits change of the shading windows 8 of display board 9 to a single display window.

Such information as characters, figures and marks which should be displayed on the display board 6, for example, such information as "warning declared' as shown in Fig. 17 is displayed by selecting one or more display patterns from several display patterns stored previously in semiconductor storage devices of control unit (not illustrated), sending out the control signal according to the selected display pattern(s) to the display unit, lighting the multicolored light emitting devices corresponding to the display pattern(s) from all the multicolored light emitting devices 10, and controlling or flickering the light of the devices.

The above-mentioned control unit can be contained in eclosure 2 of the main body 1 together with other electrical devices, and if desired, the control unit can be arranged outside the enclosure 2.

Figs. 13 to 15 show another embodiment concerning multicolored light emitting devices in which transparent cover 25 covers the front opening of lampcase 17 in order to provide dust- and water-proof properties to the lampcase 17 and enhance the adaptability of the lamp case to outdoor installation.

As the cover 25, an opaque plate, colored filter, lens or the like can be used for various applications. In this example of

the embodiment , lamp case 17 is constructed in the cylindrical form and six heat dissipation holes 18 are provided along the circumference of the lampcase, but the numbers of the holes are not limited to six.

Further, in the given position on the circumference of the lamp-case 17, usually in front of the heat dissipation holes 18, threads 26 is machined and at the end, a flange 27 is fitted, and a nut 28 is a set to the threads 26 . The flange 27 and nut 28 are used for holding, in the mounting plate 29, multi-colored light emitting devices 10 arrayed and fitted in the display unit, and each multicolored light emitting device 10 can be removed freely from the mounting plate 29 by loosening the nut 28. The structure for holding the light emitting devices in the mounting plate 29 is not limited to the combination of screw 26 and nut 28 as mentioned above.

Fig. 16 shows a modified example of above-mentioned embodiment related to the front opening of lampcase 17, and the edge of the opening is projected a little forward from cover 20 can prevent the lighting face of cover 25 from exposure to direct sunlight or other external light that reduces contrast between the light from the lighting face and external light and therefore also lowers the visibility of the information display of information display apparatus. Such purpose can be usually achieved enough by 10-15 mm forward projection of cover 25.

According to the present invention as disclosed above, the visibility, visual attractivity and attention evocativeness of the information display apparatus can be enhanced by displaying in the desired brightness the specific display patterns selected from predetermined display patterns in response to the road information in the area where the information display apparatus of the present invention is installed.
Moreover, the high-temperature air generated in the lamp case is vented out through heat dissipation holes, temperature rise in the lamp case is controlled, and thus reduction of brightness of LEDs by high temperature can be prevented. In addition adaptability of the information display apparatus to outdoor installation can be improved by selecting the multicolored light emitting devices which excels in dust- and water-proof properties.

INDUSTRIAL APPLICABILITY OF THE INVENTION

The information display apparatus according to the present invention is suitable for application as road traffic information display apparatus installed outdoors and for other information display purposes.

WHAT IS CLAIMED IS:

1. An information display apparatus which comprises a display unit which is made of a number of multicolored light emitting devices arrayed in the checkerboard pattern, a control unit which selects one or more display patterns from different display patterns stored in semiconductor storage devices and sends out the control signal concerning unit which lights the multicolored light emitting groups in response to the selected display pattern or patterns, adjust their brightness, and flicker them unit which lights the multicolored light emitting device groups in response to the selected display pattern or patterns, adjusts its or their brightness, flickers the light of the light emitting devices, and changes the lighting color of the light emitting device groups as required.

2. An information display apparatus in accordance with claim 1 in which each multicolored light emitting device provided with a substrate which is fitted with one or more light emitting diodes (LEDs) in each of two or more different colors in its front face and with electrodes on its back face, and a lamp case which holds said substrate in such a manner as freely removable, contains the LEDs, and is provided with heat dissipation through holes in its side plates to form a path in the horizontal or vertical direction when said lamp case is placed horizontally.

3. An information display apparatus in accordance with claim 2, in which opening edge of said lamp case in the direction of light emission of LEDs is projected in a given length forwared from the front of LEDs.

4. An information display apparatus in accordance with claim 2, in which the front opening of said lamp case is covered with a transparent cover.

5. An information display apparatus in accordance with claim 3, in which said cover is a opaque or colored filter.

6. An information display apparatus in accordance with claim 3, in which said cover has a lens function.

0210274

FIG.1

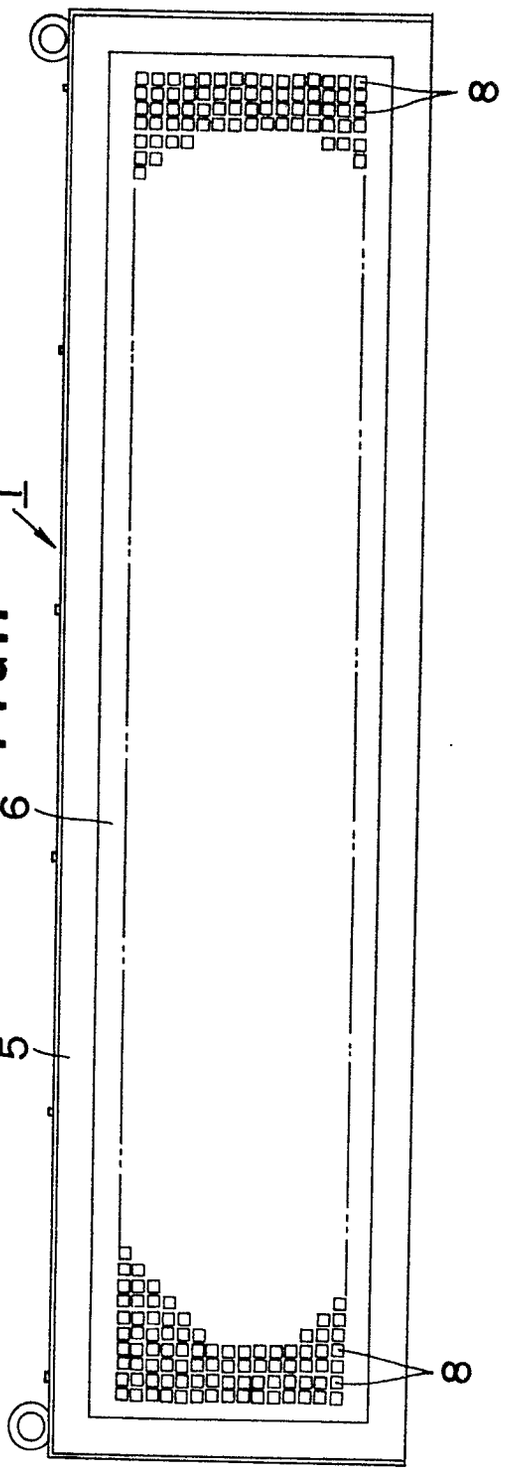


FIG.2

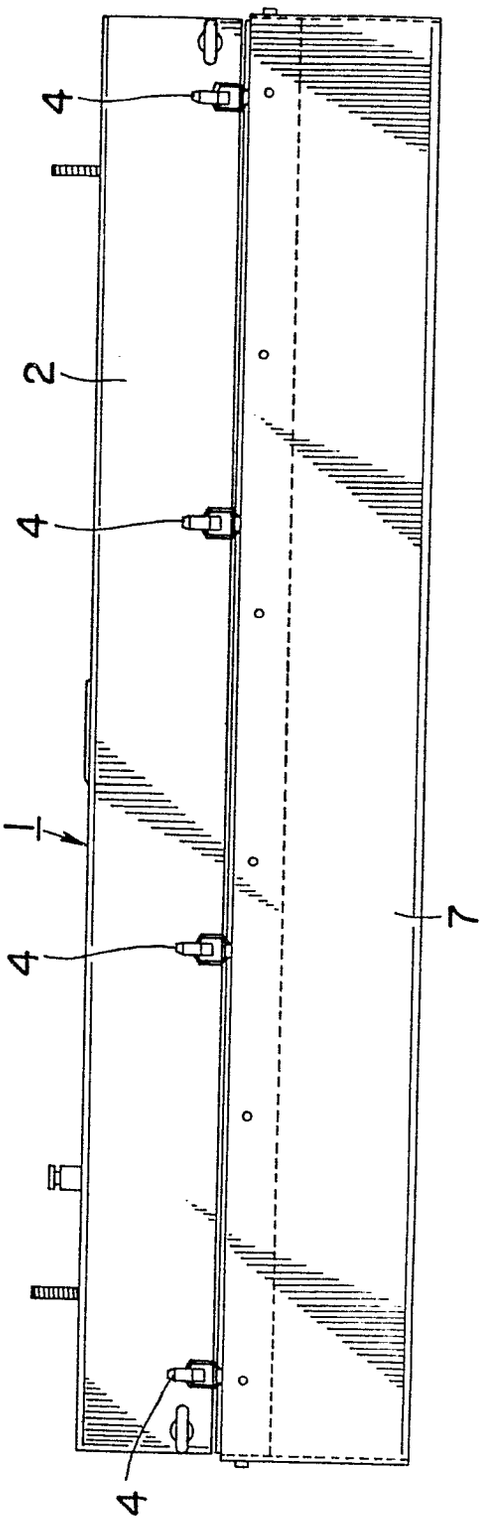


FIG.3

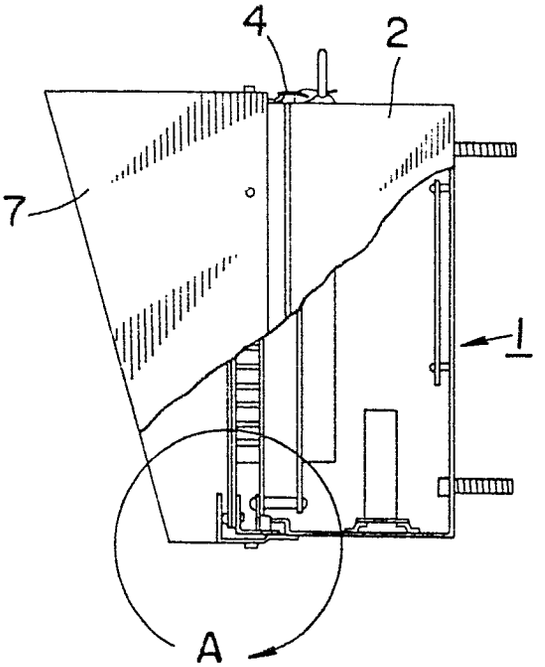
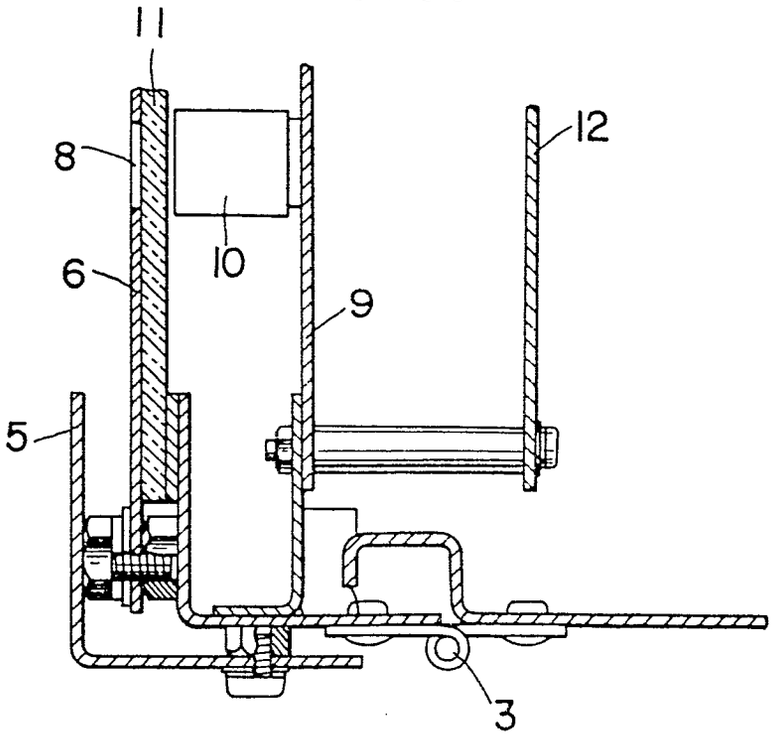
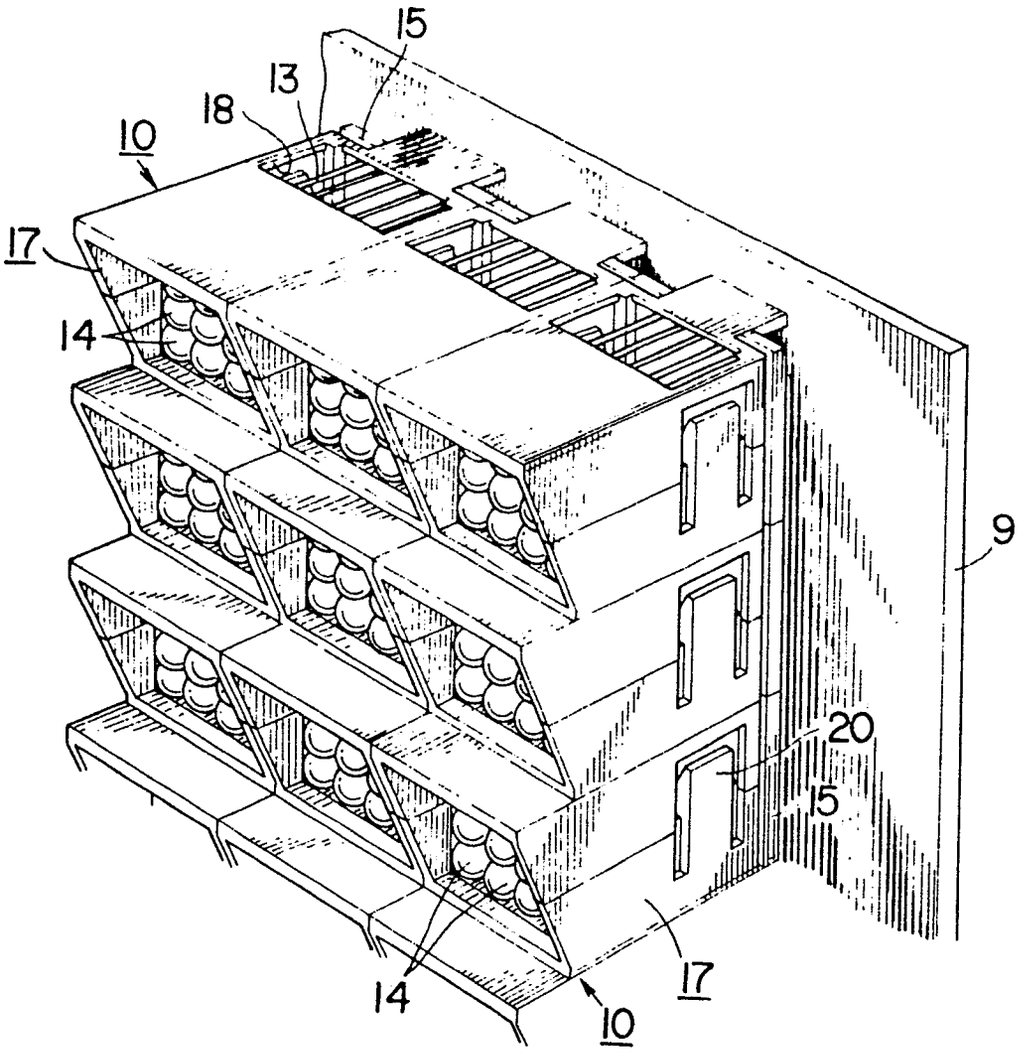


FIG.4



0210274

FIG.5



0210274

FIG.6

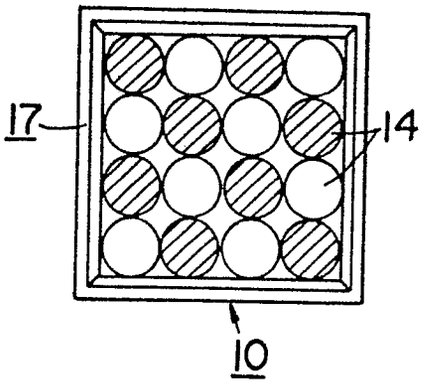


FIG.8

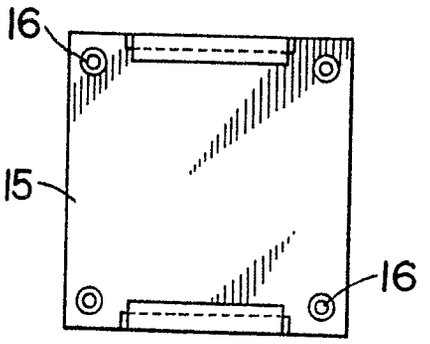


FIG.7

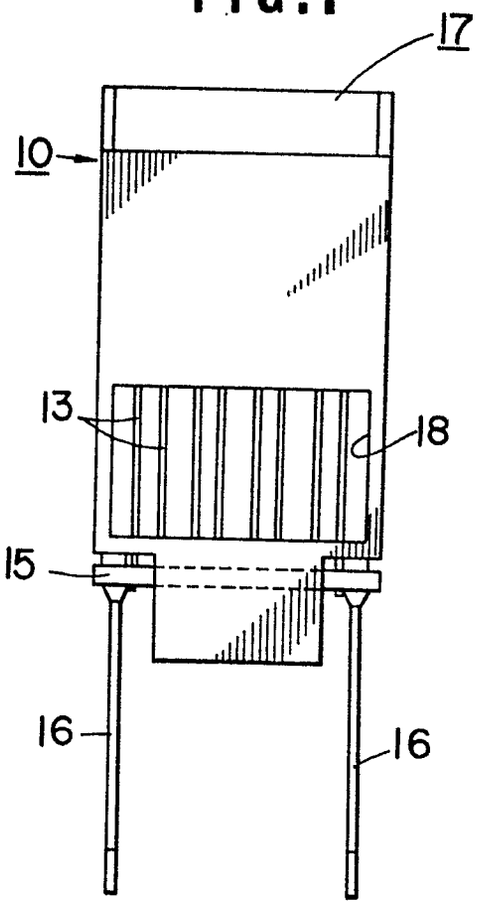
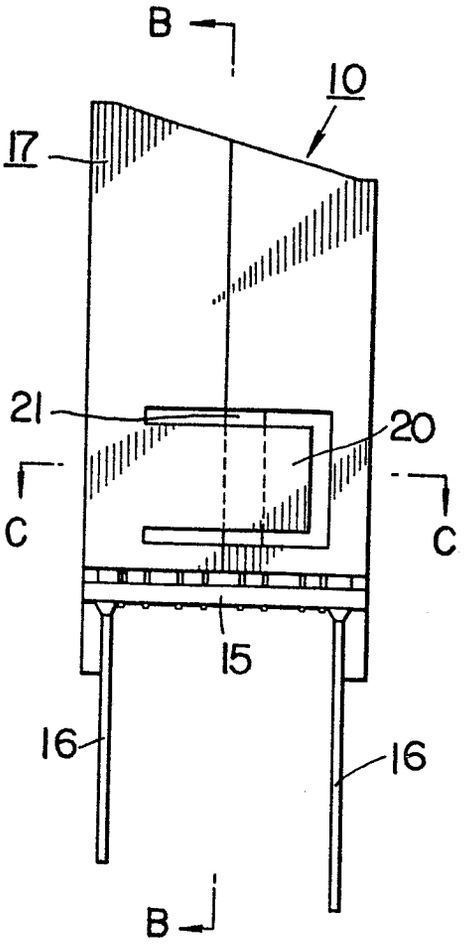


FIG.9



0210274

FIG.10

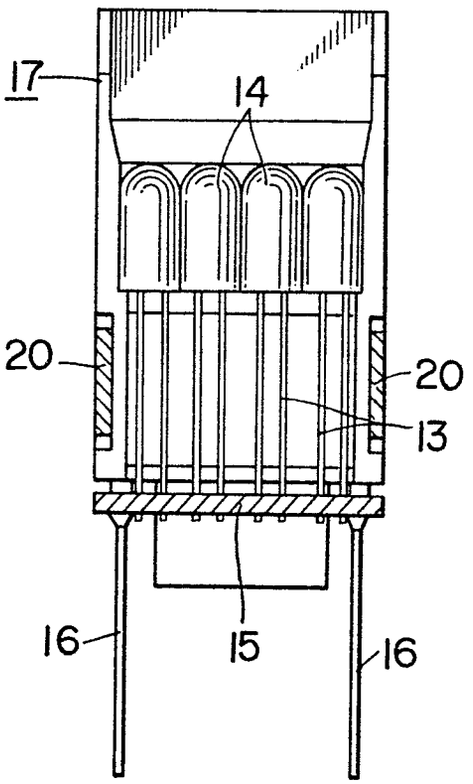


FIG.11

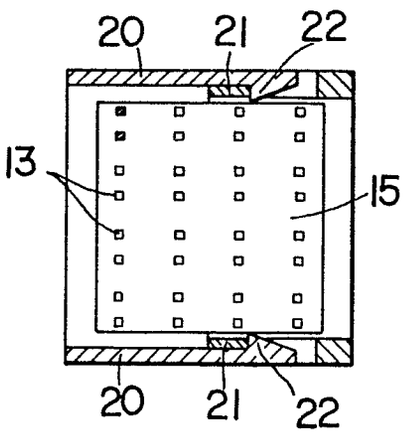
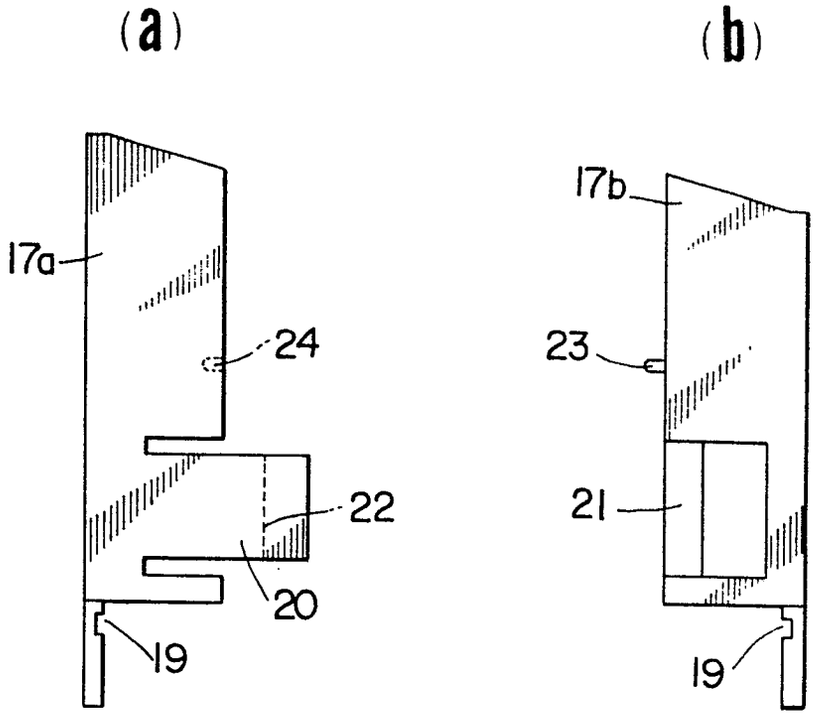


FIG.12



0210274

FIG.13

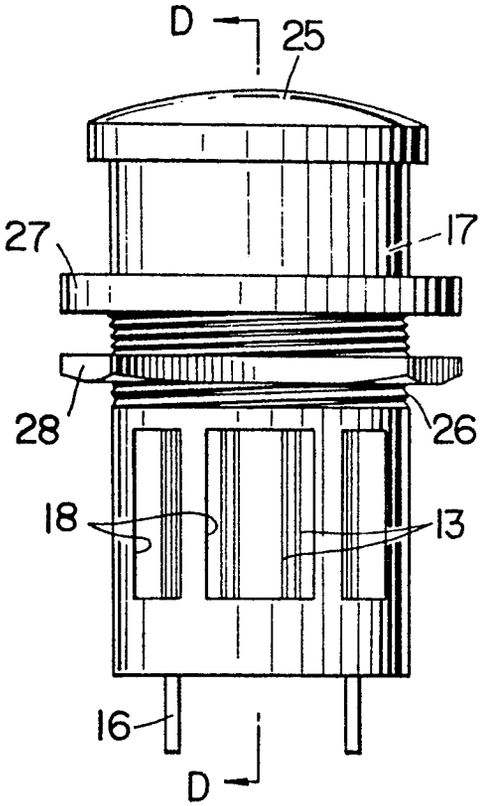


FIG.15

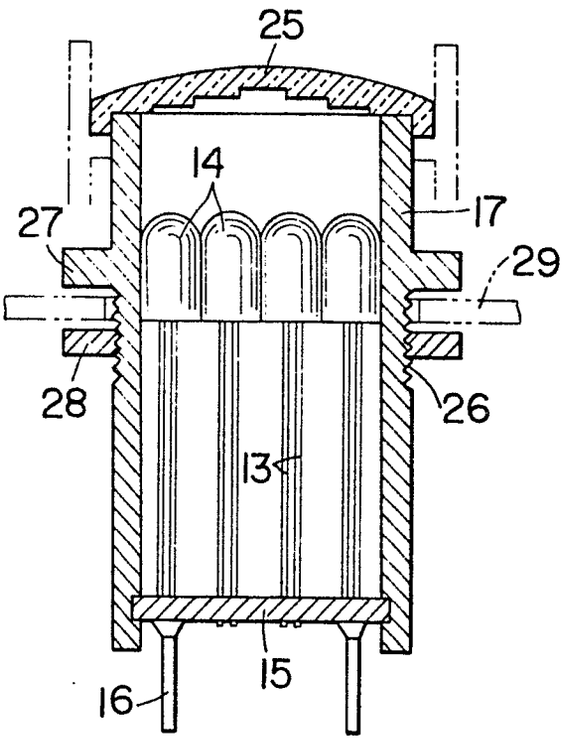


FIG.14

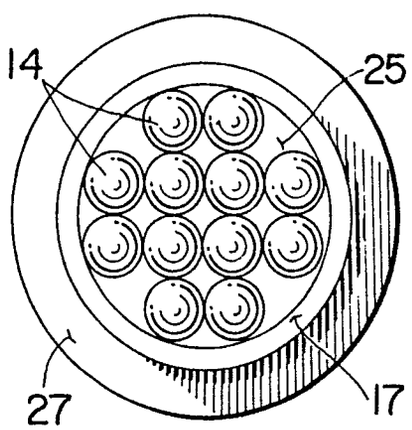
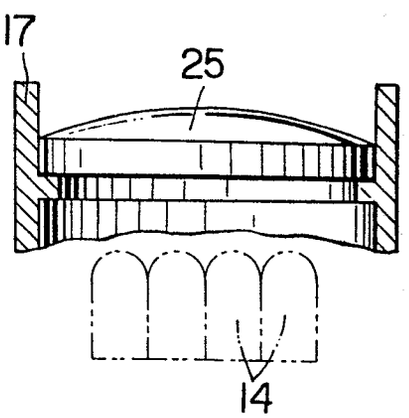
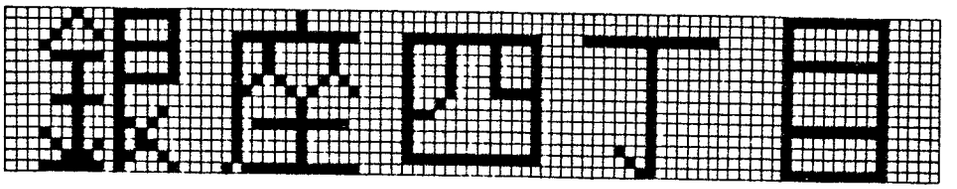


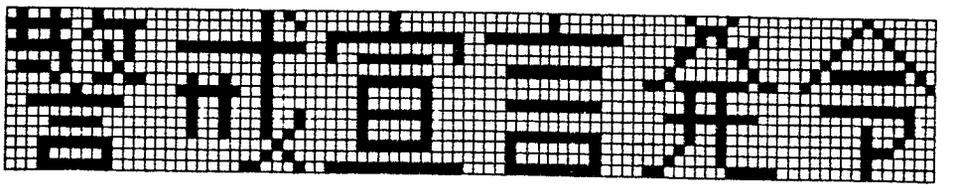
FIG.16

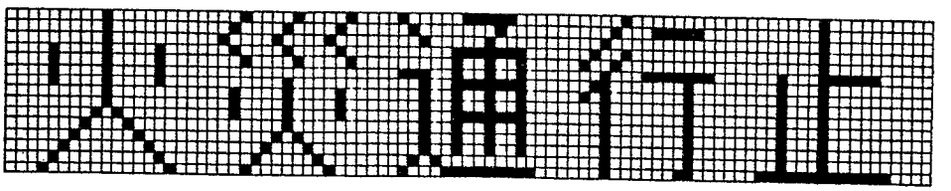


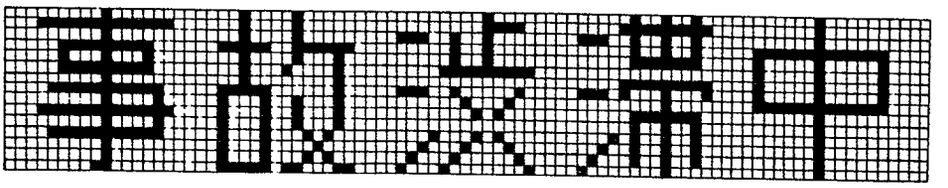
0210274

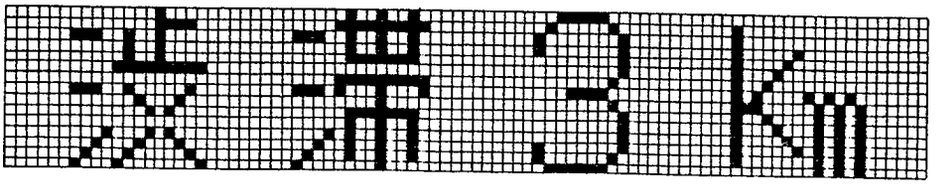
FIG.17

(A) 

(B) 

(C) 

(D) 

(E) 

INTERNATIONAL SEARCH REPORT

International Application No PCT/JP84/00234

I. CLASSIFICATION OF SUBJECT MATTER (if several classification symbols apply, indicate all) [3]

According to International Patent Classification (IPC) or to both National Classification and IPC

Int. Cl[4] G09F 9/33

II. FIELDS SEARCHED

Minimum Documentation Searched [4]

Classification System	Classification Symbols
IPC	G09F 9/30, 9/33

Documentation Searched other than Minimum Documentation to the Extent that such Documents are Included in the Fields Searched [5]

Jitsuyo Shinan Koho 1972 - 1985
Kokai Jitsuyo Shinan Koho 1972 - 1985

III. DOCUMENTS CONSIDERED TO BE RELEVANT [14]

Category*	Citation of Document, [16] with indication where appropriate of the relevant passages [17]	Relevant to Claim No [18]
Y	JP, U, 54-158586 (Omron Tateisi Electronics Co.), 5 November 1979 (05. 11. 79) (Family nashi)	1 - 6
Y	JP, U, 59-41385 (Nippon Koho Kyokai Kabushiki Kaisha), 16 March 1984 (16. 03. 84) (Family nashi)	1 - 6
Y	JP, A, 59-180582 (Toshiba Corp.), 13 October 1984 (13. 10. 84) (Family nashi)	1 - 6
Y	JP, U, 57-41669 (Japan Traffic Management Technology Association), 6 March 1982 (06. 03. 82) (Family nashi)	1 - 6
Y	JP, U, 57-186055 (Daiwa Denshi Kogyo Kabushiki Kaisha), 26 November 1982 (26. 11. 82) (Family nashi)	1 - 6
Y	JP, U, 57-133081 (Ohashi Seiichi), 19 August 1982 (19. 08. 82) (Family nashi)	1 - 6
Y	JP, Y1, 48-24541 (Matsushita Electric Industrial Co., Ltd.), 17 July 1973 (17. 07. 73) (Family nashi)	1 - 6

* Special categories of cited documents: [15]

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"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)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"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

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

"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

"&" document member of the same patent family

IV. CERTIFICATION

Date of the Actual Completion of the International Search [2]	Date of Mailing of this International Search Report [2]
March 1, 1985 (01. 03. 85)	March 11, 1985 (11. 03. 85)

International Searching Authority [1]

Japanese Patent Office

Signature of Authorized Officer [20]

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y	JP, U, 53-79320 (K.C.C. Shokai Kabushiki Kaisha), 1 July 1978 (01. 07. 78) (Family nashi)	2 - 6
Y	JP, U, 53-11978 (Toshiba Electric Equipment Corp.), 31 January 1978 (31. 01. 78) (Family nashi)	2 - 6
Y	JP, Y1, 48-27675 (Takamura Goro), 15 August 1973 (15. 08. 73) (Family nashi)	2 - 6
Y	JP, U, 50-83980 (Fujitsu Ltd.), 18 July 1975 (18. 07. 75) (Family nashi)	2 - 6
Y	JP, U, 57-93983 (Copal Co., Ltd.), 9 June 1982 (09. 06. 82) (Family nashi)	2 - 6

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

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 [12] 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 [13], specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

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

FURTHER INFORMATION CONTINUED FROM THE SECOND SHEET

Y	JP, U, 50-19381 (Toshiba Corp.), 4 March 1975 (04. 03. 75) (Family nashi)	3 - 6
Y	JP, U, 54-91086 (Nippon Electric Co., Ltd.), 27 June 1979 (27. 06. 79) (Family nashi)	3 - 6

V. ☐ OBSERVATIONS WHERE CERTAIN CLAIMS WERE FOUND UNSEARCHABLE [10]

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 [13] 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 [13], specifically:

VI. ☐ OBSERVATIONS WHERE UNITY OF INVENTION IS LACKING [11]

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