Eye exercise apparatus, suitable for convenient home use by the user, which includes a base (2) with a viewer at one end and two visual fixation objects (31 and 41), one at the other end of the base and a second one (31) smaller, object which can be positioned between the viewer and the first object (41) by means of a holder and a track on the base. The visual fixation objects can be pictures, which can be varied to provide interest to the user, or light sources which can be turned on or off.
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Eye Exercise Apparatus

FIELD OF THE INVENTION

This invention relates to orthoptic eye exercise devices, and more particularly to such devices which use two fixation centers and viewer frame with accessories, and adapted for exercise at patient’s home.

BACKGROUND OF THE INVENTION

Heretofore, various devices were used to perform orthoptic eye exercise. The goal of these exercises is to correct mainly for fusion deficiencies, for example convergence insufficiency or divergence insufficiency or intermittent strabismus.

The systems now in use are based on the stereoscopic effect, wherein each eye is presented a separate picture, and the patient is required to exert the eyes muscles to integrate the two pictures into one focused image.

Some of these prior art devices are boring to the patient, thus the patient has no incentive to perform the required exercise; other devices offer only incomplete exercise, which does not accomplish all the functions prescribed by the orthoptist; still other devices are too expensive and cannot be used by the public at home.

Moreover, these prior art devices are not useful for the intermittent strabismus deficiency, that is while one eye ceases at times from participating in the image-forming process. When this happens, the usual eye exercises are not effective.

It is an objective of the present invention to provide for an eye exercise device with means for overcoming the abovedetailed deficiencies, adapted for exercise at home.
SUMMARY OF THE INVENTION

The present invention seeks to provide eye exercise apparatus which overcomes disadvantages of known art in that it can be used conveniently in the patient's home, allows the patient to perform a full range of exercise functions prescribed by orthoptists, is not boring to the patient, and can be made simply and inexpensively.

There is thus provided, in accordance with a preferred embodiment of the invention, eye exercise apparatus which includes a base with a viewer at one end and two visual fixation objects, one at the other end of the base and a second, smaller, object which can be positioned between the viewer and the first object by means of a holder and a track on the base. Either or both of the visual fixation objects can be pictures, which can be varied to provide interest to the user, or diffuse or point light sources which can be turned on or off. In a further preferred embodiment of the present invention, the pictures can have light sources which can be turned on or off and apertures to direct the light to the viewer. The track on the base runs along the optical axis of the apparatus which is coincident with axis of symmetry of the viewer. The viewer can be an open frame which the user looks through along the optical axis of the apparatus.

In further preferred embodiments of the present invention, the viewer can include holders positioned in front of each eye of the user which can support one or more optical elements which can be lenses, prisms, or red filters. The base can be free standing with adjustable height for use on a table or can include a handle to allow the apparatus to be held in front of the user's eyes.

BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will be more fully understood and appreciated from the following detailed description, taken in conjunction with the drawings, in which:

Fig. 1 illustrates the structure of the device for eye exercise;
Fig. 2 details the optical path and the operation of the device;
Fig. 3 details the image formation for the far fixation case;
Fig. 4 details the image formation for the near fixation case;
Fig. 5 details several possible picture pairs usable with the device for eye exercise.
A preferred embodiment of the present invention will now be described by way of example and with reference to the accompanying drawings.

Referring to Fig. 1, there is illustrated an example of a device for eye exercise, viewer frame 1 is used to hold (not shown) lenses and/or prisms and/or red filters, according to the exercise to be performed. Support means 55 is used to keep viewer frame 1 at a suitable height, to be comfortable to the user. Frame 1 is kept at eye level, while support means 55 are laid on the table (not shown).

Viewer frame 1 has two receptacles 12, 13, each for holding a lens, a prism and/or filter close to one of patient’s eye.

A fixed picture 4 and a movable picture 3 are presented to the patient. These are the visual fixation objects used for eye exercise.

Picture 3 and picture 4 are held on picture holders 31 and 41, respectively. The pictures are removably attached using mechanical, magnetic or other means (not shown) known in the art.

Picture 3 can be moved along base 2 to change the distance between picture 3 and viewer frame 1. Track 22 together with corresponding means (not shown) in picture holder 31 can be used to allow the movement of picture 3 along base 2, and its fixation at a desired distance. The length of base 2 is typically about 30 cm.

Each of pictures 3 and 4 has a hole, 32 and 42 respectively, at a fixed location in the picture. Lamps (not shown) are included in each picture holder 31, 41 located such as to be seen through holes 32, 42 respectively. The lamps may be the usual incandescent bulbs used at home, and preferably operating at a lower voltage (for example 1.5 or 3 Volts), to be usable with small electrical batteries (not shown). A preferred implementation uses light emitting diodes, LEDs, which consume less current and thus enable longer battery life.

The lights may be manually operated using switches 51, 52. Each switch, when activated, closes an electric circuit to connect one of the lamps to the battery. Thus, each light can be activated independently during the exercise.
Method of use: The patient is instructed to look at the closer picture 3; then lamp (not shown) in picture 4 is turned on, and the patient should see it double. If only one light is seen, this indicates that only one eye is participating in the exercise. In this case, the exercise is ineffective, and a different exercise, adapted to that patient, should then be recommended by the orthoptist. Means for adapting to the patient may include, for example, the use of red filters; this helps the patient's other eye to see the light in picture 4, such that when the patient sees picture 3 with both eyes, the light in picture 4 is seen double. Various shades of red filter can be used to transmit more or less light; these may be chosen by the orthoptist as required. The filter may be made, for example, of glass or celluloid.

If necessary, lenses may be used during the first stages of the exercise to help eye convergence and accommodation. Divergent lenses of about 3 diopters are recommended. The lenses should be dispensed within the more advanced stages of the treatment.

Prisms 123 and 133 may also be used to perform eye exercises, as detailed below, as shown in Fig. 2.

To adapt the device for use by adults as well as children, the distance between the left receptacle 13 and the right receptacle 12 should be adjustable. Preferably, receptacles 12 and 13 should be attached to base 2 using a mechanism (not shown) with means for changing the distance between receptacles 12, 13 while keeping the receptacles at an equal distance from base 2. Thus a slot 14 is created between receptacles 12 and 13 of viewer frame 1.

The range of change is preferably such as to achieve an inter-pupilar distance of between about 55 mm and 65 mm.

Optional handle 5 can be used to better hold the device during the exercise performance.

Additionally, batteries (not shown) powering the lights may be included in handle 5.

For ease of use, the device may include a stand (not shown) with a base and a telescopic beam, to hold it at eye level while the device is placed on a table. This provides for effortless exercise, since the patient does not have to hold the device. Other implementations may include two support means or rods (not shown) one connected to base 2 near viewer frame 1 through a rotatable hinge, the other rod connected to base 2 near picture 4, through a hinge as well. The device has then two states, one while not in use, with the rods folded and
close to base 2, while the in the other state the rods are opened down to about a normal angle with base 2. to hold the device at the desired height.

Referring to Fig. 2, which details the optical path and the operation of the device, each of the frames 12 and 13 includes a lens 122 and 132 or a prism 123 and 133, respectively. Lenses of about 3 diopters are preferred. An additional slot 124 and 134 can be used to hold a filter (not shown), additional lenses or other accessories.

Point M on optical axis 62 is viewed by the left eye 603 and the right eye 602. Axis 62 is normal to the axis 61 connecting eyes 602, 603, and intersects axis 61 at its middle. This is achieved by making optical axis 62 coincident with the axis of symmetry of the viewer (not shown).

Prisms 132 and 133 deflect the line of sight, such that while the patient’s eyes 602 and 603 look forward along line of sight 632 and 633, the actual image which is seen is further out, away from point M. Thus, the prisms as shown should be used in advanced stage exercise, to prompt the eyes to a greater effort to look at point M, along optical paths 642 and 643 respectively. Usually, prisms of 2 diopters or 3 diopters are used.

The prisms are shown in the “base out” configuration.

Fig. 3 details the image formation for the far fixation case. Here, while eyes 602 and 603 are looking at far point X, and causing images M and M’ to be formed on the retinas, additional images O’ and O” are also formed as shown, resulting in the near picture being seen double.

Referring to Fig. 4, which details the image formation for the near fixation case, eyes 602 and 603 are looking at near point X, causing Images M and M’ to be formed on the retinas as shown, resulting in the far picture A being seen double as images A’ and A”, respectively.

Fig. 5 details several possible picture pairs usable with the device for eye exercise. Replacing the pictures and using related pictures, like A and B, or C and D, results in a more interesting and pleasing eye exercise. Referring to Fig. 5 (B), which is a typical example, it includes picture 3 and hole 32, though which the lamp (not shown), which may be mounted behind the picture 3, can be seen by the patient.
Various alternative embodiments of the present invention may be include the following. For example, picture 4 may be movable as well along base 2, like picture 3, using similar means (not shown) to attach it to base 2 at the desired distance.

A minimal configuration of the present invention includes a base 2 shaped like an elongated beam of about 30 cm length, a picture 3 which is devised such as to be suitable for eye exercise and which is also movable or slidable or, attachable or otherwise including means for its being positioned at various locations along track 22 on base 2, and a light source (not shown) attached to base 2 as well.

The light source includes a lamp, an electrical power source such as a battery, and means for closing and opening the electric circuit, like a switch. The lamp is attached to base 2 at a fixed location or can be positioned at various locations along base 2. The base 2 together with picture 3 and the lamp are devised such that, while base 2 is symmetrically located before the eyes, both picture 3 and the lamp are kept at equal distance from both eyes at all times during the exercise.

To be suitable for eye exercise, picture 3 is devised such as to include a clear picture, including features which can be easily seen at a distance of between 15 and 40 cm; not too small (in which case its features are too small to be seen) and not too large (then it obstructs the other, more distant picture and/or lamp). A picture of about 2.5 to 4 cm wide by 3 to 6 cm high is preferred.

Instead of viewer frame 1, ocular means with two viewing apertures for looking through may be used, like a (not shown) spectacles-like frame without lenses, or an obstructing sheet with two holes, each located in front of one eye.

The eye exercise may be performed without lenses if low cost is the predominant consideration. In this case, however, the eye adaptation will take longer, and the whole treatment will take a longer time than with the more advanced embodiments of the present invention, as detailed above.

Viewer frame 1 can be placed on the nose during the exercise, with the patient holding the base 2 while moving picture 3 along track 22 on base 2. This embodiment allows the patient to look at a picture located at various distances from the eyes, while checking that both eyes are participating in the exercise, by activating the light and ensuring that two images of the light are seen, as detailed above. The device also keeps the picture and the light
at a fixed spatial relationship with respect to the eyes and to each other, and continuously visible to the user, to allow performance of the exercise.

In an alternative embodiment, mains electrical power can be used instead of batteries, which is a cheaper means; alternately, rechargeable (secondary) batteries may be used.

The device is held by the user during the exercise, without support means to achieve a lower cost.

It will be recognized by those skilled in the art that the foregoing is but one example of apparatus and method within the scope of the present invention, and that various modifications will occur to those skilled in the art upon reading the disclosure set forth hereinbefore.

It will further be appreciated, by persons skilled in the art that the scope of the present invention is not limited by what has been specifically shown and described hereinabove, merely by way of example. Rather, the scope of the present invention is defined solely by the claims, which follow.
CLAIMS

1. Eye exercise apparatus which comprises:
   a base having front and rear ends;
   a viewer located at said front end of said base;
   a rear visual fixation object located at said rear end of said base for selectable viewing by a user performing eye exercises looking through said viewer along an optical axis;
   a front visual fixation object located between said viewer and said rear image for selectable viewing by the user performing eye exercises looking through said viewer along said optical axis, wherein said front visual fixation object is smaller than said rear visual fixation object; and
   means for positioning said front image along said optical axis at selected distances from said viewer.

2. Eye exercise apparatus according to claim 1 wherein the axis of symmetry of said viewer is coincident with said optical axis.

3. Eye exercise apparatus according to claim 1 wherein
   said front visual fixation object has a selectably operable light source associated therewith.

4. Eye exercise apparatus according to claim 1 wherein
   said rear visual fixation object has a selectably operable light source associated therewith.
5. Eye exercise apparatus according to claim 1 wherein said front visual fixation object has an aperture formed therewith and said light source is arranged rearwardly of said visual fixation object so as to radiate toward said viewer via said aperture.

6. Eye exercise apparatus according to claim 1 wherein

said rear visual fixation object has an aperture formed therewith and said light source is arranged rearwardly of said visual fixation object so as to radiate toward said viewer via said aperture.

7. Eye exercise apparatus according to claim 3 wherein

said light source associated with said front visual fixation object is a point light source.

8. Eye exercise apparatus according to claim 4 wherein

said light source associated with said rear visual fixation object is a point light source.

9. Eye exercise apparatus according to claim 1 wherein said means for positioning comprises a track parallel to said optical axis and support means for movably mounting said front and rear visual fixation objects on said track.

10. Eye exercise apparatus according to claim 1 wherein each of said front and rear visual fixation objects comprises one of a plurality of optical images which are selectably exchangeable with other images of said plurality.

11. Eye exercise apparatus according to claim 1 wherein said viewer comprises an open frame through which the user looks into said apparatus in intersecting relation with said optical axis.
12. Eye exercise apparatus according to claim 1 wherein said viewer further comprises mounting means for selectably supporting at least one optical element.

13. Eye exercise apparatus according to claim 12 wherein said at least one optical element is selected from a group consisting of lenses, prisms, and red filters.

14. Eye exercise apparatus according to claim 1 wherein said base has a handle operative to allow said apparatus to be held by the user at eye level.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER
IPC(6) : A61B 3/00
US CL : 351/203, 200, 246
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
U.S. : 351/203, 200, 246

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
none

Electronic database consulted during the international search (name of database and, where practicable, search terms used)
none

C. DOCUMENTS CONSIDERED TO BE RELEVANT

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☐ Further documents are listed in the continuation of Box C. ☐ See patent family annex.

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Date of mailing of the international search report 23 DEC 1997

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