

12 **EUROPEAN PATENT APPLICATION**

21 Application number: **89119259.3**

51 Int. Cl.⁵: **G09F 19/22, G09F 13/04**

22 Date of filing: **17.10.89**

30 Priority: **17.04.89 JP 95272/89**

43 Date of publication of application:
24.10.90 Bulletin 90/43

64 Designated Contracting States:
DE FR GB

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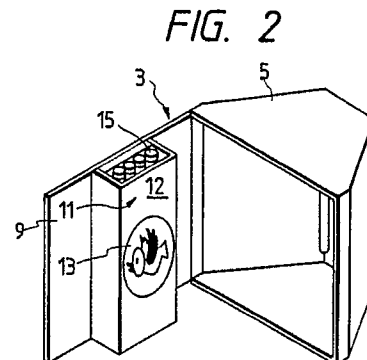
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54 **Display apparatus utilizing afterimage.**

EP 0 393 243 A2
 57 A display apparatus utilizing afterimage comprises a plurality of display boards disposed alongside a track of vehicles at such intervals that a passenger in a running vehicle can see the character or pattern on the display boards in a continuous flow by the action of afterimage. Shielding means having a vertical slit is provided at a distance away from the display surface of each display board to cover the display surface. A passenger in a running vehicle sees one display board after another disposed alongside the track through the slit cut in the shielding means as the vehicle moves forward. Because adjoining display surfaces are kept from overlapping, the passenger can clearly see the character or pat-

tern that appears to remain at a standstill or moving.



DISPLAY APPARATUS UTILIZING AFTERIMAGE

This invention relates to a display apparatus that presents information to view by taking advantage of afterimage. The display apparatus is intended for showing advertisement and other information to passengers in running trains, automobiles and other vehicles.

A method of displaying information utilizing afterimage is disclosed in Japanese Provisional Patent Publication No. 204291 of 1988. This method employs multiple advertising boards placed parallel to the traveling direction of a train at such intervals that the display boards appear, when the train runs at a proper speed, with a frequency greater than the critical fusion frequency with which afterimage is formed in the eyes of a passenger in the running train.

The characters and patterns on the advertising boards of the known method successively give to the eyes of a passenger visual stimuli with a frequency greater than the critical fusion frequency. The stimuli is perceived as a series of continued stimuli forming an afterimage that looks as if it is moving or stopping like a motion picture.

For the characters and patterns on the display boards to form a clearly visible apparently stopping or moving afterimage, each board should not overlap the adjoining one in the eyes of the perceiver. More specifically, adjoining boards must be spaced away from one another at large enough intervals that each board is perceived intermittently. Actually, however, the relationship between the running speed of the vehicle and the time span during which afterimage remains on the retina of eyes limits the space between adjoining display boards. In an example shown in the aforementioned provisional patent publication, for instance, advertising boards are spaced at intervals of 1 m along a railway over which train runs at a speed of 100 kilometer per hour. Consequently, the display boards arranged by that known method overlap one another, failing to form an apparently moving or stopping afterimage of characters and patterns.

The above problem may be solved if, for example, stroboscopic lamps or other similar light sources are provided to instantaneously light one display board after another, which are disposed along rails in a tunnel, as train passes therealong. But provisions to turn on such light sources simultaneously with the passage of train are very costly.

The object of this invention is to provide an inexpensive display apparatus that gives an apparently moving or stopping image of characters and patterns by utilizing the action of afterimage.

A display apparatus utilizing afterimage accord-

ing to this invention comprises a number of display boards disposed alongside railway at such intervals that passengers in a running train can perceive letters or patterns drawn thereon in a continuous flow by the action of afterimage. Shielding means to cover the display board is provided at some distance away from the display board. The shielding means having a vertical slit cut therein is either a shielding plate or a box-shaped housing.

Each unit of the display apparatus according to this invention comprises a housing having a vertical slit cut in the front panel thereof, a display board contained in the housing with the display surface looking forward, and a light source contained in the housing to light the display surface. A plurality of such units are placed alongside railway at given intervals so that passengers in running trains perceive the characters or patterns on the display surfaces in a continuous flow by the action of afterimage.

The space between the display surface and the slit depends on the size of the display apparatus, distance between the passenger and the display apparatus, and other factors, ranging, for example, between 100 mm and 600 mm. The width of the slit varies with the running speed of vehicle, distance between the passenger in the vehicle and the display surface, distance between the display surface and the slit, thickness of the shielding plate or housing, brightness of the display surface, etc., generally ranging between 1 mm and 5 mm. Letters and characters vertically elongated in appropriate proportion to the running speed of vehicle look normal to the eyes of passengers in running vehicles. The ratio of vertical elongation, which varies with the positional relationship among the display surface, slit and passenger, is usually between 1.1 to 5 times.

To the eyes of a passenger, a character or a pattern appear to remain at a standstill if exactly the same character or pattern is copied on all display surfaces. A series of patterns gradually changed, like those in the successive frames of a motion picture film, in the traveling direction of vehicle produces an apparently moving image.

Though momentarily seeing only part of the character or pattern on the display surface through the slit, a passenger in a vehicle sees from one end to the other thereof as the vehicle runs forward. By the action of afterimage, the passenger who sees one display surface after another disposed alongside railway through each slit feels as if the character or pattern he sees in moving or at a standstill. With the display surface covered with the shielding means, the passenger sees the character

or pattern drawn thereon only through the slit cut therein. This prevents the characters or patterns on adjoining display surfaces from overlapping one another in the eyes of the perceiver. Thus, an apparently moving or stopping image of characters or patterns can be seen clearly.

Having a shielding plate or housing with a slit that covers the display surface on which character or pattern is drawn, the display apparatus of this invention dispenses with special lighting apparatus that flashes light as a train passes thereby. Therefore, the display apparatus according to this invention is simple and inexpensive.

Fig. 1 is a perspective view showing a preferred embodiment of this invention, and more particularly a display unit making up the display apparatus according to this invention;

Fig. 2 is a perspective view of the same display unit seen from behind, with the back door opened;

Fig. 3(a) shows an example of the character or pattern drawn on the display surface of the display unit and Fig. 3(b) shows how the character or pattern in Fig. 3(a) appears in the eyes of a passenger in a running vehicle;

Fig. 4 is a vertical cross-sectional view showing a display apparatus placed in a tunnel;

Fig. 5 is a perspective view showing a plurality of the display units disposed alongside a railway;

Fig. 6 is a perspective view showing another example of the display unit seen from behind, with the back door opened,

Fig. 7 is a partially broken perspective view showing still another example of the display unit; and

Fig. 8 is a partially broken perspective view showing yet another example of the display unit.

Now a preferred embodiment of this invention placed in a tunnel through which trains run at a speed of 100 km per hour will be described in the following.

A display apparatus according to this invention comprises a plurality of display units 3 shown in Figs. 1 and 2.

Each display unit 3 comprises a housing 5 having a trapezoidal cross section, with a vertical slit 7 cut in the front panel 6 thereof. The slit 7 is 2 mm wide and 550 mm long. The housing 5 has an openable back door 9 that carries a display board 11 whose display surface 12 faces the front panel 6. The display board 11 is of translucent plastics, with a vertically elongated character or pattern 13 drawn thereon as shown in Fig. 3(a). The display board 11 is 500 mm high and 200 mm wide, with the display surface 12 and the front panel 6 spaced away by a distance of 200 mm. A fluorescent lamp 15 to flash a light on the display surface 12 is

provided between the back door 9 and the display board 11.

The display unit 3 just described is mounted on the wall 26 of a tunnel 25 through which a train 21 travels, at such a height that a passenger P in the train 21 can see the unit 3 through a window 22 of the train 21, as shown in Fig. 4. The distance between the passenger P and the display unit 3 is between 0.8 m and 1.6 m. One hundred display units 3 are mounted on the wall 26 of the tunnel 25 alongside a railway 28 over which the train 21 runs, as shown in Fig. 5. The distance L between adjoining display units 3 is such that the passenger P in the running train 21 can see the character or pattern 13 in a continuous flow by the action of afterimage. In the case of a standard motion picture, for example, an afterimage remains in the eyes of a perceiver for a period of 1/24 or 0.04 second. On the other hand, the train running at a speed of 100 km per hour advances 27.7 m in a second. To attain the afterimage time of 0.04 second, therefore, the distance L between adjoining display units 3 should be 1.15 m. Because one hundred display units 3 are provided, the passenger P in the running train 21 will then see the character or pattern 13 for a period of about 4 seconds.

The passenger P in the running train 21 who sees one display surface 12 after another disposed alongside the railway 28 feels as if the character or pattern 13 is at a standstill or moving by the action of afterimage. The vertically elongated character or pattern 13 shown in Fig. 3(a) looks normal, as shown in Fig. 3(b), in the eyes of passenger P in the running train 21.

Fig. 6 shows another preferred embodiment of the display unit.

A display unit 31 comprises a housing 32 having a trapezoidal cross section, with a vertical slit 35 cut in the front panel 34 thereof. The housing 32 has an openable back door 37 that carries a display board 11 whose display surface 12 faces the front panel 34. The display board 11 shows a vertically elongated character or pattern 13 drawn thereon as shown in Fig. 3(a). The dimensions of the housing 32, slit 35 and display board 11 are the same as those with the display unit 3 of the first preferred embodiment. But the distance between the front panel 34 of the housing 32 and the display surface 12 is greater than the distance of 200 mm in the first preferred embodiment, being 350 mm. A fluorescent lamp 39 to flash a light on the display surface 12 is provided on the back of the front panel 34 of the housing 32.

As mentioned previously, the space between the display board 11 and the slit 35 must be above a certain limit. With the preferred embodiment being described, it is possible to reduce the size of

the display unit 31 because large enough space can be provided therebetween.

Fig. 7 shows still another preferred embodiment of the display unit.

A display unit 41 has a shielding plate 43 disposed parallel to the traveling direction A of vehicle, with a vertical slit 44 cut in the shielding plate 43. A display board 11 is provided at the back of the shielding plate 43 so that the display surface 12 thereof is diagonal to the traveling direction A of vehicle at an angle of 60 degrees. The display board 11 carries a vertically elongated character or pattern 13 drawn with a fluorescent paint as shown in Fig. 3(a). The slit 44 is perpendicular to the display surface 12. Therefore, the slit 44 is diagonal to the traveling direction A of vehicle at an angle of 30 degrees. An ultraviolet lamp 46 to flash a light on the display surface 12 is provided at the back of the shielding plate 43. The shielding plate 43 must be large enough to keep the light of the ultraviolet lamp 46 out of the eyes of a passenger. The angle of inclination mentioned above may be varied according to the distance between the passenger and display apparatus and other factors.

The display unit 41 of the preferred embodiment being described is particularly simple. The character or pattern 13 drawn with a fluorescent paint and lighted with the ultraviolet lamp 46 looks clear to the eyes. The slit 44 oblique to the traveling direction A of vehicle permits a passenger to see the character or pattern 13 from a point far upstream of the display unit 41. This preferred embodiment is advantageous where no great distance can be left between the display unit and passenger, as in a tunnel.

Fig. 8 shows yet another preferred embodiment of the display unit.

A display unit 51 has a housing 52 with a rectangular cross section, with a vertical slit 55 cut along one edge of the front surface 53 thereof. A transparent display board 11 is provided inside the housing near the front surface 53 thereof. A vertical elongated character or pattern 13 is drawn on the display board 11. Several fluorescent lamps 57 are provided between the front surface 53 of the housing 52 and the display board 11. A reflector 59 is disposed near the rear surface 54 of the housing 52 and diagonally with respect to the front surface 53 thereof to face the slit 55. The reflector is inclined at an angle of 60 degrees with respect to direction A in which the vehicle runs. Cut perpendicularly to the reflector 59, the slit 55 is inclined at an angle of 30 degrees with respect to said direction A.

In this preferred embodiment, the character or pattern on the display board 11 is reflected by the reflector 59 and then viewed through the slit 55.

Accordingly, a long path of light rays can be secured between the display board 11 and slit 55 even when the depth of the housing 52 is small. This permits reducing the thickness of the housing 52. Because of this feature, this preferred embodiment proves advantageous where no great distance can be kept between the passenger and display unit, as in a tunnel.

This invention is by no means limited to the specific embodiments described herein. The display apparatus may be installed on an express highway for automobiles. It may be provided along a track ride in an amusement or theme park to give a special stage effect to the motion of animation characters. High-speed jet coasters and lower-speed theme rides for the spectators of shows and attractions are typical examples of the track ride. The display surface may consist of a television screen. The entire display unit may be disposed diagonal to the traveling direction of vehicle, too.

Claims

1. A display apparatus utilizing afterimage comprises:

a plurality of display boards each showing a character or pattern thereon, the display boards being disposed alongside a track of vehicles at such intervals that a passenger in a running vehicle can see the character or pattern thereon in a continuous flow by the action of afterimage; and shielding means disposed away from the display surface (12) of each display board to cover the display surface (12), the shielding means having a vertical slit (7, 35, 44, 55) cut therein, the slit (7, 35, 44, 55) permits seeing part of the character or pattern (13) on the display surface (12).

2. A display apparatus according to claim 1, in which the display boards (11) are disposed diagonal to the traveling direction (A) of vehicle (21).

3. A display apparatus according to claim 1 or 2, in which the character or pattern (13) is vertically elongated in proportion to the traveling speed of vehicle (21).

4. A display apparatus according to any one of claims 1 to 3, in which the shielding means consists of a shielding plate (43).

5. A display apparatus according to any one of claims 1 to 4, in which the shielding means consists of a box-shaped housing (5, 32, 52).

6. A display apparatus according to any one of claims 1 to 5, in which the slit (7, 35, 44, 55) has a width of 1 mm to 5 mm.

7. A display apparatus according to any one of claims 1 to 6, in which all display boards (3, 31, 41, 51) are slanted with respect to the traveling direction (A) of vehicle (21).

8. A display apparatus according to any one of claims 5 to 7, in which the housing (5, 32) has a vertical slit (7, 35) in the front surface thereof and contains a display board (11) having a display surface (12) that faces forward so that part of the character or pattern (13) can be seen through the slit (7, 35) and a source of light (39) to illuminate the display surface (12), a plurality of said housings (5, 32) being disposed alongside the track (28) of the vehicle (21) at given intervals so that a passenger (P) in the running vehicle (21) can see the character or pattern (13) in a continuous flow by the action of afterimage.

9. A display apparatus according to any one of claims 5 to 7, in which the housing (52) has a vertical slit (55) cut near one edge of the front surface (53) thereof and contains a transparent display board (11) carrying a character or pattern (13) thereon and disposed near the front surface (53) thereof, a light source (57) disposed between the front surface (53) of the housing (52) and the display board (11) and a reflector (59) inclined to face the slit (55) and disposed near the rear surface (54) of the housing (52), a plurality of said housings (52) being disposed alongside the track (28) of the vehicle (21) at given intervals so that a passenger (P) in the running vehicle (21) can see the character or pattern (13) in a continuous flow by the action of afterimage.

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FIG. 1

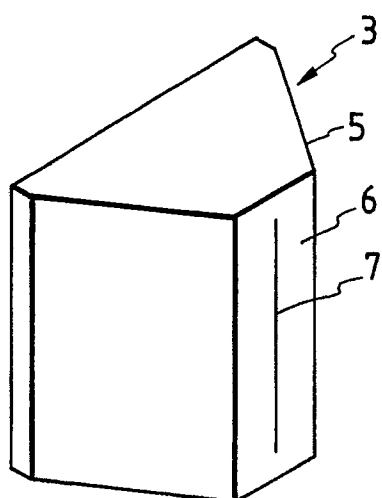


FIG. 2

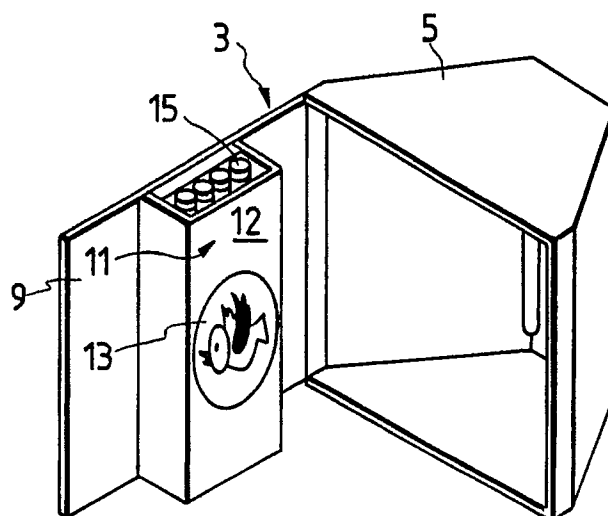


FIG. 3

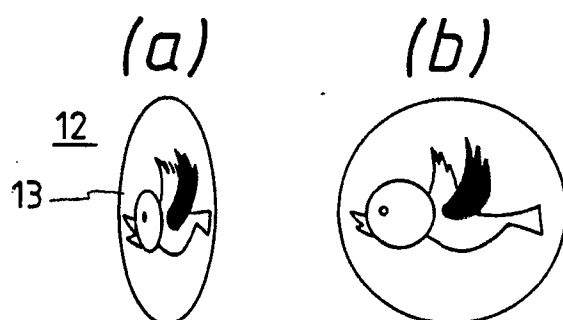


FIG. 4

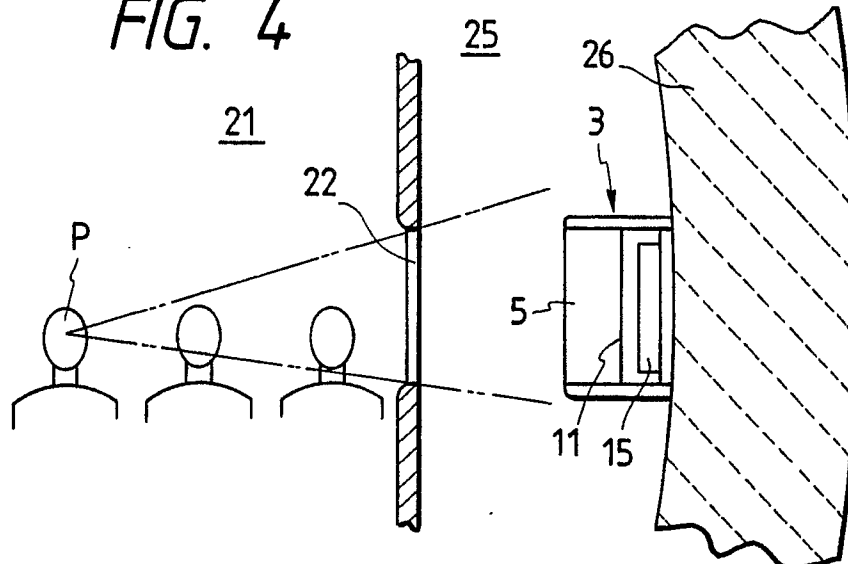


FIG. 5

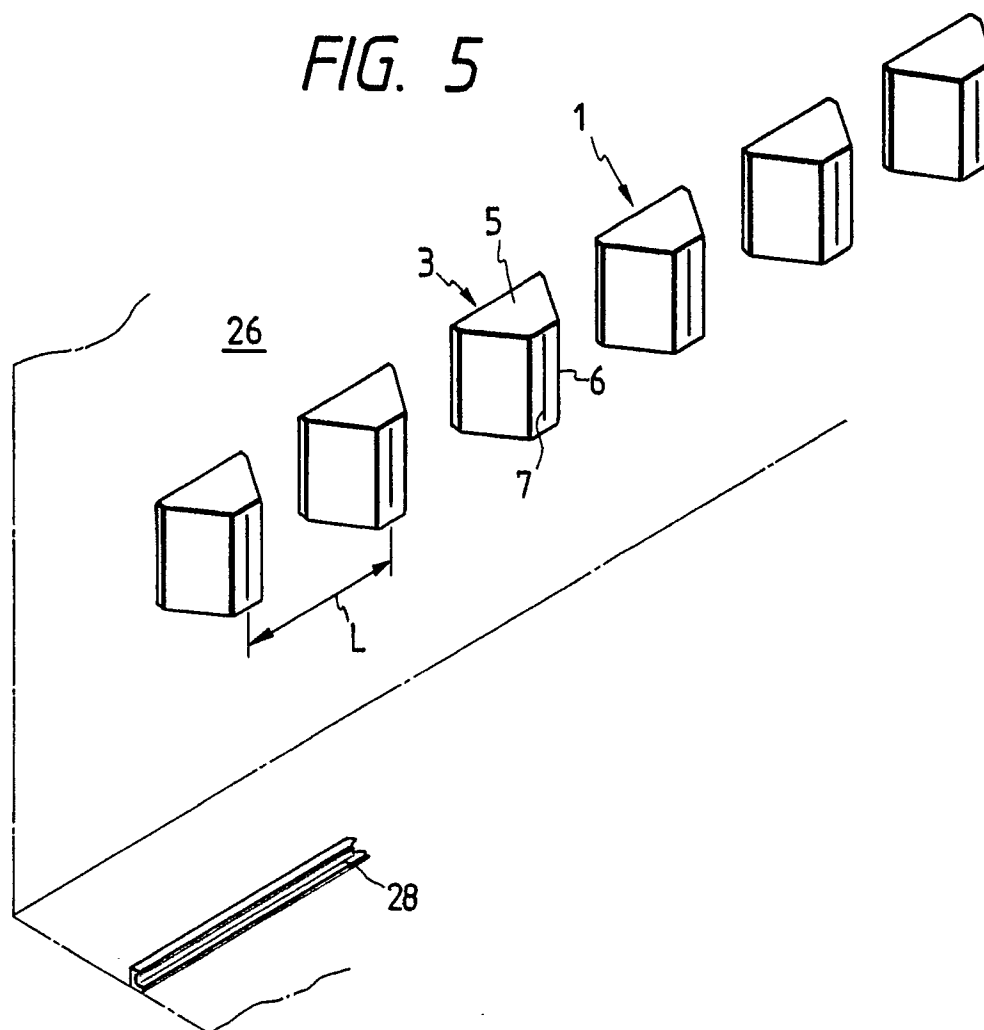


FIG. 6

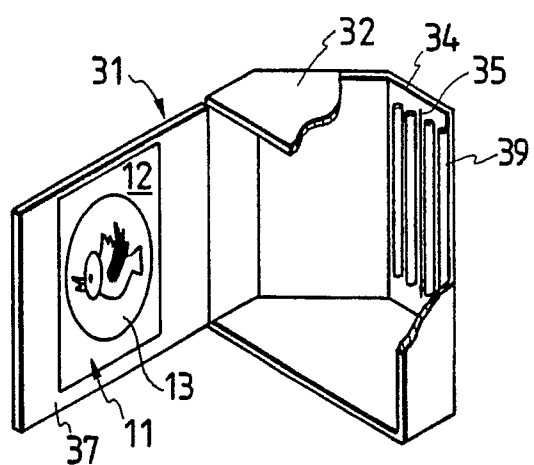


FIG. 7

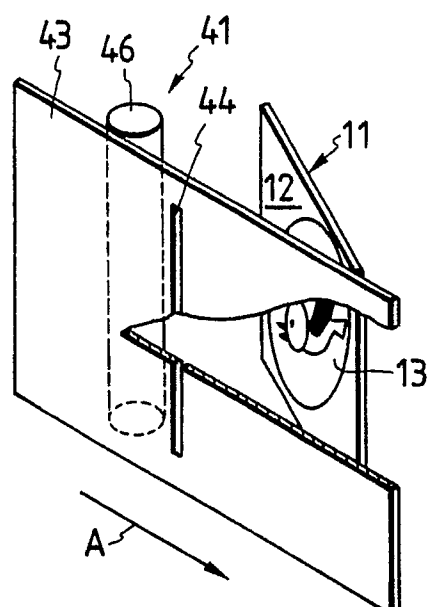


FIG. 8

