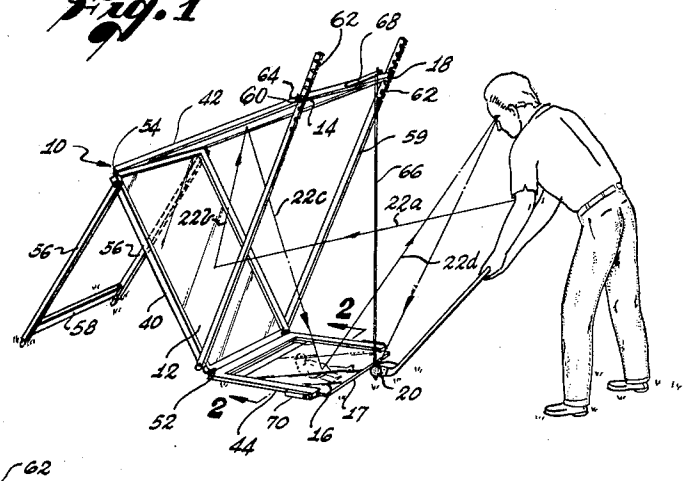
July 16, 1963 W. H. HARRISON 3,097,437

GOLF TEACHING DEVICE

Filed Nov. 16, 1961 2 Sheets-Sheet 1

Fig. 1



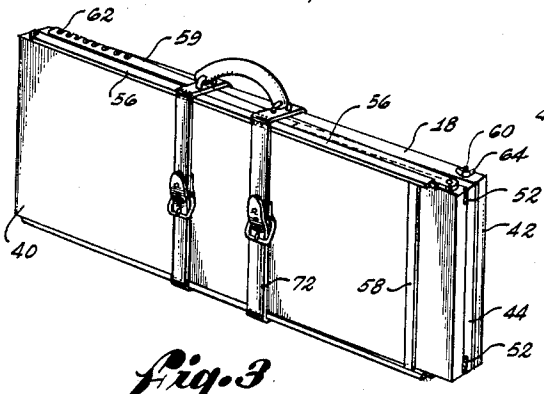


Fig. 3

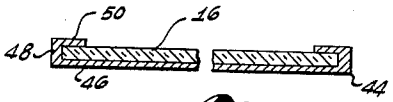
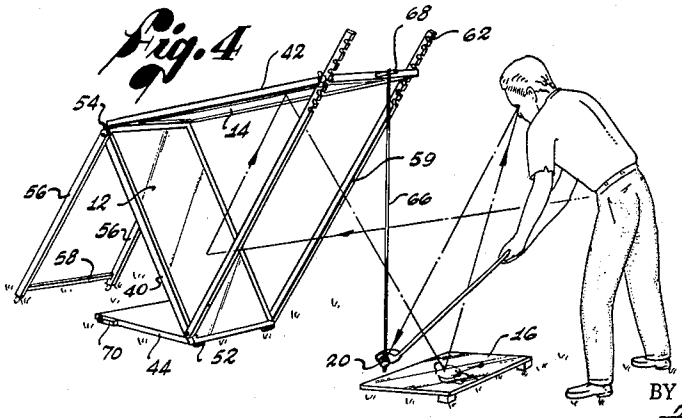


Fig. 2

Fig. 4



INVENTOR.
WILLIAM H. HARRISON
BY
Fulwider Mattingly & Hunttley
ATTORNEYS

July 16, 1963 W. H. HARRISON 3,097,437

GOLF TEACHING DEVICE

Filed Nov. 16, 1961 2 Sheets-Sheet 2

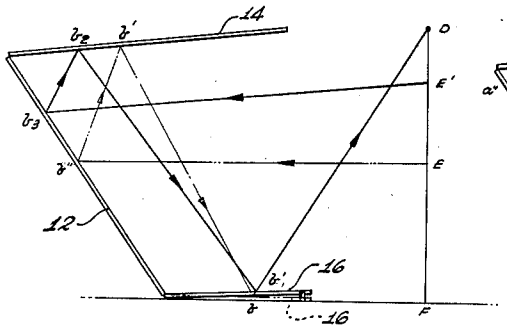


Fig. 6

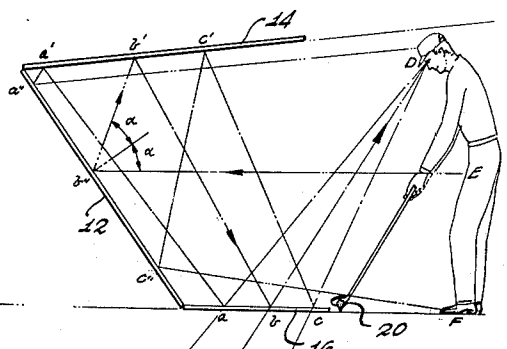
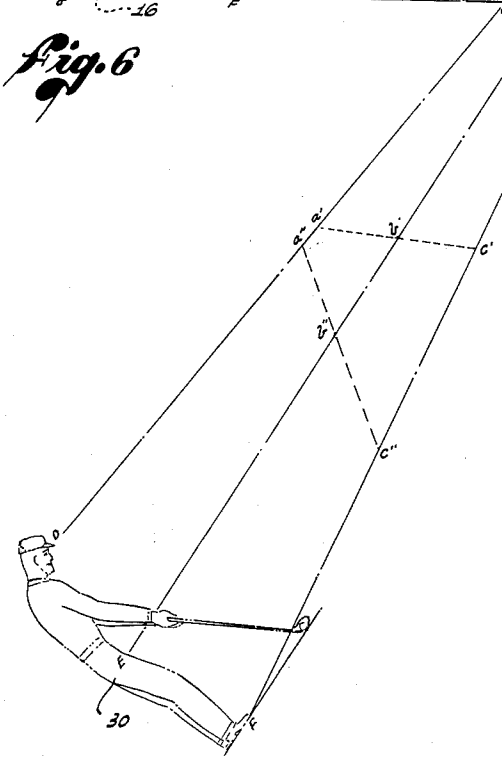


Fig. 5



INVENTOR.
WILLIAM H. HARRISON

BY
Fulwider Mattingly & Huntley
ATTORNEYS

United States Patent Office 3,097,437 Patented July 16, 1963

3,097,437

GOLF TEACHING DEVICE

William H. Harrison, 6363 Santa Monica Blvd., Los Angeles 38, Calif.

Filed Nov. 16, 1961, Ser. No. 152,756
8 Claims. (Cl. 35—29)

This invention relates to teaching devices and more particularly to a device of the type used in the self-teaching of manual skills involving coordinated body movements.

The device of the invention is particularly well adapted for use in the self-teaching of golf. Experience has shown that most golfers are acuately aware of the attributes of a good swing. Moreover, they commonly form a mental picture of their own swing which is patterned after that of an expert and frequently is quite different from that which actually takes place. Thus, it will be appreciated that if a golfer can view his own swing while performing, his faults are immediately apparent to him. Adjustment or correction of the swing can be made as necessary, until the desired results are achieved. Moreover, a further advantage of a device of the subject type is that the swing may be judged not only from the standpoint of the image seen, but also from the standpoint of the flight of the ball.

Because of this particularly advantageous use, the device of the invention is described as especially constructed and arranged for that use. However, as will become apparent, there are other equally advantageous uses. Accordingly, the detailed description of this one is not intended to be limitative.

A basic fundamental of golf is that the golfer must concentrate his vision on the ball, while swinging or, as it is commonly stated, "keep his eye on the ball." Thus, an essential requirement of an effective self-teaching device for golf is that the golfer be able to concentrate his vision on the ball, while using the device.

All known prior devices of this general type embody a mirror arranged in a generally upright position in front of both the golfer and the ball. In use, the golfer views his image in the mirror, while swinging. A significant disadvantage of such prior devices is immediately apparent. Inasmuch as the mirror is arranged upright, it is impossible for a golfer with a normal field of vision to concentrate his vision on the ball and still observe his image in the mirror. This is particularly true with reference to the upper portion of the body which is presented in the corresponding upper portion of the mirror. Thus, these prior device fail to meet the above discussed requirement of a device for accomplishing the present purpose.

In view of the foregoing, it is a primary object of this invention to provide a self-teaching device of the type descrbed which obviates the above problems of the prior art.

Another object of this invention is to provide a self-teaching device, in which the pupil can observe himself performing a manual skill, while doing so in the preferred manner.

A related and more specific object of this invention is to provide a device for the self-teaching of golf, the device being constructed and arranged so that a golfer can concentrate his vision on the ball, while swinging, and still observe his performance.

It is a further object to provide a device of the type described, adapted to be readily assembled for use and, thereafter, collapsed into a package for convenient transporting and storing.

A still further object of the invention is to provide a device of the type described for the self-teaching of golf which is adjustable so as to concentrate on a specific portion of the body as, for example, the hands.

It is still another object to provide a self-teaching device of the type described, which is highly effective and accomplishing its intended purpose, yet which is relatively simple in construction and, hence, inexpensive to manufacture.

These and other objects and advantages of the invention will be better understood by referring to the following detailed description taken in conjunction with the accompanying drawings in which:

FIGURE 1 is a perspective view of the device of the invention assembled for use, there being a golfer shown in position for using the device;

FIGURE 2 is a sectional view taken on the line 2—2 of FIGURE 1;

FIGURE 3 is a perspective view of the device collapsed into a package for convenient transporting and storing;

FIGURE 4 is a perspective view similar to FIGURE 1, except that the device of the invention is arranged for use in a slightly different manner;

FIGURE 5 is an optical diagram illustrating the operation of the device of the invention and showing the apparent position and orientation of the virtual image seen by the golfer; and

FIGURE 6 is a simplified optical diagram illustrating the effect achieved by relative adjustment of one of the mirrors of the device.

Referring to the drawings and in particular to FIGURE 1, the device of the invention is indicated by the reference numeral **10**. The device includes generally three cooperating plane mirrors **12**, **14**, and **16**, and frame means **18** for supporting the mirrors at the desired spacing to one another.

Briefly, the mirrors **12**, **14**, and **16** function, when properly oriented with respect to a golfer and a ball **20** being driven, as well as to one another, to reflect the image of the golfer so that it may be seen by him within his field of vision, while concentrating on the ball. The path taken by a light ray considered as emanating from the golfer as it is reflected between the mirrors is shown by the arrowed lines **22***a*, **22***b*, **22***c*, and **22***d* in FIGURE 1 and by the optical diagram of FIGURE 5. The ray and hence, the image of the golfer is first reflected by the intermediate or fist reflecting mirror **12** to the upper or second reflecting mirror **14**. After reflection by the latter, the ray is finally reflected by the lower or third reflecting mirror **16** to the eye of the golfer. Since the mirror **16** is the one in which the golfer observes his image, it is considered to be the image mirror.

In order that the golfer's image may be seen by him well within the peripheral extents of his field of vision, while concentrating on the ball **20**, the image mirror **16** is arranged on or immediately adjacent and either parallel to, or at a slight angle to the ground. With the ball **20** positioned adjacent the forward edge **17** of the mirror **16** and the golfer assuming his normal stance, as illustrated in FIGURE 1, he may easily view his image in the mirror **16** and still concentrate on the ball **20**.

Taking the image mirror **16** as a fixed starting point, basic laws of geometric optics govern the relative positions of the remaining two mirrors **12** and **14**. One such basic law is that when a light ray is reflected from a plane surface, the angle if incidence equals the angle of reflection. As is well known in the optical art, angles of incidence and reflection are measured between the normal to the reflecting surface and the incident in reflected rays, respectively. For illustrative purposes, reference is made to FIGURE 5 where it may be seen that the angle α of incidence is equal to the angle α' of reflection.

Another law of geometric optics having present appli-

cation is that when a person views an object in a multiple mirror system of the present type, a virtual image of the object appears to be located at a distance from the final reflecting mirror equal to the sum of the distances along a given light ray between the object viewed and the final reflecting mirror. In this special case, the object viewed is, of course, the viewer himself.

With the foregoing principles in mind, attention is now directed to the optical diagram in FIGURE 5. As illustrated, the mirrors **12** and **14** are arranged relative to the image mirror **16** and to one another so that rays emanating from both the viewer's head and feet, as well as all points therebetween will converge at his eye. To achieve this result, the intermediate or first reflecting mirror is inclined upwardly rearwardly and at an obtuse angle to the image mirror **16**. The upper or second reflecting mirror **14** is oriented at an acute angle to the intermediate mirror **12** and vertically spaced above and arranged approximately parallel to the image mirror **16**.

Arranging the cooperating mirrors as shown in the diagram of FIGURE 5 and as explained above, makes it possible for the golfer to see his virtual image in the image mirror **16** in the apparent location and orientation shown at **30**. Choosing the ray emanating from the midpoint E of the body of the golfer for purposes of illustration, the sum of the distances along that ray between the points E and *b''*, *b''* and *b'*, and *b'* and *b* is equal to the distance between the image mirror **16** and a corresponding point on the virtual image. The image distance is, of course, plotted along an extension of the line of sight D—*d* of the golfer. Like rays from the head and feed D and F, respectively, of the golfer may be traced to plot the entire virtual image.

A feature of the present invention is that the golfer views his image as if he were standing opposite to and looking directly at himself. That is the virtual image is oriented substantially perpendicular to his line of sight. As a result, the head and feet appear to be equidistant from the eye and the golfer gets a true undistorted picture of his swing. In view of the fact that an odd number of mirrors are used, the image seen is erect, but perverted or apparently reversed from left to right.

By virtue of each of the mirrors **12**, **14**, and **16** being successively farther from the golfer, they may be successively smaller in area and still take in the full length of a person. This point is graphically illustrated in the plot of the virtual image in FIGURE 5. For the illustrated orientation of the mirrors **12**, **14**, and **16** and the length of the image mirror **16** utilized (between *a* and *c*), the minimum lengths of the mirrors **12** and **14** are equal to the lengths of the phantom lines *a''*—*c''* and *a'*—*c'*, respectively. In actual practice, the mirrors **12** and **14** are preferably constructed of substantially the same length and somewhat longer than necessary, so as to facilitate adjustment of the device. However, the mirror **16** of the illustrative embodiment is considerably shorter than the other two and is horizontally slidable, thus enabling its full length to be used in presenting the image.

It is sometimes desirable to concentrate self-teaching effort on a given portion of the body. As an example, the grip of the hands on the shaft of the club and wrist movement play an important part in the golf swing. Accordingly it may be desirable to concentrate attention on them. Such concentration is readily possible with the device of the invention simply by making a single adjustment. To this end, the forward portion of the image mirror **16** is tilted slightly upwardly relative to the ground and to the mirrors **12** and **14**.

The effect of the tilting adjustment of the mirror **16** is graphically illustrated in the simplified optical diagram of FIGURE 6. In this last mentioned figure, the mirror **16** is shown in phantom lines in the horizontal position originally occupied, as in FIGURE 5. Also shown in phantom lines is the path taken by the ray emitted from the midpoint E of the body, as it is reflected by the various mirrors in their original positions. Assuming that the golfer maintains his vision on the spot "*b*" on the image mirror **16**, as the latter is tilted upwardly, he then sees the point E' on his body which is vertically spaced substantially above the midpoint E. Thus, it will be appreciated that the result of such mirror adjustment is to shift the image forwardly in relation to the mirror **16**. By making just the right amount of angular adjustment, the hands can be shown immediately adjacent the forward edge **17** of the mirror **16** where they readily can be seen by a golfer concentrating his vision on the ball being driven.

The frame means **18** serve to mount the mirrors **12**, **14**, and **16** and to support them in the assembled condition of FIGURE 1 and in the collapsed condition of FIGURE 3. As shown in FIGURE 1, the intermediate and upper mirrors **12** and **14** are fixedly mounted in rectangular frames **40** and **42**, respectively. The image mirror **16** is slidably mounted, as suggested above, in a frame **44**. Referring to FIGURE 2, the frame **44** comprises an integral bottom plate **46**, upwardly projecting side flanges **48**, and inwardly projecting top flanges **50**. As illustrated, the top flanges **50** are oriented parallel to the bottom plate **46** and are spaced a distance therefrom substantially equal to the thickness of the mirror **16**. The frame **44** serves to receive the mirror **16** and hold it against vertical or lateral movement, yet to permit longitudinal sliding movement forwardly and rearwardly, relative to the frame. Preferably, the frames **40**, **42**, and **44** are all constructed of a strong, yet light weight material, such as aluminum.

In order to facilitate assembling and adjusting the device of the invention for use and collapsing it for transporting it and storing, the mirror assemblies, including the three mirrors and their associated frames, are hingedly connected to one another. In this regard, the frame **40** of the intermediate mirror **12** is connected at its opposite end to the ends of the frames **42** and **44** by hinges **52** and **54**, respectively. The hinge axes are parallel to one another so that a common plane is perpendicular to the reflecting surfaces of all three mirrors.

As noted above, in use the intermediate mirror **12** is inclined rearwardly and upwardly from the lower or image mirror **16**. To maintain the mirror **12** in this position and to permit rapid adjustment of the same, a pair of pivotal legs **56** are provided. As shown in FIGURE 1, the legs **56** are pivotally connected at their upper ends to the sides of the frame **40** adjacent the upper end thereof. The lower ends of the legs **56** are adapted to engage or project slightly into the ground. A crossmember **58** rigidly connects the two legs and insures that they move in unison.

As illustrated in FIGURE 1 and as set forth above, the upper mirror **14** in its operational position is arranged at an acute angle to the intermediate mirror **12** and extends forwardly from the intermediate mirror **12** with a slight upward inclination with respect to the horizontal and, hence, to the lower or image mirror **16**. The mirror **14** is maintained in this position of adjustment in the illustrative embodiment by means of a pair of support arms **59**. For convenience of adjusting, the arms **59** are pivotally connected at their lower ends to the sides of the frame **40** adjacent the lower end thereof and adjustably connected at their upper ends to the sides of the frame **42** adjacent its forward end. Adjustable connection is here achieved by providing threaded studs **60** projecting outwardly from the sides of the frame **42**. A plurality of spaced slots **62** are provided in each of the arms **59** for the reception of the studs. To lock the mirror **14** in its position of adjustment, wing nuts **64** are threaded onto the studs **60**.

In use, the device is set up and adjusted so that the mirrors **12**, **14**, and **16** take the approximate positions shown in FIGURE 1. The golfer then assumes his playing stance in front of the device at a distance from the forward edge **17** of the mirror **16** dependent upon the par-

ticular golf club being used. Further adjustment of the device may be made, if necessary, so that the full image of the golfer may be seen by him in the image mirror **16**. Experience has shown that final adjustment may be conveniently made by leaving the angle between mirrors **12** and **14** fixed and moving the legs **56** to adjust the angle between the last mentioned mirrors and the lower or image mirror **16**. Along with this angular adjustment, the mirror **16** is slid forwardly or rearwardly in its frame **44** to a position wherein its available length is used most effectively.

Slidably mounting the image mirror **16** also makes it possible for the golfer to vary the area of that mirror used in presenting his image. This is true for the reason that sliding the mirror in its frame **44** varies the distance along a given light ray between the golfer and the mirror **16** and, hence, the apparent distance which his image is spaced from the mirror **16**. Moreover, it will be readily understood that, as the apparent spacing of the virtual image from the image mirror **16** increases and decreases, the mirror area used in presenting the image correspondingly increases and decreases, respectively. Thus, as an example, if the image mirror **16** is slid outwardly in its frame from the position shown in FIGURE 1 or completely removed therefrom and moved even farther out as in FIGURE 4, the area of the mirror **16** used decreases accordingly. The advantage of such adjustment is that the golfer can reduce the area of the mirror **16** which need be observed to any extent desired so that his image can easily be seen by him well within his field of vision, while concentrating on the ball **20**.

After mirror adjustment has been accomplished, the golfer then tees or positions the ball adjacent the forward edge **17** of the mirror **16**. For convenience of home use, the ball **20** may comprise a plastic practice ball suspended in the desired position by a string **66** attached to a rod **68** which, in turn, is removably mounted on the forward edge of the upper mirror frame **42**. Since the ball **20** of the illustrative embodiment is permanently attached to the device, the necessity of retrieving it or supplying a new ball after each shot is eliminated. However, in other cases as, for example, when using the device at a driving range or at a practice area, regular golf balls can be used.

As previously discussed, in some distances it is desired to concentrate teaching effort on the specific portion of the body. It was explained that this is readily possible with the device of the invention by simply tilting the forward portion of the image mirror **16** upwardly relative to the mirrors **12** and **14**. To support the mirror **16** in this tilted position, a pair of relatively short legs **70** are provided on opposite sides of its frame **44**. The legs are pivotally mounted to the frame and adjustment is accomplished by pivoting them downwardly under the frame **44**, as the latter is tilted upwardly to the desired position. In such a use, the image mirror **16** is tilted upwardly until that portion of the body on which it is desired to concentrate may be seen immediately adjacent the forward edge **17** of the mirror. It will be understood that in such a use, the lower portion of the body is off the mirror and, hence, is obscured from view.

Still another manner of use is illustrated in FIGURE 4. In this case, the image mirror **16** is completely removed from its associated frame **44** and positioned between the ball **20** and the feet of the golfer. So positioning the mirror **16** is sometimes advantageous especially where a club having a relatively long shaft is used so that the ball is teed or positioned at a substantial horizontal spacing from the feet of the golfer. The optics in this case are exactly the same as in the previous one. The golfer sees his image in upright position in this last mentioned mirror. Experience has shown that in order for the mirror **16** to take in the full image in its present use, it is necessary to tilt it slightly upwardly in the manner illustrated at its forward end. Since the frame **44** is no longer used in supporting the mirror **16**, it may be pivoted rearwardly, as shown in FIGURE 4, to a position where it can in no way interfere with the swing.

It will be recalled that the device is adapted to be quickly and easily collapsed in a package, as illustrated in FIGURE 3, for convenient transporting and storing. Assuming it to be initially in the condition shown in FIGURE 1, the mirror **16** is first slid back to its rearmost position in its frame **44**. If the device is being used in the manner illustrated in FIGURE 4, i.e. with the image mirror **16** completely removed, the mirror **16** is, of course, inserted back into and then slid to its rearmost position in its frame. In either case, the lower mirror assembly including the frame and mirror is next pivoted or folded upwardly into engagement with the surface of the intermediate mirror **12**. The wing nuts **64** are then loosened to permit the support arms **59** to be disengaged from the studs **60** and the upper mirror **14** to be pivoted or folded downwardly onto the intermediate mirror **12**. When this has taken place, it will be appreciated that the lower mirror assembly is then sandwiched between the intermediate and upper assemblies. Moreover, it is to be noted that in the collapsed condition, the reflecting surfaces of the mirrors **12** and **14** face inwardly and are thereby protected. To complete the package, the arms **59** and the legs **56** are pivoted inwardly toward the frame **40** to which they are attached. A combined handle and strap assembly **72** is secured around the entire package to maintain the various members in their collapsed condition and to provide a means for conveniently carrying the package.

It will be appreciated that the device of the invention provides a highly effective means for the self-teaching of manual skills involving coordinated body movements, and is particularly well adapted for the self-teaching of golf, since it enables the golfer to view his swing, while concentrating on the ball. The device in fact serves to aid the golfer in keeping his head down and his eye on the ball. This desirable result is achieved by virtue of the golfer's attention being attracted to his image thereby overcoming the common tendency to "look up" prematurely to observe the flight of the ball. Thus, it will be appreciated that the device of the invention aids the pupil in developing the habits desired for actual performance of the sport.

Although one embodiment of the invention has been illustrated and described in detail, it will be understood that this is by way of illustration only and that various changes in the construction and arrangement of the cooperating parts may be made without departing from the spirit and scope of the invention.

I claim:

1. A device of the type used in self-teaching of manual skills involving coordinated body movements, comprising: an image mirror assembly including a mirror adapted to be arranged adjacent and generally parallel to the ground; a first reflecting mirror assembly including a mirror; first hinge means connecting said first reflecting mirror assembly at one of its ends to one end of said image mirror assembly for relative pivoting about a first axis; first supporting means for adjustably establishing the angular spacing within the range of an obtuse angle between the mirrors of said image and first reflecting mirror assemblies; a second reflecting mirror assembly including a mirror; second hinge means connecting said first reflecting mirror assembly at its opposite end to one end of said second reflecting mirror assembly for pivoting about a second axis, said first and second axes being parallel; and second support means for adjustably establishing the angular spacing within the range of an acute angle between the mirrors of said first and second reflecting mirror assemblies.

2. A device of the type used in the self-teaching of manual skills involving coordinated body movements, comprising: adjustable frame means; a lower mirror having forward and rearward ends and carried by said

frame means, said lower mirror being adapted to be arranged adjacent the ground with its reflecting surface facing upwardly; an intermediate mirror having upper and lower ends and carried by said frame means with its lower end adjacent the rearward end of said lower mirror, said intermediate mirror being adapted to be arranged so as to extend upwardly and rearwardly relative to said lower mirror with its reflecting surface facing upwardly; and an upper mirror having forward and rearward ends and carried by said frame means with its rearward end adjacent the upper end of said intermediate mirror, said upper mirror being adapted to be arranged so as to extend generally forwardly from said intermediate mirror with its reflecting surface facing downwardly.

3. The construction of claim 2 wherein said lower mirror is slidably and removably carried by said frame means.

4. A golf teaching device for use by a golfer driving a ball, comprising: a plane image mirror adapted to be disposed immediately adjacent and generally parallel to the ground; a plane first reflecting mirror arranged in alignment with and at an obtuse angle to said image mirror, the planes of said image and first reflecting mirrors intersecting to define a first axis; and a plane second reflecting mirror positioned above and arranged in alignment with and at an acute angle to said first reflecting mirror, the reflecting surface of said second reflecting mirror facing the reflecting surfaces of both said first reflecting mirror and said image mirror, so that the image of the golfer driving the ball is successively reflected by said first reflecting, second reflecting and image mirrors and the planes of said first and second reflecting mirrors intersecting to define a second axis parallel to said first axis and to the intended path of the golf ball being driven.

5. A golf teaching device for use by a golfer driving a ball comprising: frame means, a first reflecting mirror carried by said frame means and adapted to be positioned with its reflecting surface facing the golfer; a second reflecting mirror carried by said frame means at one end of said first mirror, said first and second mirrors being adapted to be arranged at angular spacing with their reflecting surfaces facing one another; and a third reflecting mirror carried by said frame means at the opposite end of said first mirror, said third mirror being adapted to be arranged at angular spacing to said first mirror and with its reflecting surfaces facing the reflecting surface of said second mirror and to be positioned adjacent the ground and the ball to be driven so that the image of the golfer driving the ball is successively reflected by said first, second, and third mirrors and may be seen by him in said third mirror within his field of vision, while concentrating on the ball.

6. The construction of claim 5 wherein said frame means include first and second hinge means intermediate the portions of said frame means carrying said first and second and said first and third mirrors, respectively, whereby said second and third mirrors are adapted to be folded onto said first mirror for convenience of transporting and storing.

7. A device of the type used in the self-teaching of manual skills involving coordinated body movements, comprising: a first reflecting mirror assembly; a second reflecting mirror assembly; first hinge means connecting said first assembly at one of its ends to one end of said second assembly; a third reflecting mirror assembly adapted to be positioned adjacent the ground; second hinge means connecting said first assembly at the other of its ends to one end of said third assembly, said first and second hinge means being arranged so that their hinge axes are parallel; arm means connected to said first and second assemblies for adjustably establishing the angular spacing therebetween; and leg means pivotally connected to said first mirror assembly and adapted to engage the ground for adjustably establishing the angular spacing between said first assembly and said third assembly.

8. A device of the type used by a person in the self-teaching of manual skills involving coordinated body movements, comprising: a lower, image mirror having forward and rearward ends and positioned adjacent and generally parallel to the ground so that it is within the field of vision of a person located forwardly thereof who is performing the movements; an intermediate, first reflecting mirror positioned rearwardly of said image mirror and inclined upwardly and rearwardly relative thereto and with its reflecting surface facing the person; and an upper, second reflecting mirror positioned forwardly of the upper end of said first reflecting mirror and arranged with its reflecting surface facing the reflecting surfaces of both said first reflecting and image mirrors, its image of the person being successively reflected by said first reflecting, second reflecting and image mirrors, so that it may be seen by him in said mirror while performing the movement.

References Cited in the file of this patent

UNITED STATES PATENTS

3,000,261 Frenkel ---------- Sept. 19, 1961

FOREIGN PATENTS

10,775 Great Britain ---------- Aug. 5, 1887