Sept. 8, 1964 N. M. GELFAND 3,147,664

VARIABLE ELEVATION TARGET PROJECTION SYSTEM WITH ROTARY MIRROR ASSEMBLY

Original Filed June 29, 1959 2 Sheets-Sheet 1

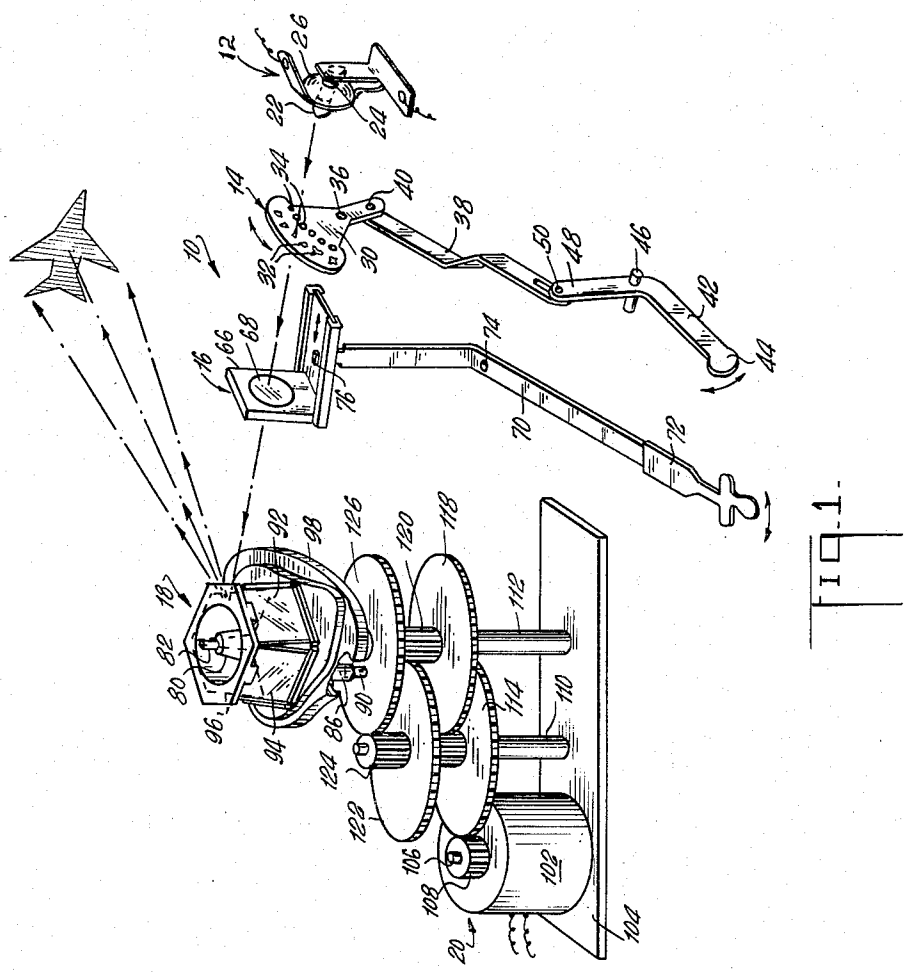

FIG. 1

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FIG. 2.

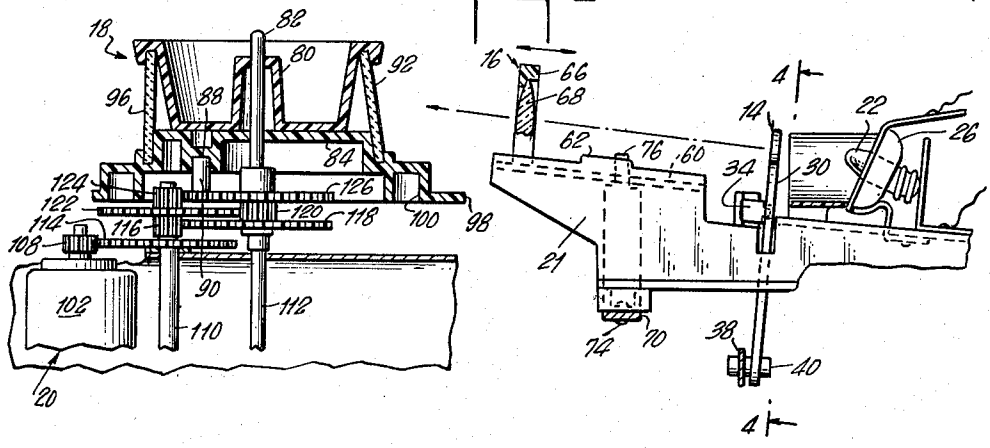


FIG. 3.

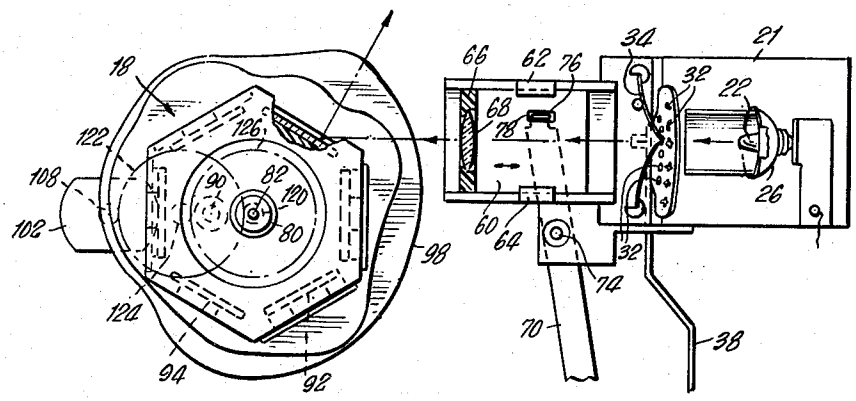
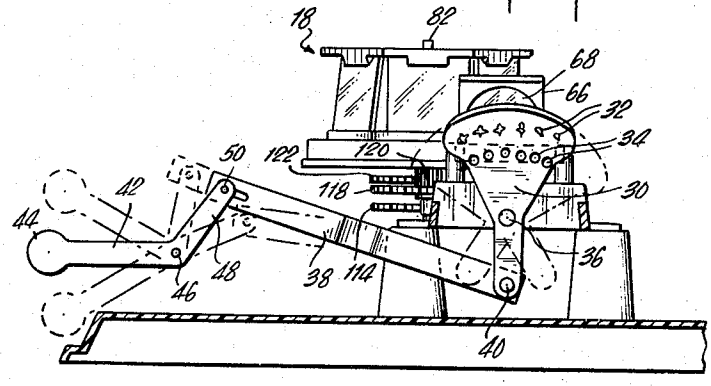


FIG. 4.



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VARIABLE ELEVATION TARGET PROJECTION SYSTEM WITH ROTARY MIRROR ASSEMBLY

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Original application June 29, 1959, Ser. No. 823,474. Divided and this application May 8, 1961, Ser. No. 103,410

2 Claims. (Cl. 88—24)

This invention relates to an optical device for use in a toy simulating the cockpit of a miliary airplane, and more particularly to a system for projecting a moving image of a simiulated target at differing elevations on a wall or like projection surface. This application is a division of the application of Nathan M. Gelfand, Serial No. 823,474, filed June 29, 1959, now abandoned, entitled Toy Cockpit.

Various projection devices exist for providing a target image on a projection surface. Through the use of this projection device it is now possible to provide increased play value by producing wide sweeps of various shapes and sizes of targets along a projection surface such as a wall or the like. Each successive sweep is at a different level or elevation rendering the tracking of the target a greater challenge thus increasing the enjoyment derived from this projection device.

An object of this invention is to provide a system for projecting an image of a simulated target on the wall in a realistic manner, with the target moving along the wall successively at different elevations thereby affording a toy of very great play value.

A further object of the present invention resides in the provision of a projection system which employs means for projecting images of different sizes and shapes simulating aircraft, missiles, spaceships, and various other airborne targets.

A still further object of the invention is to provide a simple means for reflecting light rays onto a wall or other similar surface at different elevations to render the tracking of a target more difficult and more interesting to the user of the toy.

The construction of this invention features an arrangement including a mirror assembly which is rotated and which has a plurality of mirrors extending at differing angles to the axis of rotation so that a target image is reflected on a wall or other similar surface at different elevations dependent upon the angular relationship of the mirror with respect to the light rays and the surface onto which the target is reflected.

Still further objects and features of this invention reside in the provision of a system for projecting a moving image of a simulated target that is simple in construction, easy for even a child to use and enjoy, and which is capable of being manufactured out of readily available materials thereby permitting mass production for wide scale distribution.

In accordance with an illustrative embodiment of the invention, the mirror assembly incorporated in the embodiment includes a plurality of planar mirrors disposed at different angles to the vertical. A beam of light from a light source is intercepted by suitable means for forming a target image and is directed on the mirror assembly as it is turning. The position of each mirror will determine the position of the target image reflected on a wall or other projection surface and wide sweep of the target across the projection surface will be consecutively reflected by the different mirrors with each succesive sweep of the target being at different elevation or level.

These, together with the various ancillary objects and features of the invention which will become apparent as the following description proceeds, are attained by this

projection system, a preferred embodiment of which has been illustrated in accompanying drawings, by way of example only, wherein:

FIG. 1 is a schematic perspective view of the projection system;

FIG. 2 is a partial vertical sectional view of the invention particularly illustrating the construction of the mirror assembly;

FIG. 3 is a plan view of the projection system; and

FIG. 4 is a sectional detail view taken along the plane of line 4—4 in FIG. 2 illustrating details of construction of the image forming means.

With continuing reference to the accompanying drawings wherein like reference numerals designate similar parts throughout the various views, reference numeral **10** generally designates the projection system comprising the present invention. This projection system **10** is an optical device adapted to be used in a Toy Cockpit disclosed in the application of Nathan M. Gelfand, Serial No. 823,474, filed June 29, 1959, now abandoned.

The projection system **10** is suitably mounted within the toy cockpit and includes a source **12** for a beam of light image forming means **14**, a lens assembly **16** for focusing light rays passing through the image forming means **14**, and a mirror assembly **18** for reflecting the focused light rays onto a suitable surface such as a wall or the like. Drive means **20** are provided for rotating the mirror assembly **18** to sequentially bring the portions of the mirror assembly into alignment with the focused light rays from the lens assembly **16** whereby a moving simulated target is projected on a wall or like surface at different elevations.

The projection system **10** is adapted to be mounted within a housing (not shown) of any convenient or desired size or shape and on any convenient support **21**. Within the housing the light source **12** is suitably mounted and may include an incandescent lamp **22** suitably connected to a source of electrical power and controlled by convention switch mechanism (not shown). The lamp **22** may be mounted in a suitable socket **24** provided with a reflector **26**.

The image forming means **14** include a target plate **30** having a plurality of apertures **32** therethrough of varying sizes and shapes corresponding to simulated targets. Each of the apertures serve to shape the light rays passing therethrough from the lamp **22**. Below the apertures **32** are a series of holes **34**. A detent spring **35** mounted on the support **21** holds the plate **30** in a selected position by engagement in a selected hole **34**. Each hole **34** corresponds to an aperture **32** so that the detent spring **35** serves to hold the plate **30** in accurate aligned position relative to the lamp **22**.

The plate **30** is pivoted by means of a pin or bolt **36** to the support **21**. A link **38** is pivoted at **40** to the plate **30** and is mounted for movement relative to the support **21**. Operating lever **42** having a handle **44** is pivoted at **46** to the support **21**. The end **48** of lever **42** is pivotally connected to link **38** so that handle **44** may be manipulated to select the position of the plate **30**.

Light rays passing through the selected aperture **32** in plate **30** are directed through the lens assembly **16**. The lens assembly **16** may include a lens mount in the form of a tray **60** slidably movable in guides **62** and **64**. Rising up from the tray **60** is a lens frame **66** in which a focusing lens **68** is mounted.

A lever **70** provided with a handle **72** is connected to the tray **60** and is pivoted at **74** to the support **21**. The rear end portion **76** of the lever **70** is upwardly inclined and extends into an opening **78** in tray **60**. This permits movement of the handle **72** to position the tray **60** and hence move the lens **68** to focus light rays passing there-

through so that a discrete image is focused on the mirror assembly **18** for reflection thereby.

The mirror assembly **18** is shown in greatest detail in FIG. 2. The mirror assembly **18** includes a drum **80** turnably mounted on the upper end of a shaft **82**. A bottom wall **84** is fixedly secured to the drum **80** and has a projection **86** provided with a recess **88** which rests upon and receives pin **90** therein for rotating the drum **80**. A plurality of mirrors **92**, **94**, **96**, etc. are fixed to the drum in any suitable manner. These mirrors are planar and it is noted that these mirrors extend at different angular relationship to the shaft **82** which forms the axis of rotation of the mirror assembly **18**. The mirror **96** is shown as extending vertically while mirror **92** is shown as being upwardly inwardly inclined. The mirrors are disposed about the periphery of drum **82** in angular relationship to each other.

The bottom wall **84** is provided with cam surfaces **98** and **100** whose function is not related to this projection system.

The drive means **20** includes an electric motor **102** supported on a shelf **104** or like portion of the housing (not shown). The motor **102** has an output vertical shaft **106** with a pinion **108** fixedly mounted thereon. Journalled in the shelf **104** is vertical shaft **110** which is fixed against vertical movement. Another vertical shaft **112** is fixedly secured to the shelf **104**. A gear **114** is fixedly mounted on the shaft **110** and meshes with pinion **108** and is rotated thereby. Pinion **116** is fixedly mounted on shaft **110** and rotates therewith and meshes in turn with gear **118** turnably mounted on shaft **112**. Fastened to gear **118** is another pinion **120** which meshes with gear **122** which is turnably mounted on shaft **110** and which has pinion **124** fixed thereto which in turn meshes with a further gear **126** carrying pin **90**. The various gears and pinions form a gear reduction assembly and the motor therefor drives gear **126** and the mirror assembly **18** at a reduced speed.

In operation, with the motor **102** and lamp **22** operatively electrically connected to a source of electrical power, light rays emitted by lamp **22** pass through a selected one of the apertures **32** to form an image foscused by lens **68** on the mirrors **92**, **94**, **96**, etc. of the mirror assembly **18**. The mirrors **92**, **94**, **96** because they are arranged at various angles will reflect the focused image on a wall or like surface at various elevations. Handle **72** may be manipulated to adjust the lens **68** for ideal focus while the particular target image is selected by adjusting handle **44**. The spring detent **34** which will serve to hold plate **30** is adjusted position so that the selected one of the apertures **32** is in alignment with the lamp **22** and lens **68**.

A latitude of modification, change and substitution is intended in the foregoing disclosure and in some instances some features of the invention will be employed without a corresponding use of other features.

What I claim is:

1. A projection system comprising a light source, a lens, a plate between said light source and said lens, said plate having a plurality of through apertures of different sizes and shapes, means for moving said plate so that a selected aperture is positioned in the light path between said light source and said lens, a mirror assembly disposed on the opposite side of said lens from said plate, said mirror assembly including a drum having an axis of rotation, a plurality of mirrors secured on said drum at differing angular relationships to said axis so as to reflect light rays at differing elevations, and means connected to said drum for rotating said mirror assembly so that a moving image is reflected by said mirrors at differing elevations.

2. In a toy target device, a projection system for flashing moving targets on a remote surface at a plurality of locations on said surface comprising, in combination, a support, a light source fixedly mounted on said support, a lens mounted on said support for movement toward and away from said light source, said light source and said lens defining a light beam path, a target image-forming shield mounted on said support between said lens and said light source for movement transverse to said light beam path, said target image-forming screen being opaque and having formed therein a plurality of openings in the shape of targets, the light beam emanating from the light source being shaped to form a target image by said shield, means for selectively moving said target image-forming shield for bringing different ones of said openings into said light beam path for selectively shaping the light beam into differing target images, a shaft mounted for rotation on said support, a plurality of mirrors secured to said shaft at various small angles from parallel thereto, said shaft being adjacent but spaced from said light beam path on the side of said lens removed from said light source such that said mirrors successively intercept the shaped light beam as said shaft is rotated, and drive means for said shaft to drive same and said mirrors for reflecting successive target images onto the remote surface at different locations on the surface and for moving said target images across the surface.

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