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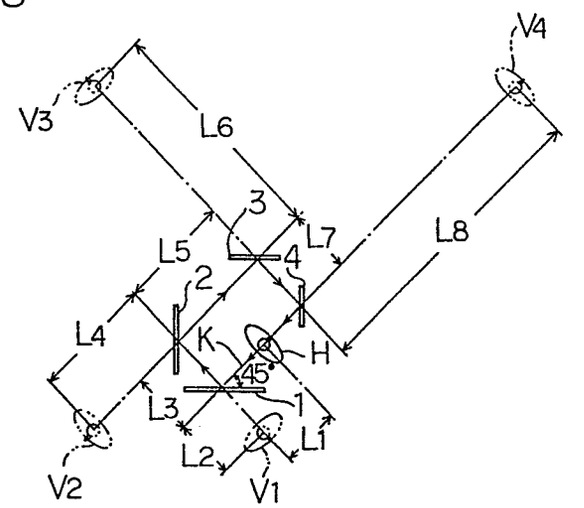
(54) Mirror system for viewing rear side of subject.

(57) In a mirror system to enable projection of an observer of the invention, a whole image at rear side of the observer can be easily seen. The mirror is provided with a first mirror (1), a second mirror (2), a third mirror (3), a fourth mirror (4), and a base (5) to support the four mirrors integrally.

The four mirrors stand contiguous to each other in sequence, and mirror surfaces of the contiguous mirrors are perpendicular to each other and mirror surfaces of every other contiguous mirror are arranged in opposition, so that the incident ray to the first mirror at the horizontal incident angle 45° is projected through the second mirror and the third mirror onto the fourth mirror. When the observer (H) backs against the first mirror and faces the fourth mirror at intermediate position between the first mirror and the fourth mirror, a whole image at rear side of the observer in the same direction as that of the observer can be projected onto the mirror (4) in front of the observer.

Fig. 3



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MIRROR SYSTEM FOR VIEWING REAR SIDE OF SUBJECT

The present invention relates to a mirror wherein an image of the rear side of an observer can be easily seen.

In the prior art, in order to enable a person to see an image of his left or right profile, a mirror system comprising a front mirror and respective wing mirrors at both sides thereof is used.

This three-mirror arrangement is so constituted that, when the subject faces the front mirror, the front image and the side images of the subject are formed by the front mirror and the wing mirrors respectively.

In order for the subject to see his or her rear view, for example, when he or she cares for hairs, a separate hand mirror is generally used and the back of the head is reflected by the hand mirror to the front mirror in which it is viewed. Thus the wing mirrors in this arrangement have not been used to form an image of the rear view of the subject, a further hand mirror has been necessary to do this.

The present invention provides a mirror system comprising three or more mirrors, characterised in that said mirrors are supported to define a folded ray path in the form of a closed loop such that a subject interposed in said ray path can see his rear view in one of said mirrors, preferably, there are four of said mirrors.

In the observation of the rear side using a multi-folded mirror in the prior art, the, size of the hand mirror or range of its reach is limited and therefore the observation position to be reflected and projected on the front mirror is limited.

Consequently, the whole image of the rear side of the observer cannot be seen accurately in such constitution.

This disadvantage is overcome in a preferred embodiment of the invention, in which one of said mirrors is of substantially the full height and width of a person and forms a substantially complete rear view of the subject in another of said mirrors when said subject is interposed said ray path.

In one embodiment the system comprises a first mirror, a second mirror, a third mirror, a fourth mirror, and a base to support respective mirrors integrally. Respective mirrors stand contiguous to each other in sequence, and mirror surfaces of the contiguous mirrors are perpendicular to each other and mirror surfaces of every other contiguous mirrors are arranged in opposition. In this constitution, if the rear side of the observer is projected, incident ray to the first mirror in the horizontal incident angle 45° is projected through the second mirror and the third mirror onto the fourth mirror so as to attain the above object.

Operation of the mirror to enable projection of the rear side of the subject, or observer, according to this embodiment of the invention will be described referring to Fig 3. If the observer (H) backs against the first mirror (1) and faces the fourth mirror (4), imaginary center line K in the front and rear direction of the observer (H) is directed in angle of 45° with respect to the first mirror (1) and the fourth mirror (4), and the rear side of the observer (H) is incident upon the first mirror (1) at the incident angle 45°. Then, virtual image, V1 is produced at position of distance L2 being equal to distance L1 between the observer (H) and the reflecting point.

The virtual image V1 is projected onto the second mirror (2) remote from the first mirror (1) by distance L3 between the reflecting points, and virtual image V2 is produced at position of distance L4 being equal to sum of the distance L2 and the distance L3.

Also the virtual image V2 is projected onto the third mirror (3) remote from the second mirror (2) by distance L5 between the reflecting points, and virtual image V3 is produced at position of distance L6 being equal to sum of the distance L4 and the distance L5.

Further the virtual image V3 is projected onto the fourth mirror (4) remote from the third mirror (3) by distance L7 between the reflecting points, and virtual image V4 is produced at position of distance L8 being equal to sum of the distance L6 and the distance L7, thereby the rear image of the observer (H) is projected onto the fourth mirror (4) in front of the observer (H).

The rear image becomes the same phase at lateral sides by the reflection of four times, and becomes the projection image in the same direction as that of the observer (H).

Consequently, in this mirror system, when the observer backs against the first mirror and faces the fourth mirror at intermediate position between the first mirror and the fourth mirror, a whole image at rear side of the observer in the same direction as that of the observer can be projected onto the mirror in front of the observer.

Furthermore, according to the mirror of the invention, the subject himself can observe the rear image which is accurate and seen as another person sees the back configuration of the subject.

Embodiments of the invention will now be described by way of example only with reference to Figures 1 to 7 of the accompanying drawings, of which:

Fig. 1 is a plan view of a mirror system to enable projection of rear side of an observer as an embodiment of the invention;

Fig. 2 is a perspective view of the mirror system of Fig. 1;

Fig. 3 is a plan view of the mirror system illustrating operation;

Fig. 4 is a plan view of the mirror system illustrating equivalent position of each mirror;

Fig. 5 is a side view of Fig. 4;

Fig. 6 is a plan view illustrating surface reflection image from the front side; and

Fig. 7 is a plan view illustrating surface reflection image from oblique direction.

In the accompanying drawings, reference numeral 1 designates a first mirror of the mirror to enable projection of rear side of an observer. The first mirror 1 of the embodiment is formed in lateral size 70 cm and longitudinal size 150cm so that whole rear side of the observer can be projected with a prescribed spacing.

A second mirror 2, a third mirror 3 and a fourth mirror 4 in the embodiment are set respectively in lateral size to 0.9 times, 0.6 times and 0.45 times of that of the first mirror 1 and in longitudinal size to 0.8 times, 0.45 times and 0.25 times of that of the first mirror 1.

Size of the mirrors 1, 2, 3 and 4 is determined by equivalent position of the projection image when the four mirrors 1, 2, 3 and 4 are deemed as transmission bodies.

As shown in Figs. 4 and 5, when the four mirrors 1, 2, 3 and 4, each having length A, are arranged contiguous to each other in sequence along reference lines 11, 12, 13 and 14 formed in square, if the four mirrors are developed from position E of eyes of the observer H towards the fourth mirror 4 on the reference line 14, the reference lines 13, 12 and 11 respectively become reference lines 13', 12' and 11' developed continuously to the reference line 14.

Virtual image V1 projected onto the first mirror 1 is positioned at distance 2A/2 in front of the observer H, and mounting positions of the mirror 1, 2, 3 and 4 and lateral size and longitudinal size of the mirrors 1, 2, 3 and 4 are determined by intersections between the line connecting the virtual image V1 to the position E of eyes and the developed reference lines 11', 12', 13' and 14.

In each of the mirrors 1, 2, 3 and 4 of the embodiment, silver surface is formed on rear surface of a glass plate having thickness 5mm, and lining is further applied thereto.

A base 5 in the embodiment is a frame body formed by tubular members. As shown if Fig. 1, bottom portion of the base 5 is constituted along the reference lines 11, 12, 13 and 14 to form square, and a polyhedron space is formed at inside of the square. The base 5 has support members 5a, 5b, 5c and 5d formed at prescribed positions, and an open surface 6 for entering or leaving to the inside space of the base 5 is formed on one side of the support members 5a, 5b, 5c and 5d. The mirrors 1, 2, 3 and 4, each mirror surface directed towards the inside, are fixed and supported respectively on the support members 5a, 5b, 5c and 5d. Consequently, when the mirror 1, 2, 3 and 4 are fixed and supported respectively on the support members 5a, 5b 5c and 5d, the first mirror 1 is opposed to the third mirror 3 and also the second mirror 2 is opposed to the fourth mirror 4, and the mirrors 1, 2, 3 and 4 are connected by luminous path P so that the center of the lateral length of each mirror has the incident angle and the reflecting angle of 45° respectively.

Although lateral size and longitudinal size of the four mirrors 1, 2, 3 and 4 become smaller in sequence in the above embodiment, for example, only lateral size of

the four mirrors 1, 2, 3 and 4 or only longitudinal size thereof may be made smaller in sequence.

Lateral size of the mirror 1 and 2 may be made equal and lateral size of the mirrors 3 and 4 may be made equal to each other and smaller than that of the mirrors 1 and 2, and longitudinal size of the mirrors 1, 2, 3 and 4 may be made smaller in sequence.

Also the four mirrors, 1, 2, 3 and 4 may be of the same size, and various combination of the mirror size may be taken corresponding to whole amount of the observer and the mirror as well as design of the mirror to enable projection of rear side of the observer.

Further the bottom space constituted by the reference lines 11, 12, 13 and 14 may be of rectangular form.

The base 5 may be provided with pivoral members 7 at bent portions in Fig. 1 and the support members 5a, 5b, 5c and 5d may be folded so that the packing volume during transportation is made compact.

In place of the mirrors 1, 2, 3 and 4 of rear surface reflection type in the embodiment, mirrors of front surface reflection type may be used.

The mirror of front surface reflection type has effect of suppressing obscureness of the reflection image which is inevitable in the mirror of rear surface reflection type. The obscureness of the reflection image will be described referring to Figs. 6 and 7. In general, in a rear surface reflecting mirror 21 with a reflecting surface 21a formed on rear side of a glass plate, 4 ~ 5% of the incident ray is reflected on the surface of the mirror 21 and the residual is reflected on the reflecting surface 21a.

If the observer H faces the mirror 21 just opposite to him, rear surface reflecting image R1 and front surface reflecting image R2 lie one upon another in the

front and rear direction as shown in Fig. 6 and therefore existence of the front surface reflecting image R2 becomes no problem.

If an object is observed in oblique reflection using the rear surface reflecting mirror 21, however, the rear surface reflecting image R1 and the front surface reflecting image R2 do not lie one upon another, but the front surface reflecting image R2 appears as shown in Fig. 7 and makes the rear surface reflecting image R1 obscure in proportion to the distance between the observer H and the object H to be observed. The obscureness of the rear surface reflecting image R1 due to the front surface reflecting image R2 can be removed using a front surface reflecting mirror with silver surface formed on the mirror surface. Consequently, one or plural pieces among the mirrors 1, 2, 3 and 4 may be replaced by the front reflecting mirrors so that a rear side mirror to obtain clear reflecting image can be formed. Also in the rear side mirror using the front surface reflecting mirrors, the four mirrors may be made smaller in sequence as above described.

It will be appreciated that the invention is not limited to mirror systems incorporating an even number of mirrors (which form a real image of the rear view of the subject), but also includes within its scope systems incorporating an odd number of mirrors, which form a virtual image of the rear view of the subject.

CLAIMS

1) A mirror system comprising three or more mirrors (1, 2, 3, 4), characterised in that said mirrors are supported to define a folded ray path (P) in the form of a closed loop such that a subject (H) interposed in said ray path can see his rear view in one of said mirrors (4).

2) A mirror system as claimed in claim 1, comprising four of said mirrors (1,2,3,4).

3) A mirror system as claimed in claim 2, wherein adjacent ones of said mirrors (1,2,3,4) are substantially orthagonal to one another and said ray path (P) is substantially rectangular.

4) A mirror system as claimed in any preceding claim, wherein said mirrors (1,2,3,4) are mounted on a common supporting frame (5) and the relative orientations of said mirrors are adjustable.

5) A mirror system as claimed in claim 4, wherein said frame (5) is hinged and can be folded flat.

6) A mirror system as claimed in any preceding claim, wherein are of said mirrors (1) is of substantially the full height and width of a person (H) and forms a substantially complete rear view of the subject (H) in another of said mirrors (4) when said subject is interposed in said ray path.

7) A mirror system as claimed in any preceding claim wherein a diversion of said mirrors (1,2,3,4) increases successively from one mirror to the rear adjacent mirror.

8) A mirror system as claimed in claim 7 wherein the edges of said mirrors (1,2,3,4) lie on a common projection from said subject (H) along said ray path (P).

9) A mirror system as claimed in any of claims 6,7 and 8 wherein a said mirror (4) which is smaller than any of the other said mirrors (1,2,3) is mounted substantially

at head height such that said subject (H) can see his rear view in said smaller mirror.

10) A mirror system as claimed in any preceding claim wherein at least one of said mirrors (1,2,3,4) is a front surface reflecting mirror.

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Fig.1

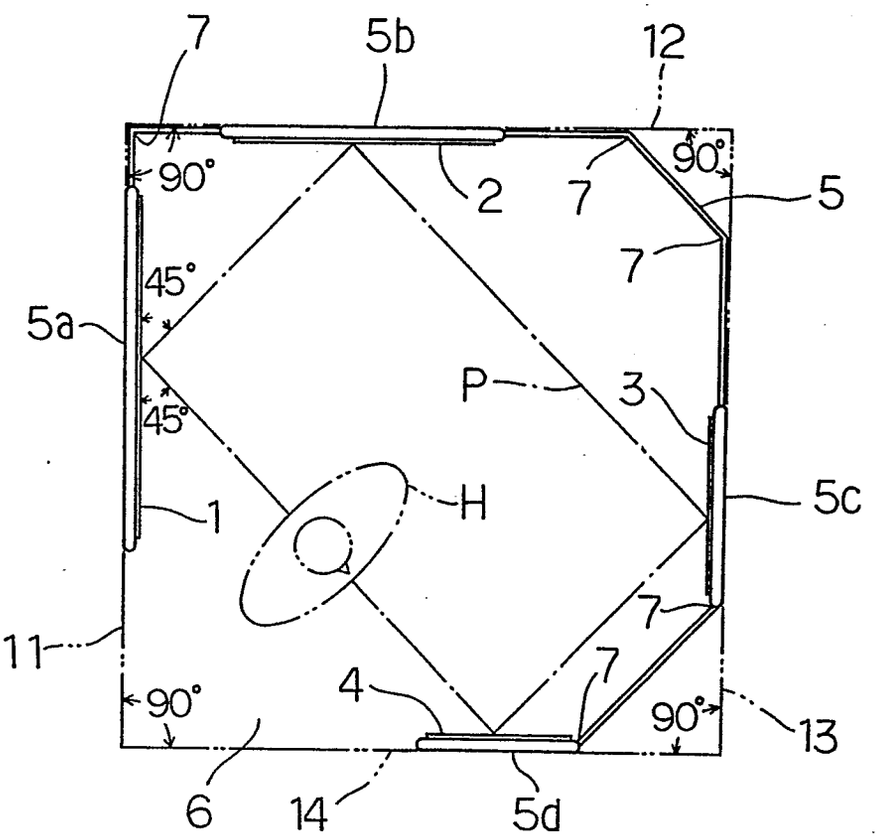

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Fig. 2

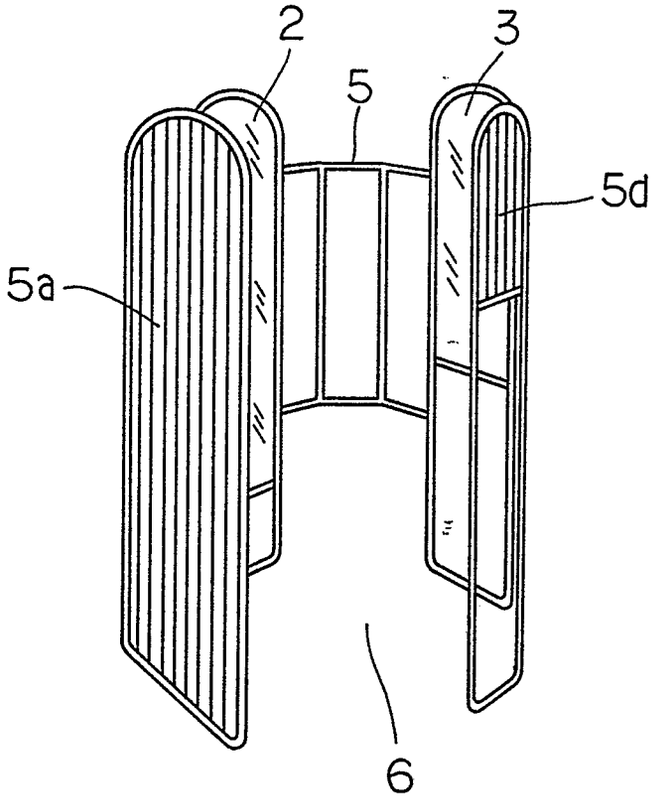

Fig. 3

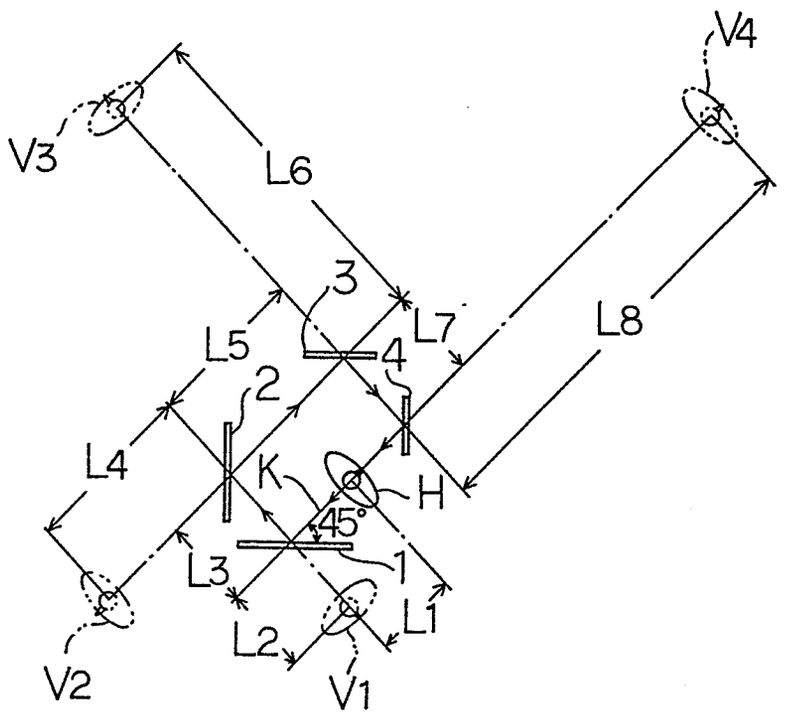

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Fig.4

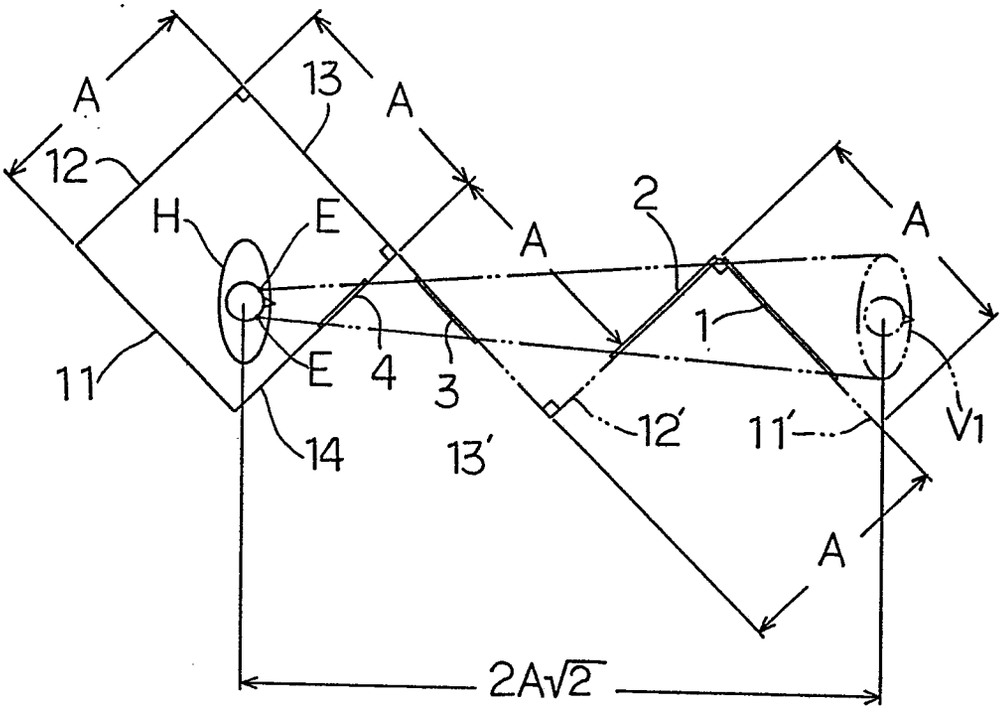

Fig.5

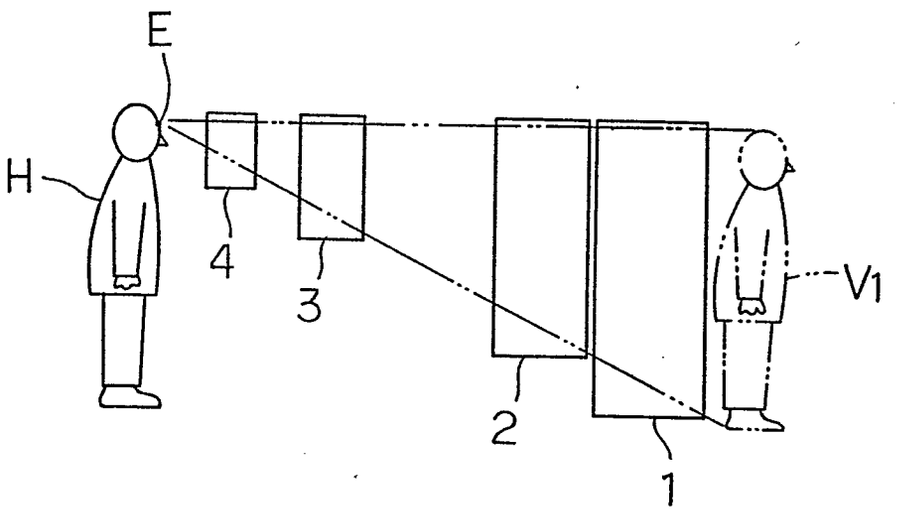

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Fig.6

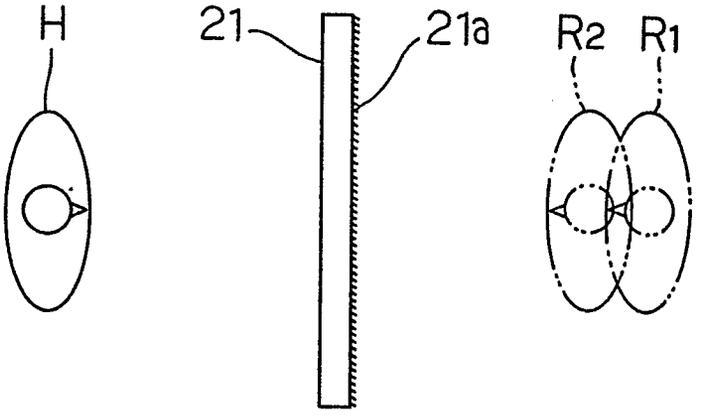

Fig.7