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EP 0447712 A
US 6567536 A
US 4891748 A
JP 070051421 A
US 6533675 A

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(54) Abstract Title: **Golf training device**

(57) A golf training device comprises: an input arrangement which allows data to be entered concerning physical and playing characteristics of the golfer, the nature of the shot to be practised, and the intended club to be used; a calculating system which uses pre-collected reference data and algorithms to provide specified factors in an ideal address position or for weight transference during a stroke; and indicators which give visual and/or audible instruction to the golfer concerning these factors. The device may be incorporated with a striking mat having arrays of light emitting diodes to show the ideal ball position, the placement and angling of both feet, and the clubface alignment and position for addressing the ball, Figs 1 to 3 (not shown) with the personal and shot data being entered via a touch sensitive screen. Pressure responsive devices which distinguish between the heel and toe regions of both feet can be housed within the mat and provide analysis of weight distribution at address and weight transference during a playing stroke in order to give suitable instruction, as in Fig 4b where the upper diagram gives the player weight distribution at address, the lower diagram a calculated preferred distribution and the instruction can be provided on the screen or audibly, or in Figs 5, 7 and 8 (not shown) where the diagrams relate to dynamic changes and the instructions are suggested after each stroke has been completed.

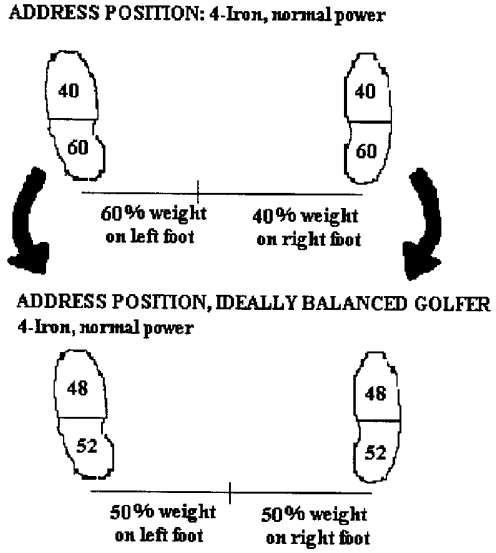


FIGURE 4b

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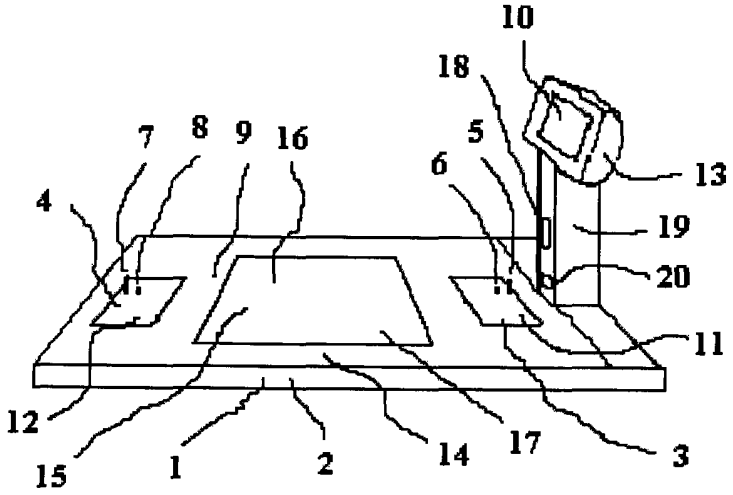


FIGURE 1

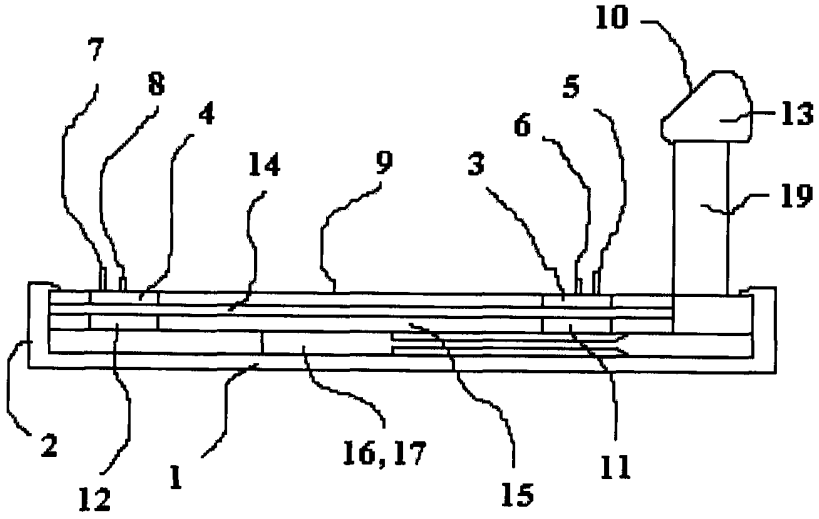


FIGURE 2

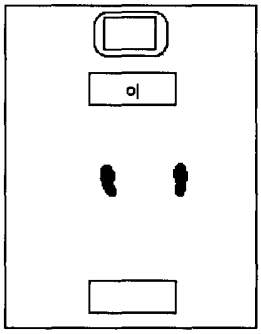


FIGURE 3a

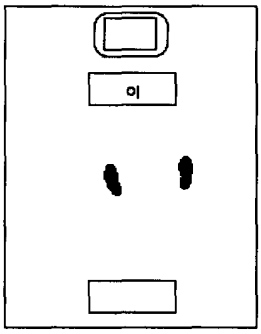


FIGURE 3b

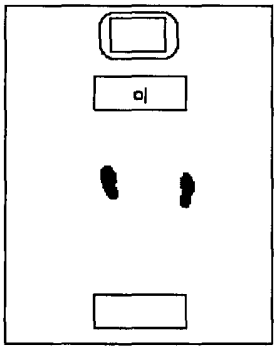


FIGURE 3c

ADDRESS POSITION: 4-Iron, normal power

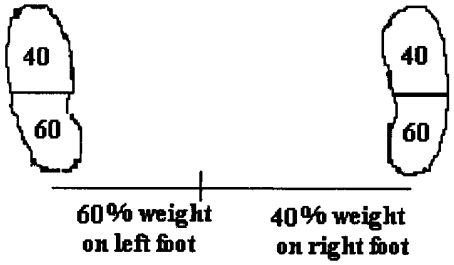
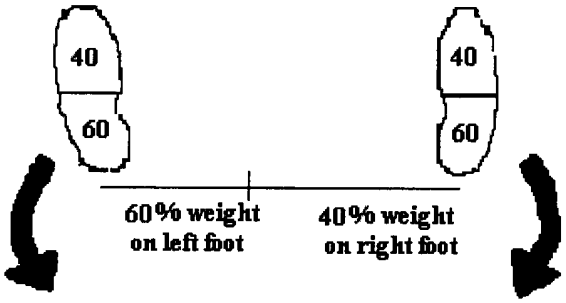
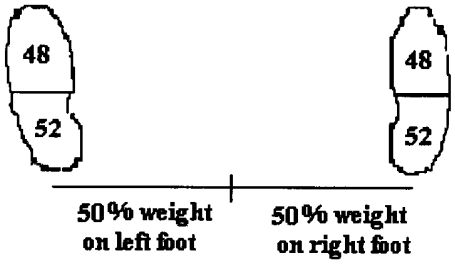


FIGURE 4a

ADDRESS POSITION: 4-Iron, normal power



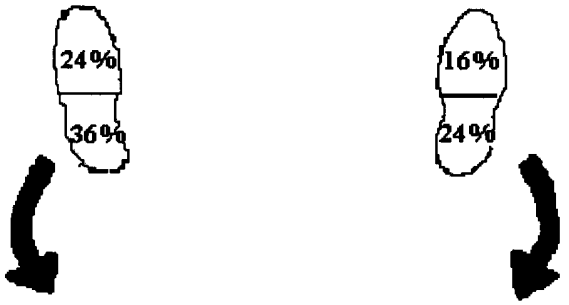
ADDRESS POSITION, IDEALLY BALANCED GOLFER
4-Iron, normal power



INSTRUCTION: Balance your weight evenly between your two feet with less on your left side. Shift your weight more onto your toe areas, less on your heels.

FIGURE 4b

ADDRESS POSITION: 4-Iron, normal power



ADDRESS POSITION, IDEALLY BALANCED GOLFER
4-Iron, normal power



INSTRUCTION: Balance your weight evenly between your two feet with less on your left side. Shift your weight more onto your toe areas, less on your heels.

FIGURE 4 c

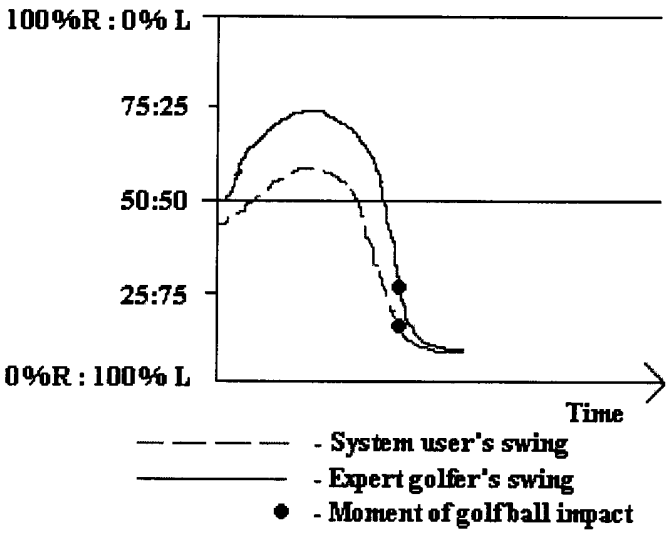


FIGURE 5a

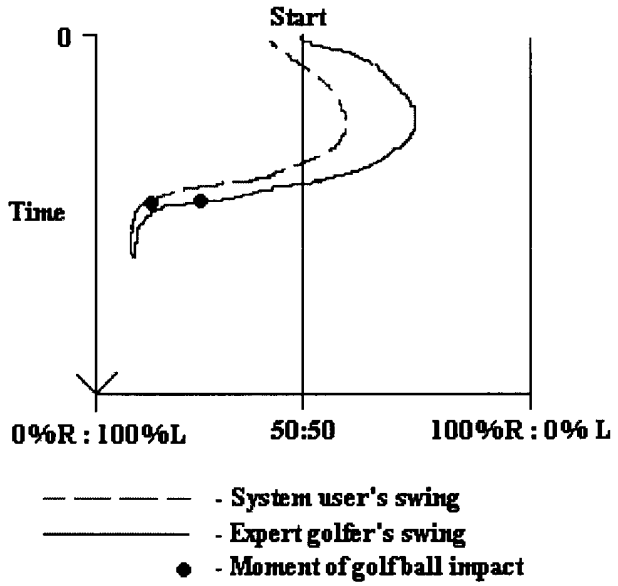
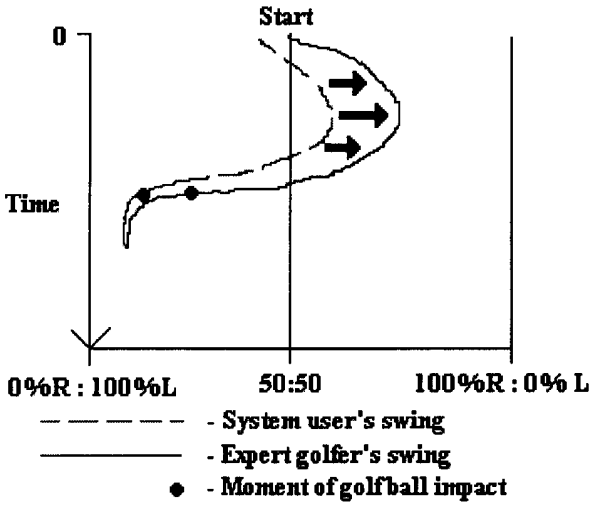


FIGURE 5b



INSTRUCTION: Shift more weight onto your right side during your backswing and also have less weight on your left side during your downswing. The arrows on the graph are indicating you to do this.

FIGURE 5c

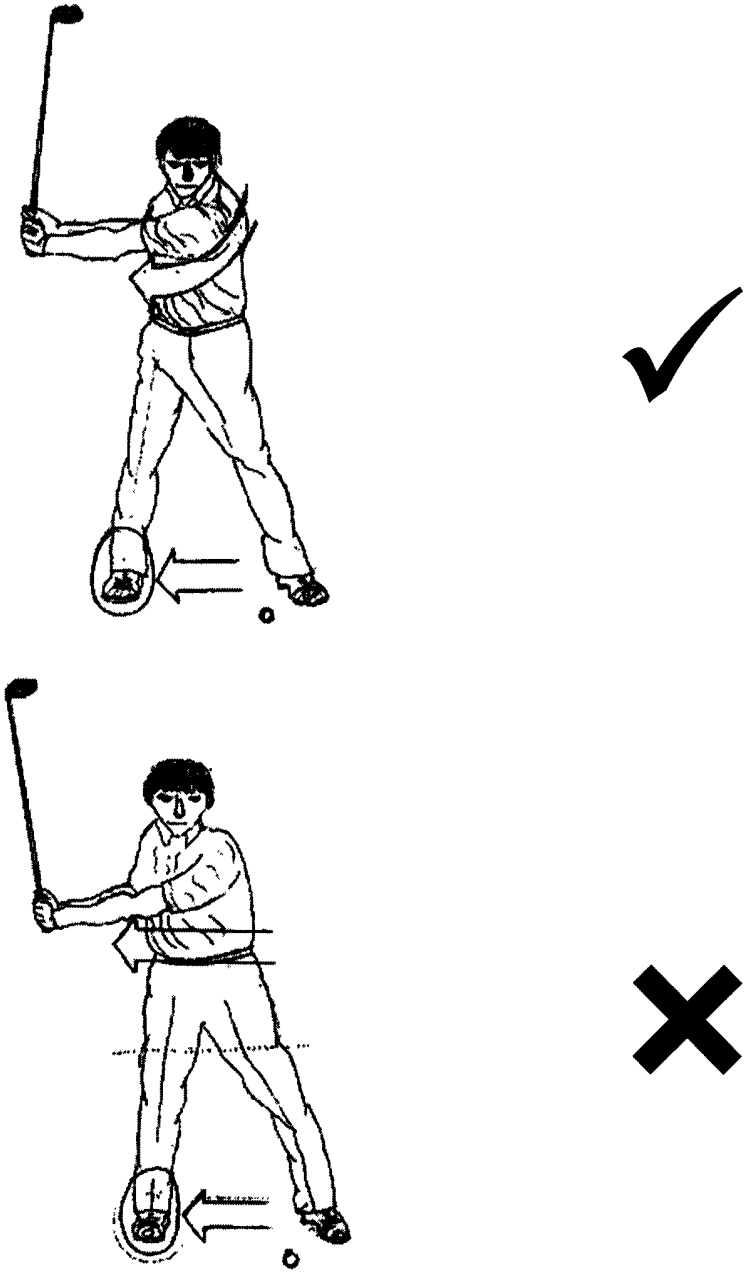


FIGURE 6



Bodyweight transfer during impact area of golfer using device

Bodyweight transfer during impact area of expert golfer

FIGURE 7a



Bodyweight transfer during impact area of golfer using device

Bodyweight transfer during impact area of expert golfer

INSTRUCTION: Through the impact area, when shifting your weight onto your left side, shift it more onto your left heel rather than onto your left toes as the black flashing arrow is indicating.

FIGURE 7b



Bodyweight transfer during impact area of golfer using device

Bodyweight transfer during impact area of expert golfer

FIGURE 7c



Bodyweight transfer during impact area of golfer using device

Bodyweight transfer during impact area of expert golfer

INSTRUCTION: Through the impact area, initiate your weight shift from further on your right side, and when shifting your weight onto your left side, shift it more onto your heel area rather than your toe area, as the black flashing arrows are indicating to you to do.

FIGURE 7d

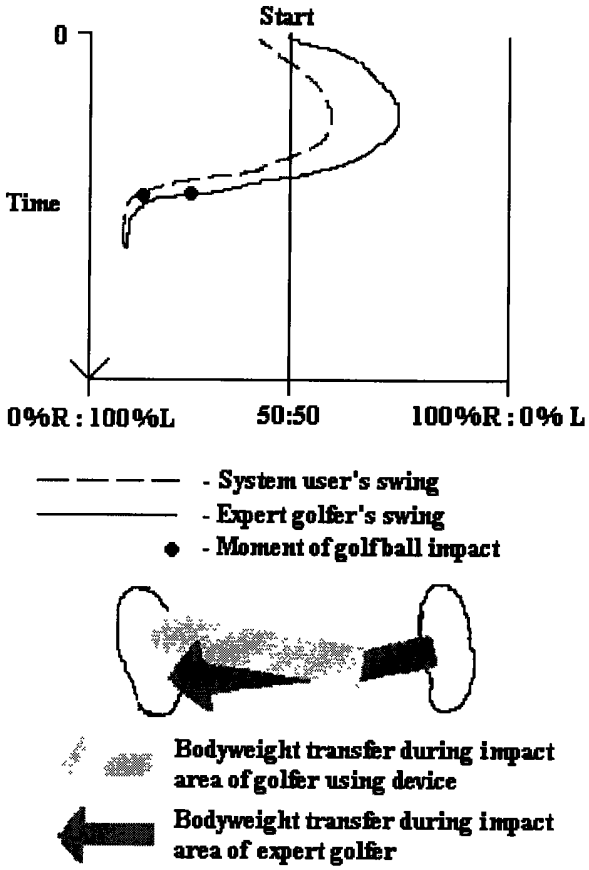
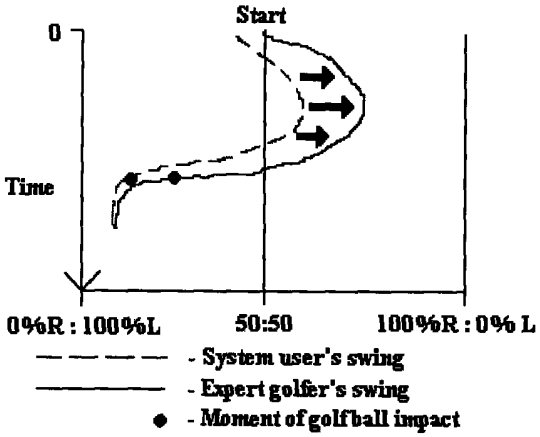

Start
0
Time
0%R : 100%L
50:50
100%R : 0% L
- System user's swing
- Expert golfer's swing
- Moment of golfball impact
Bodyweight transfer during impact area of golfer using device
Bodyweight transfer during impact area of expert golfer

FIGURE 8a



INSTRUCTION: Shift more weight onto your right side during your backswing and also have less weight on your left side during your downswing. The arrows on the graph are indicating you to do this.

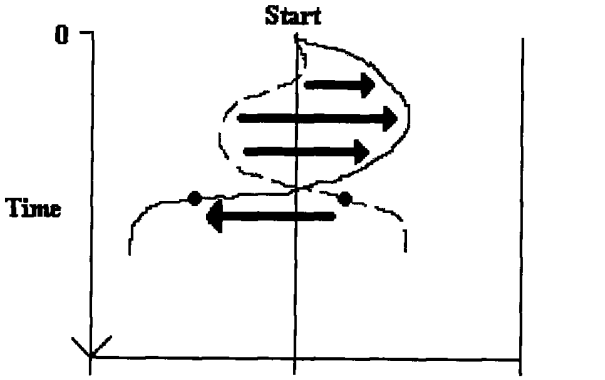


Bodyweight transfer during impact area of golfer using device

Bodyweight transfer during impact area of expert golfer

INSTRUCTION: Through the impact area, initiate your weight shift from further on your right side, and when shifting your weight onto your left side, shift it more onto your heel area rather than your toe area, as the black flashing arrows are indicating to you to do.

FIGURE 8b



- - - - - - System user's swing
——————— - Expert golfer's swing
● - Moment of golfball impact

INSTRUCTION: During your backswing, shift your weight onto your right side instead of your left, and during your downswing and follow through, shift your weight onto your left side instead of your right. Follow as the black arrows tell you to do.



Bodyweight transfer during impact area of golfer using device

Bodyweight transfer during impact area of expert golfer

INSTRUCTION: Transfer your weight from your right foot to your left foot through the impact area, rather than from your left foot to your right, as indicated by the black flashing arrow.

FIGURE 8c

Golf Training Device

The present invention relates to a golf training device for improving golf swings and, more particularly, for improving the stance, golf ball positioning, clubface alignment, bodyweight distribution and bodyweight transfers of an individual playing a golf stroke.

A wide variety of teaching and training aids have been designed to aid individuals in developing golf swings of improved power, accuracy and consistency. These devices have a diverse range of purposes, including improving posture, swing plane, hand and/or head position and the like.

Moreover, several devices have been proposed which are directed at improving a golfer's stance. However, as discussed in more detail below, a common drawback is that these devices do not express a sufficient number of parameters in order for precise foot positions to be indicated for use by a large size range of individuals using a large range of golf clubs, nor do they indicate with precision optimal angles at which the golfer's feet should be placed for playing a range of golf strokes. For a golfer to have a consistent, effective golf swing for striking the golf ball accurately to the target, correct stance, ball position and clubface alignment at address of the golf ball are fundamentally important.

On careful observation, there exists a consistency amongst many professional male and female golfers of stance width, feet angles and ball position relative to the feet at address of the golf ball, depending on gender, height and build. By contrast, many amateur golfers routinely have some or all of these items in incorrect positions at address. Amateur golfers of this type, if they aim to improve their golf game, should, amongst other things, aim to simulate the correct positions at address of an expert golfer of similar gender, height and build to him or herself. Moreover, repeated enforcement and training of these and other correct fundamentals at address will aid significantly the improvement of the golf game of the golfer, especially a young or inexperienced one. Additionally, enforcement and training of these fundamentals in a high-level golfer will aid in maintaining his or her game in a consistently good state.

While many instructional articles, books, videos and the like instruct the golfer of ways to address the golf ball such that the feet, golf ball and clubface are in the correct positions relative to each other and the target, it is difficult for a golfer, especially a young or inexperienced one, to determine whether he or she has all of these items in the correct positions relative to each other during address of the golf ball without close supervision by a coach.

At address of the golf ball, correct alignment of the stance, with the feet aligned parallel or roughly parallel to the target line between the golf ball and the target, promotes, amongst other things, accuracy and consistency of swing path through impact of the golf club with the golf ball. Correct width of the golfer's stance aids in achieving optimal stability, balance, pivot and power during the golf swing. Correct angles of the feet at address promote optimal resistance of the rear side during the golfer's backswing and optimal clearing of the forward side during the forward swing. A stance at the correct distance from the golf ball aids in optimal posture, swing plane and swing path. Correct clubface alignment at address aids in the golfer's visualisation of the stroke to the target and also negates the requirement for compensatory action during the golf swing in order to align the clubface squarely to the target at the moment of impact of the golf club with the golf ball.

A common drawback of many current instructional aids is that they are either too complicated, too easily used in the wrong way and/or do not lend themselves for use at a driving range or other similar facility at which many golfers practice their swings. A reason for this is that many such aids include multiple components which require too much time to set up or adjust, are too complicated to quickly learn how to use or which may easily be misplaced in whole or part.

While many driving ranges typically provide golf mats from which the golfer strikes golf balls, such golf mats typically do not provide sufficient or any instructional aids whatsoever to help the golfer efficiently practice his or her golf swing. Attempts have been made to provide golf mats which aid the golfer with foot alignment and golf ball

placement. For example, Grabowski in US 6,482,102 discloses a mat with foot print patterns of different colours and club numbers for indicating to the golfer correct foot placement positions. In another example, Dionne et al. in US 5,645,494 disclose a golf mat with a grid for the golfer to use as reference lines for aligning feet and judging ball position. In another example, Shofner in US 5,071,130 discloses a grid pattern for ball placement with numbers and letters. In another example, Bott in US 4,805,913 discloses a mat with a grid pattern to which foot silhouettes are removably attached at desired stances.

Whilst of some use in indicating to the golfer somewhat sensible stance widths and golf ball positions, the main drawbacks with the above-referenced devices are that they are typically crude forms of indicating ball and/or feet positioning and typically do not express a sufficient number of parameters, and thus do not indicate with precision desired foot and ball placement positions for a large size range of individuals of both genders using a large range of golf clubs. Additionally, these devices may be complicated and/or difficult to use, especially for young or inexperienced golfers, may consume too much time of a golfer's practice session, may cause too much of a distraction during the golfer's practice session and/or are often open to an individual's interpretation of what constitutes correct foot placement and/or ball position. If a device is open to an individual's interpretation of what constitutes correct foot placement and/or golf ball positioning, then this device is essentially only marginally more beneficial to the golfer, especially a young or inexperienced one, than the golfer making a guess at correct foot placement and golf ball positions whilst addressing the golf ball with no aid whatsoever.

Other instructional aids are known for aiding a golfer with width and alignment of the stance as well as ball position for use of various clubs. These devices are typically in the form of frames, strips, boards, templates and the like. For example, Froggatte in US 6,726,576 discloses a cross-shaped device with adjustable sliding members. Harrell in US 6,723,003 discloses a golf stance coordinator template comprising an adjustable E-shaped frame configuration with indicia provided to serve as golf stance indicator markers. Ferrara in US 6,142,883 discloses a framework of strips with indicia. Mason

in US 5,984,801 discloses a frame comprising adjustable plastic rulers. Dubois in US 5,944,613 discloses a horizontal tube with transverse shaft with marks for placing in front of the golfer's feet. Best in CA 2,303,673 discloses a stance instructor comprising two members attached at the ends, which is personalised on first use by an individual placing stickers on the device members. Lindberg Jr. in US 5,131,659 discloses an acrylic mirror which has foot placement indicia.

Whilst of some use in indicating to the golfer somewhat sensible stance widths and golf ball positions, the main drawbacks with the above-referenced devices are as follows. They are typically crude forms of indicating ball and/or feet positioning and typically do not express a sufficient number of parameters, and thus do not indicate with precision desired foot and ball placement positions for a large size range of individuals of both genders using a large range of golf clubs. They typically have to be adjusted each time the golfer changes his or her club, which can consume too much time and/or cause a distraction of the golfer's practice session, are sometimes open to an individual's interpretation during use, for instance as to how far the individual's toes should be placed from the device so as to be close enough to be aligned correctly but far enough away so that the golfer's toes do not collide with and/or move the device during the foreswing. The devices are sometimes personalised on first use and cannot be easily used from one individual to another. The devices typically do not aid the golfer in playing right-to-left or left-to-right ball flight golf strokes, are sometimes not easily amenable to driving range or practice range use since they have to be transported around. They are often flimsy devices which may be blown by the wind during use and/or damaged, broken or misplaced in whole or part, may not necessarily be suitable for a large size range of individuals and typically do not clearly indicate optimal angles at which the golfer's feet should be placed for playing a particular golf stroke.

Golf clubface alignment guiding devices are also known, however these are generally for use with putters. The X-golf system (www.x-golf.net) shows by way of a computer screen clubface angle on the forward swing leading into the impact area of the clubface with the golf ball and also at the moment of impact, although this does not show the

clubface angle at the golfer's address of the golf ball and/or a means of instructing and/or showing to the golfer the correct clubface alignment angle at address.

In view of the above, it is desirable to provide a golf training aid that overcomes some or all of the above-described problems.

In addition to the need for the above-mentioned fundamentals of the golfer to be correct at the address of the golf ball, correct distribution of bodyweight of the golfer through his or her feet at address of the golf ball and also correct weight transfers during the golf swing, in which the bodyweight is transferred substantially onto the rear foot, relative to the target, during the backswing and then substantially onto the forward foot during the foreswing, aid the golfer in playing golf strokes of optimal power, accuracy and consistency.

Attempts have been made to provide devices that provide bodyweight transfer information to the golfer for use by the golfer in training for optimising his or her golf swing. For example, Bregman et al. in US 5,118,112 disclose a system in which a golfer standing on two pads, each pad with weight measuring means, hits a golf ball using his or her normal golf swing. The golfer subsequently analyses the weight transfer results on a visual display of the golf swing at top of the backswing, at impact with the golf ball and at the top of the foreswing or follow through.

Whilst of some use, especially to golfers who transfer their weight in a somewhat correct manner to their rear foot, relative to the target, during the backswing and to their front foot, relative to the target, during their follow through, the above system is relatively crude in that it only measures extremes of bodyweight shift towards one foot and the other, no matter where those shifts occur during the golf swing. Since this device has no means for detecting the physical travel of either the golfer's club or arms to the top of the backswing and similarly to the end of the foreswing of the golf swing, it determines (and therefore deems) the peak backswing point by measuring the maximum bodyweight shift to the golfer's rear foot relative to the target. It also

determines (and therefore deems) the peak foreswing point by measuring the maximum bodyweight shift to the golfer's front foot relative to the target.

Since a common golf swing feature among many golfers is the transfer of weight to their front foot relative to the target during their backswing and to their rear foot relative to the target during their foreswing (a so-called "reverse pivot"), or subtle variations thereof, this device could give false or misleading information to many golfers. Golfers who possess such features in their golf swing would benefit a great deal from a bodyweight distribution measurement and display device which has improved and/or advanced function over this one.

Additionally, when the golfer using the system takes his or her stance on the pads, in order for the golf ball to be level with the feet, the ball needs to be placed high on a tee or similar object. This is not ideal for a golfer's practice session since this does not simulate an actual lie of the golf ball encountered during a round of golf, such as that on the fairway or semi-rough when a wood or iron club is used. Alternatively, if the golfer places the pads on, for example, a level grass surface and, whilst taking a stance on the pads, strikes the golf ball from the grass surface, the golfer's feet will be significantly higher above the level of the golf ball, which is an inconvenient type of lie for a golfer to practice his or her swing, since the plane of the golf swing and bodyweight distribution in the feet are altered relative to a flat lie since this lie with the feet above the golf ball simulates a sidehill lie.

Additionally, the golfer may be distracted during his or her practice session by moving the pads when different widths of stance are required for different golf clubs. Furthermore, the pads may slip during use, especially on a wet surface, or alternatively on a hard indoor surface such as a concrete flooring of a driving range, where the holding pegs may not easily be used.

Another golf training aid is described by Ashton in US 5,358,251. Known pressure sensing devices are provided beneath the golfer's standing area platform for detecting the weight distribution between the respective feet, signals from which are fed during a

golf swing to comparator means and thence to indicator means for showing the percentage of bodyweight taken by each foot at address of the golf ball and the transfer of bodyweight during a golf swing. In this device, the indicator means is a strip of light emitting diodes (LEDs) located in a low position directly adjacent to the golf ball striking mat.

The drawbacks of the Ashton device are that the LEDs only show bodyweight distribution information during the golfer's address of the golf ball and golf swing, and thus it is very difficult for the golfer to assess his or her bodyweight distributions at the same time as concentrating on making a golf swing and striking the golf ball. The bodyweight distribution information is not saved for the golfer to view afterwards, and thus it is very difficult for the golfer to make a comparison of his or her bodyweight distribution information with those provided on a chart of ideal golf swings. Additionally, the device has only one golf ball striking area with adjacent LED display, which is not convenient for right-handed as well as left-handed golfers. If the aid, a large heavy device, were to be used by a right-handed golfer followed by a left-handed golfer or vice-versa in an enclosed area such as a golf driving range, it would have to be turned around 180° each time, which is inconvenient.

In view of the above, it is desirable to provide a golf training aid that overcomes some or all of the above-described problems.

According to a first aspect of the present invention there is provided a golf training device for improving a user's address of a golf ball, comprising: input means for inputting influence data comprising information which might affect how the user should address the ball; calculation means for calculating address data, based on the input influence data, specifying one or more aspects of an appropriate address for the user; and indication means for indicating address information to the user, based on the calculated address data, the information relating to how the user should address the ball.

The calculation means may calculate the address data based on pre-collected influence data and associated address data for a reference golfer or golfers.

The calculation means may use an algorithm derived from the pre-collected data.

The calculation means may use a store of such pre-collected data, selecting the closest match from the store based on the input influence data and using the associated address data for the closest match.

The address data may comprise information relating to the user's stance at address.

The address data may comprise information relating to the placement of the user's feet in relation to each other and to the ball.

The address data may comprise information relating to positions and angles of the user's feet.

The address data may comprise information relating to the position of the ball.

The address data may comprise information relating to the distance between the ball and the user's feet.

The address data may comprise information relating to the clubface placement in relation to the ball.

The address data may comprise information relating to alignment of the clubface.

The address information indicated to the user may depend not only on the influence data and address data derived therefrom, but also on the intended target direction. The intended target direction may also be indicated to the user.

The influence data may comprise one or more of the following items of information: gender; age; height; weight; build; race; neck size; shoulder width; waist size; chest size; shoe size; inside leg measurement; distance from tips of fingers to floor when

standing fully erect with arms hanging by the side; right or left-handedness; club selection for the stroke to be played; length of club for the stroke to be played; lie of the club for the stroke to be played; strength of the stroke to be played; intended golf ball flight of the stroke to be played; golfing experience; golfing handicap; and manufacturer and model of club for stroke to be played.

The device may further comprise a playing surface on which the user and ball are positioned at address.

The indication means may be operable to indicate the address information to the user by illuminating a part or parts of the playing surface.

The indication means may be operable to illuminate parts of the playing surface that specify the user's feet placement for the address.

The indication means may be operable to illuminate a part of the playing surface that specifies the ball placement for address.

The indication means may comprise an array of light-emitting devices beneath the playing surface that are selectively illuminated to indicate the address information to the user. In this respect, therefore, illuminating the playing surface should be taken to include providing illumination through the playing surface from beneath, such that the playing surface appears illuminated to the user.

The device may further comprise means for detecting the position of the ball.

The device may further comprise means for detecting the positions of the user's feet.

The detecting means may comprise a pressure-responsive device or devices beneath the playing surface.

The indication means may be operable to indicate the address information relating to a stroke after the user has completed that stroke.

The input means may comprise a device for receiving an electronic data tag or the like holding the influence data.

The input means may comprise a touch-sensitive screen.

The device may further comprise measurement means for providing a bodyweight distribution measurement.

The indication means may be operable to provide an automated instructional indication to the user involving a comparison of the bodyweight distribution measurement at address against a corresponding ideal bodyweight distribution.

The indication means are able to provide information to the user in an automated manner based on the calculated address data. This provides a very convenient training aid for the user, who is able to receive targeted training with minimal input from the user and minimal or no intervention from trained personnel or an experienced golfer.

According to a second aspect of the present invention there is provided a golf training device for improving a user's weight distribution during a golf stroke, comprising: measurement means for providing a time series of bodyweight distribution measurements during a predetermined period of the stroke; storage means for storing the time series of measurements; indication means for providing an automated instructional indication to the golfer after completion of the stroke involving a comparison of at least part of the stored time series of measurements against a corresponding ideal bodyweight distribution.

The predetermined period may at least include address of the ball.

The predetermined period may at least include address of the ball and impact of the ball.

The predetermined period may at least include the follow-through.

The indication means may comprise a display device for displaying the instructional indication.

The instructional indication may comprise a plot of the measured bodyweight distribution of the user.

The instructional indication may comprise a plot of the measured bodyweight distribution of the user together with a plot of the ideal bodyweight distribution.

The device may further comprise calculation means for determining differences between the measured bodyweight distribution and the ideal bodyweight distribution.

The instructional indication may comprise advice relating to how the user should change his or her bodyweight distribution at address and/or during the golf swing to reduce the determined differences.

The measurement means may be operable to measure bodyweight distribution between the heel end and toe end of one or both of the user's feet as well as bodyweight distribution between respective feet.

The instructional indication may comprise a graphical representation of the measured bodyweight transfer between heel end and toe end during a predetermined short period of the stroke.

The instructional indication may comprise a graphical representation based on the measured change in bodyweight distribution between the respective feet and between heel end and toe end of both feet during a predetermined short period of the stroke together with a graphical representation of the ideal change in bodyweight distribution for that short period. The graphical representation may be in the form of an arrow.

The instructional indication may comprise advice relating to how the user should change his or her bodyweight transfer between heel end and toe end of the respective feet during a predetermined short period of the stroke to reduce the determined differences.

The predetermined short period may include the moment of impact with the ball. The device may further comprise means for detecting the moment of impact. The detecting means may comprise a microphone. The device may further comprise a playing surface on which the user and ball are positioned. The measurement means may be located beneath the playing surface.

The measurement means may comprise one or more pressure-sensitive devices.

The device may further comprise input means for inputting influence data comprising information which might affect the user's weight distribution, and wherein the instructional indication is provided by the indication means in dependence on the input influence data.

The ideal bodyweight distribution may be based on pre-collected bodyweight distribution data for a reference golfer or golfers.

The indication means may use an algorithm derived from the pre-collected data to determine the ideal bodyweight distribution.

The indication means may use a store of such pre-collected data, selecting the closest match from the store based on the input influence data and using the bodyweight distribution for the closest match.

The predetermined period may at least includes address of the ball, and the indication means may be operable to provide an automated instructional indication to the user involving a comparison of a single one of the stored time series of measurements during

the address, or an average measure relating to a plurality of the stored time series of measurements during the address, against a corresponding ideal bodyweight distribution. The average measure may, for example, be an actual average or some sort of median measure.

A device according to the first and second aspects of the present invention may be operable in a practice swing mode in which no physical ball is used during the address and/or the stroke. In such a mode, the user of the device could take his or her stance in relation to an indicated ball position but no actual ball.

According to a third aspect of the present invention there is provided an operating program which, when loaded into a device, causes the device to become one according to the first or second aspect of the present invention.

The operating program may be carried on a carrier medium. The carrier medium may be a transmission medium. The carrier medium may be a storage medium.

According to a fourth aspect of the present invention there is provided a method of providing golf training, comprising directing a person to use a device according to the first or second aspect of the present invention.

An embodiment of the present invention can provide a device which aids the golfer in playing golf strokes of optimal power, accuracy and consistency by displaying the precise positions and angles the individual should place his or her feet relative to a golf ball while using a chosen golf club.

A device embodying the present invention preferably allows the foot placement and angular instruction to be directed and tailored to the individual by allowing the individual to input data such as height and build into a computer. The correct clubface alignment is preferably indicated to the golfer.

It is preferable that at least one of the following is displayed: optimal foot placement positions and angles, golf ball position, clubface position and clubface alignment for a chosen straight ball flight stroke, straight high ball flight stroke, straight low ball flight stroke, right-to-left ball flight stroke, high right-to-left ball flight stroke, low right-to-left ball flight stroke, left-to-right ball flight stroke, high left-to-right ball flight stroke or low left-to-right ball flight stroke.

It is preferable that there is an option for the device to detect foot positions and angles and golf ball position during address of the golf ball before instruction commences, in order that the golfer can be given instruction by the device to direct him or her to move his or her feet and/or clubface into optimal positions and angles relative to the position of the ball if any of these were previously incorrect.

The device preferably measures, displays and saves information on bodyweight distribution between the golfer's feet both at address of the golf ball and during all of the golf swing for a golf stroke. The device preferably measures bodyweight distribution between the toe ends and heel ends of the golfer's feet. The device preferably possesses and displays a saved set of ideal golf ball address and golf swing bodyweight distribution and transfer data, including heel and toe bodyweight distribution data, from a large size and age range of expert golfers playing golf strokes using a range of golf clubs using a range of swing powers and swing tempos for use by the golfer in comparing his or her own results for use in improving his or her golf swing. The device preferably measures the bodyweight transfer of the golfer between the respective feet, as well as toe and heel weight distribution, for a short period of time during the golfer's swing before, during and after the impact of the golf club with the golf ball, and to display this information in the form of a vector arrow for use by the golfer in assessing his or her bodyweight transfer information and comparing it with saved data from expert golfers, for use in improving his or her golf swing.

The device preferably conveys instructional information to the golfer so that the golfer can easily and readily adjust his or her foot placement and/or ball position, bodyweight

distribution and/or transfers towards those saved from expert golfers in order for the golfer to improve his or her golf swing.

In one embodiment of the first aspect of the present invention, a device comprises a matrix bed of lights beneath a transparent or semi-transparent mat, golf ball striking areas on or beside the mat with golf ball position sensors beneath, a touch sensitive screen for inputting and displaying information, an algorithm for using input data to switch on particular lights in the matrix in the shape of a line immediately behind the golf ball relative to the target to indicate correct clubface position and alignment and in the shape of two feet to indicate to the golfer precise foot positions and angles for use in a golf stroke, a pressure responsive device for detecting the positions of the respective feet of the golfer when the matrix bed of lights is not chosen for use, and a further set of pressure responsive devices for detecting bodyweight distribution between the respective feet of the golfer as well as the heel ends and toe ends of the golfer's feet, and a microphone for detecting the moment of impact of the golfer's club with the golf ball.

Should the individual using such a device choose to have the foot placement lights in delay mode for foot placement guidance, signals from the pressure responsive devices can be fed during address of the golf ball to the computer and once the golf stroke is completed, the device will show to the golfer where the feet should be placed relative to where they were placed for the golf stroke unless no change is required, and the golfer will be notified of this.

One embodiment of the present invention provides a golf training device comprising a base unit including a platform providing standing area comprising transparent or semi-transparent mat or mat with holes in, and golf ball striking mats with a plurality of tees and a matrix bed of lights beneath or merged into the standing area wherein an algorithm programmed into a computer is used to switch on or off particular lights in the matrix bed of lights to indicate to the individual using the device the optimal positions and angles he or she should place his or her feet and align the clubface behind the golf ball for playing a golf stroke depending on data input by the individual into the

computer with regard to gender, age, weight and dimensions, club selection and type of golf stroke to be played.

In this embodiment, the golf ball location, which needs to be known for use by the device for indicated foot placement positions relative to the golf ball, is known from the golf ball being either placed in either a known fixed, a computer-selected position or else is ascertained by known pressure responsive devices beneath the golf ball striking areas.

An algorithm calculates foot placement positions for a large size and age range of right handed and left handed individuals of both genders to play straight ball flight golf strokes using a wide range of golf clubs. An algorithm calculates foot placement positions for a large size and age range of right handed and left handed individuals of both genders to play a range of right-to-left ball flight golf strokes and a range of left-to-right ball flight golf strokes. An algorithm calculates foot placement positions for a large size and age range of right handed and left handed individuals of both genders to play a range of high straight ball flight golf strokes and a range low straight ball flight golf strokes. An algorithm calculates foot placement positions for a large size and age range of right handed and left handed individuals of both genders to play a range of high or low right-to-left ball flight golf strokes and a range of high or low left-to-right ball flight golf strokes. An algorithm calculates foot placement positions for a large size and age range of right handed and left handed individuals of both genders to play a range of golf strokes of varying power. An individual has means of selecting a swing to the left whereby the right foot is the rear foot or a swing to the right whereby the left foot is the rear foot. An individual has a choice of at least two mats on the base unit from which he or she can play a golf stroke, and the golf ball can be placed either directly on a mat or on a plurality of tees.

A known pressure sensing device or devices can be provided beneath the standing area for detecting positions of the respective feet of an individual striking a golf ball from a known position wherein the matrix bed of lights does not indicate foot placement position. The matrix bed of lights then lights up after the individual has struck his or

her golf ball to show the individual where he or she should have placed his or her feet to play that golf stroke, and concomitant instruction to the individual by way of text and/or arrows or lines on the computer screen or monitor and/or print-out, a computer or otherwise generated voice and/or a movie on the computer screen or monitor and/or lighting in the matrix bed of lights in the form of arrows or other suitable shapes to indicate this to the individual. This instruction may be flashing. This and other data and the instruction may be saved for subsequent retrieval and/or viewing either on the device or remotely on a database or on the world wide web via the internet.

According to one embodiment of the second aspect of the present invention, two moveable pressure sensing devices can be provided beneath a standing area for detecting bodyweight distribution between the respective feet of an individual striking a golf ball from a known position before and during all of the golf swing, these pressure sensing devices each having two components in order to measure bodyweight distribution between the heel and toe ends of each of the individual's feet.

A microphone or other known suitable detection device can be used to detect the moment of impact of the golf club of an individual using the device with a golf ball.

Data from an individual using the device can be saved, retrieved and/or viewed on a suitable computer screen or monitor and/or a print-out and/or viewed remotely from a database or on the world wide web via the internet.

Data can be collected of ideal bodyweight distribution and transfers before and during the golf swings of a range of experienced or expert male and female golfers, of a large size and age range using a range of golf clubs using a range of swing tempos and playing a range of types of golf strokes, including straight ball flight, low straight ball flight, high straight ball flight, right to left ball flight, left to right ball flight, high right to left ball flight, low right to left ball flight, high left to right ball flight and low left to right ball flight golf strokes, as well as a range of less than full power golf strokes are saved and can be viewed by an individual using the device to compare with his or her own golf swing results. If desired, the individual can view his or her results alongside

or superimposed on those of the expert golfers and also if so desired these results can be saved together with or separately for retrieval and/or viewing later, either on a suitable computer screen or monitor and/or a print-out and/or viewed remotely from a database or on the world wide web via the internet for use by the individual in training his or her golf swing.

Bodyweight transfer and distribution between the two feet of the golfer and also between the heel and toe areas of the respective feet can be measured across a short time span immediately before, during and after the impact of the golf club with the golf ball during the individual's golf swing, and the results of these measurements can be displayed by vector-like arrows or similar indicating the degree and direction of bodyweight transfer in this time period.

Corresponding data can also be saved for the corresponding period for a range of expert golfers using a range of golf clubs and playing a range of types of golf strokes, including straight ball flight, low straight ball flight, high straight ball flight, right to left ball flight, left to right ball flight, high right to left ball flight, low right to left ball flight, high left to right ball flight and low left to right ball flight golf strokes, as well as less than full power golf strokes.

Data from the golf swings of both the individual using the device and the expert golfers can be displayed in the form of graphs, arrows pointing towards specific parts of the feet and the like can be displayed at the same time and instruction can be given to the individual using the device should this be required by way of text and/or arrows or lines on the computer screen or monitor and/or print-out, a computer or otherwise generated voice and/or a movie in order to reduce the difference between the results of the golfer using the device and the expert golfer or golfers should this be required. The instruction on the computer screen or monitor may be flashing.

This data and the instruction may be saved for subsequent retrieval and/or viewing either on the device or remotely on a database or on the world wide web via the internet for use by the individual in training his or her golf swing.

Two pressure responsive devices, each incorporating heel and toe component pressure responsive devices, can be provided to send signals during address of the golf ball and during the golfer's swing to comparator means, and thence to indicator means by way of a graphical representation of the feet on a computer screen or similar for showing the relative amount of bodyweight taken by each foot of the golfer both at address and/or a graph on a computer screen or similar for showing the relative amount of bodyweight taken by each foot both at address and during the golf swing and an arrow on a computer screen or similar for showing the bodyweight transfer between the heel-ends and toe-ends of the golfer's feet in a short time period before, during and after the impact of the golfer's club with the golf ball.

For use by the individual using the device to improve his or her golf swing by comparing his or her results with those of expert golfers, data can be provided of ideal bodyweight distribution taken in a continuous fashion by the feet of a large size range of expert golfers of both gender at address and during golf swings using a range of golf clubs using a range of swing powers and swing tempos. Data can be displayed, at the choice of the individual using the system, of bodyweight distribution and transfers for an expert golfer. The computer will select the expert golfer with the closest match to the golfer's input data, i.e. an expert golfer of the closest match in terms of for instance gender, height, weight and build using a chosen golf club with a chosen golf swing tempo categorized as one from a range of at least slow, medium or fast. The individual using the system will thus be able to compare his or her golf swing with that or those of an expert golfer or golfers playing a similar golf stroke to his or her chosen stroke with a similar swing tempo to his or her own. The individual can thus easily monitor and assess his or her bodyweight distribution and transfers against a known expert standard for use in improving his or her weight distribution and transfers before and during a golf swing.

Additionally, since the moment of impact of the golf club of the individual using the device with the golf ball can be detected by a microphone, the bodyweight distribution of the individual at the moment of impact is known. Additionally, the golfer can be

further aided in improving his or her feet and/or ball positions and/or bodyweight distributions and transfers, if these are required, before and during the golf swing by the device in several ways, such as by an audible voice, text on the screen and/or print-out, and/or arrows on the screen, print-out and/or via the matrix bed of lights beneath the standing and/or golf ball striking mat. Data can be saved and accessed either at the system or remotely, such as on a database or website, for future reference and monitoring of the golfer's swing training.

An embodiment of the first aspect of the present invention provides a device that expresses simply and clearly to the golfer the desired foot placement positions, golf ball position and clubface alignment for playing a golf stroke. Such a training aid can express a sufficiently large number of parameters to be applicable to both a wide range of golf clubs and a large size range of individuals of both genders. Such a training aid is able to indicate in a simple, easily understood fashion with precision optimal positions and angles the golfer should place his or her feet and clubface relative to the golf ball and the target when playing a golf stroke. Such a training aid can be both quick and easy to use, amenable to driving range use and is quickly and easily adjusted from one golf stroke to another, particularly when the golf club is changed, and for use by one individual to another.

Such a training aid can provide measurement of feet positions and angles before the golfer is instructed of correct foot placement, clubface and ball position, followed by instructional advice and information, conveyed to the golfer by means such as an audible voice generated by a computer or similar, text on a screen and/or print-out and/or indicating arrows on the screen, print-out and/or golf mat, to indicate to the golfer what adjustments he or she needs to make to his or her feet positions and/or angles and/or ball position at address of the golf ball in order to achieve optimal positions and angles at address of the golf ball.

Such a training aid system can serve the purpose of improving the stance alignment, stance width, feet angles, ball positioning, posture, swing plane, swing path, ball striking quality, power and consistency of golf strokes of the golfer. With repeated

training use of the device by the golfer, the correct stance, golf ball and clubface positions should come more instinctively and comfortably to the golfer whilst he or she is playing on the golf course, practice range, driving range or similar with no instructional or training aid.

One embodiment of the second aspect of the present invention provides a system which measures and indicates bodyweight distribution in a continuous manner immediately before and during all of a golfer's swing, rather than just at extremes and golf ball impact, which can be viewed and/or saved on a computer or similar with monitor or similar or on a print-out after the golf swing has taken place such that the golfer can analyse, and if desired repeatedly analyse, his or her bodyweight distribution and transfer information at address of the golf ball and throughout all of the golf swing. By use of such a continuous bodyweight distribution and transfer measurement system, a comparison can be made between the results of the golfer's swing saved on the computer and shown on a monitor and/or print-out and that of an ideal swing made by an expert golfer for a similar golf stroke, thus allowing the golfer using the device to assess and/or modify his or her golf swing as appropriate to improve and/or optimise bodyweight distribution and transfers during his or her golf swing for achieving improved golf swing and golf stroke power, accuracy and consistency. Instructional advice and information can be conveyed to the golfer by means such as an audible voice generated by the computer or similar, text on the screen and/or print-out and/or indicating arrows on the screen, print-out and/or golf mat, to indicate what bodyweight distribution and/or transfer adjustments the golfer needs to make in his or her address position and/or golf swing in order to achieve optimal bodyweight distribution and transfers for improved golf stroke power, accuracy and consistency.

Reference will now be made, by way of example, to the accompanying drawings, in which:

Figure 1 is an overall perspective view of a golf training aid embodying the present invention;

Figure 2 is a cross-sectional side view of a golf training aid embodying the present invention;

Figures 3a, 3b and 3c are schematic views of indications to the golfer to show optimal clubface alignment and foot placement for different types of stroke in an embodiment of the present invention;

Figure 4a shows an indication produced by an embodiment of the present invention to show the golfer's measured bodyweight distribution at address;

Figure 4b shows the indication of Figure 4a together with a corresponding indication for an expert golfer and instructional advice provided to the golfer in an embodiment of the present invention;

Figure 4c shows a comparison and instructional advice similar to that in Figure 4b, using a quadrant percentage mode;

Figure 5a shows an indication produced by an embodiment of the present invention to show the golfer's measured bodyweight distribution during a golf stroke, together with a corresponding indication for an expert golfer;

Figure 5b shows an indication like that of Figure 5a, with the axes reversed for display;

Figure 5c shows an indication like that of Figure 5b, together with instructional advice provided to the golfer;

Figure 6 is a diagram of a guidance element provided with an embodiment of the present invention explaining to the golfer the correct and incorrect means of transferring bodyweight during a golf swing;

Figure 7a shows an indication produced by an embodiment of the present invention to show the golfer's measured bodyweight transfer at impact, together with a corresponding indication for an expert golfer;

Figure 7b shows an indication like that of Figure 7a, together with instructional advice provided to the golfer;

Figure 7c shows an indication produced by an embodiment of the present invention to show the golfer's measured bodyweight transfer at impact, together with a corresponding indication for an expert golfer;

Figure 7d shows an indication like that of Figure 7c, together with instructional advice provided to the golfer;

Figure 8a shows an indication produced by an embodiment of the present invention comprising indications like those in Figures 5b and 7c;

Figure 8b shows an indication like that of Figure 8a, together with instructional advice provided to the golfer; and

Figure 8c shows another example of an indication corresponding to the type shown in Figure 8b, for a golfer exhibiting a reverse-pivot type of swing.

Figure 1 is a perspective view of the overall arrangement of a golf training aid embodying invention. The aid comprises a base unit 1 with surround 2, and golf ball striking areas 3 (within the confines of which are located high tee 5 and low tee 6) and 4 (within the confines of which are located high tee 7 and low tee 8). Optionally, the outer margins of the golf ball striking areas 3 and 4 can be indicated by lines on the mat or else by lighting in the matrix bed of lights 14. The aid further comprises a mat providing a flat, level standing area 9. A microphone 18 is also located on the computer pedestal to pick up the sound of the impact of the golf club with the golf ball. Beneath the golf ball striking areas 3 (containing tees 5 and 6) and 4 (containing tees 7 and 8)

and standing area 9, base unit 1 contains golf ball weight sensors 11 and 12 for detecting the position of the golf ball, a matrix bed of lights 14, and pressure responsive devices 15, 16 and 17. The aid further comprises a touch sensitive screen 10 as the user interface.

Figure 2 shows a cross-sectional view featuring a sandwich construction of the base unit 1 containing standing and ball striking mats 9, 3 and 4 respectively, matrix bed of lights 14, golf ball position sensors 11 and 12, foot position sensor 15 and moveable pressure responsive devices 16 and 17. The layer or layers above the matrix bed of lights 14 is/are transparent or semi-transparent.

The device can be operated by means of cash, credit or debit card, key, electronic card or electronic key or similar. A typical example would be an electronic key, which could be paid for in advance at, for example, a cash register or credit or debit card payment machine. A payment could be made corresponding to an allotted number of golf balls to be dispensed from the reservoir within pedestal 19. The electronic key indicating the allotted number of golf balls could be placed on a reader or sensor connected to computer 13 at the start of the practice session.

The payment or recognition of payment will start the computer and present the user with the main menu on touch sensitive screen 10. The language to be used can be chosen at an early stage, however many menu choices and/or instructions will be in simple and/or graphic format so as to be easily understood by a wide range of individuals.

Data applicable to both the individual and the intended golf stroke about to be played is input via touch sensitive screen 10. Such data includes, but is not limited, to any one or more of the following parameters, indications and measurements:

- Gender
- Age
- Height

- Weight
- Build (such as very thin, thin, medium, athletic, large, rotund etc.)
- Race
- Neck size
- Shoulder width
- Waist size
- Chest size
- Shoe size
- Inside leg measurement
- Distance from tips of fingers to floor when standing fully erect with arms hanging by the side
- Right or left-handedness for golf stroke to be played
- Club selection (this can include training clubs such as a known Momentus® training club (www.momentusgolf.com))
- Length of the golf club
- Lie of the golf club (e.g. standard, 1° upright, 1° flat etc.)
- Full or easy power golf stroke (or increments thereof)
    - Intended golf ball flight of golf stroke to be played, for example:
    - straight ball flight
    - high trajectory straight ball flight
    - low trajectory straight ball flight
    - right-to-left ball flight (i.e. a "draw" for a right-handed golfer or a "fade" for a left-handed golfer)
    - high trajectory right-to-left ball flight
    - low trajectory right-to-left ball flight
    - left-to-right ball flight (i.e. a "fade" for a right-handed golfer or a "draw" for a left-handed golfer)
    - high trajectory left-to-right ball flight
    - low trajectory left-to-right ball flight
- Golfing experience (for example, in years)
- Handicap
- Manufacturer and model of golf club

A measurement guide and/or tape can be located on the side of pedestal 19 and/or another suitable location on the device for use in determining one more of the above measurements. The individual operates the device by using touch sensitive screen 10 to choose options from menus and by following instructions in an ordered, logical fashion. It is also possible for an individual to be supplied with an electronic key or tag which can be used to store this data and other personal preferences so that these does not have to entered before each use. The function of this data tag can be combined with the function of the above operating key in a single device.

Golf balls are entered into a reservoir housed within pedestal 19 via a hopper. The hopper may have a locked door so that only a limited number of people such as a driving range proprietor can have access to the golf ball reservoir. Should the device be used by an individual or individuals bringing their own golf balls, the electronic key can have no limit on it or else the golf ball dispenser can be by-passed and golf balls can be placed on the mat by the individual using the device and the device operated by touch sensitive screen 10 accordingly. If the reservoir within pedestal 19 is in use and should the reservoir become lower than a predetermined level of golf balls, the computer screen and/or computer generated voice will alert the individual of this so that the reservoir can be charged with further golf balls for use.

Once the golfer using the device has entered all the relevant data into computer 13 via touch sensitive screen 10, and is satisfied with all the data entered and that he or she is ready to play a golf stroke, a menu option called "Dispense golf ball" or similar can be selected. This causes the holding peg or similar such device at the bottom of the chute to release the lowest golf ball that has rolled down the chute and dispense it from outlet 20. The chute is angled such that the golf ball will fall out of the chute gently and will roll only a short, convenient distance, such as towards golf ball striking mat 3. An alternative option on the menu on touch sensitive screen 10 gives the individual using the device the choice of carrying out practice swings, i.e. simulated golf strokes without a golf ball, with the indicating, measuring and/or instructional features of the device turned on. Use of the practice swing mode of the device can, if desired, be charged at a

lower rate relative to striking golf balls or else can be used free for a limited or unlimited time. It will be noted that this practice swing mode is particularly useful for the golfer to use at the start of his or her training session to promote correct positions, angles and/or bodyweight transfers if so desired during a warm up. Furthermore, it will be noted that this practice swing mode is useful for an individual using training clubs or aids such as the Momentus® golf club swing trainer, which can involve the individual making practice swings.

When a golf ball is placed on the golf ball striking mat 3 or one of tees 5 or 6 for example for an individual inputting right-handedness, or golf ball striking mat 4 or one of tees 7 or 8 for example for an individual inputting left-handedness, and lies in a static position for a predetermined short period of time, one of golf ball position sensors 11 or 12 respectively detects the location of the golf ball to be struck. The predetermined period of time could be, for example, two seconds. This period of time could depend on the settings of the golf ball position sensors 11 and 12 linked up to the computer 13, and can if necessary be changed by the individual using the device and/or by a superuser (such as a driving range proprietor with extra access privileges) via the menu on touch sensitive screen 10. The system could also be programmed to detect if the golfer moves the ball subsequently so that the position can be re-calculated.

Alternatively, from the options on the menu on touch sensitive screen 10, the individual using the device has a choice of having the location in which the golf ball should be placed and played from indicated by the matrix bed of lights 14. This option is chosen automatically when the practice swing mode is chosen using the menu, where it will be appreciated the spot of lighting in matrix bed of lights 14 serves to indicate an imaginary golf ball. If, for example, a individual using the device selects a driver as the club to be used, the computer will present the user with a choice of high tee, low tee or golf ball striking mat from which to play the golf stroke or practice swing (depending on mode chosen), with the recommended location being the high tee. If, for example, the individual using the device selects a 8-iron as the club to be used, the computer will present the user with a choice of high tee, low tee or golf ball striking mat from which to play the golf stroke or practice swing, with the recommended location being the golf

ball striking mat. Once the individual using the device chooses the position from which he or she wishes to play the golf ball, the device will indicate to the golfer the golf ball position, both to remind the golfer and also to ensure the golf ball is placed in the correct location, in the following manner. Should the individual using the device select, for example, a high tee, a flashing arrow pointing towards one of chosen high tees 5 or 7 (depending on input data to the effect of a right handed or left handed golf stroke respectively) in the matrix bed of lights 14 will indicate for a short period where the individual should place the golf ball. Alternatively, a ring of lights lit up in matrix bed of lights 14 around the base of the tee can be lit up to indicate to the golfer the location for placing the golf ball. This ring of lights can be chosen, via the menu on touch sensitive screen 10, to be illuminated for only a short period of time prior to the golf stroke, or else remain illuminated during the golf stroke. If the individual using the device selects for example a golf ball striking mat, a computer program will select a location within the confines of one of golf ball striking mats 3 or 4 (depending upon input data to the effect of a right handed or left handed golf stroke respectively). At the location for the golf ball to be placed on the appropriate golf ball striking mat will be lit up a set of lights in matrix bed of lights 14 in the shape of a small spot or similar (which can be similar in diameter as a golf ball (i.e. 1.68 inches) or else smaller, for example of diameter of around 0.7 inches to indicate an area resembling the resting area of a golf ball). The golfer may also be informed by text, graphics and/or movie on touch sensitive screen 10 and/or a computer or other generated voice that he or she must place the golf ball on the indicated illuminated spot.

A further device which can place the golf ball in a known position for the golfer to address and strike is a chute which delivers the golf ball on an ascending brush tee in a hole in the mat as provided in the X-golf system (www.x-golf.net).

At the same time or optionally after a small delay period, lights will be lit up in matrix bed of lights 14 in the shape of a line immediately behind the golf ball location to indicate correct clubface alignment and position and also feet shaped sets of lights to indicate to the golfer optimal foot placement positions and angles for playing the chosen golf stroke. An algorithm programmed into computer 13 calculates which lights in

matrix bed 14 to switch on beneath golf ball striking mat 3 or 4 to indicate optimal clubface alignment and standing area 9 to indicate to the golfer optimal foot placement. The positions and angles of the feet and clubface indications relative to the golf ball location will depend on the individual's data previously entered into computer 13 via touch sensitive screen 10 or data tag.

An algorithm programmed into computer 13 may light up areas in matrix bed of lights 14 beneath golf ball striking mats 3 and 4 to indicate the golf ball position in randomly chosen locations within the confines of the golf ball striking mats 3 or 4 for different golf strokes in order to reduce wear on the mat at specific points or regions.

Should the individual using the device choose to have the position of the golf ball sensed by one of golf ball location sensors 11 or 12, once the golf ball position is sensed, an algorithm programmed into computer 13 calculates which lights in matrix bed 14 to switch on beneath golf ball striking mat 3 or 4 and standing area 9, the lights acting to indicate to the golfer where his or her feet should be positioned and also the correct alignment and position of his or her clubface. The positions and angles of the feet and clubface indications relative to the golf ball location will depend on the individual's data previously entered into computer 13 via touch sensitive screen 10 or data tag.

In the mode wherein one of golf ball position sensors 11 or 12 is in use, the golfer will be informed by text, graphics and/or movie on touch sensitive screen 10 and/or a computer or other generated voice that he or she must place the golf ball in a static position for a particular length of time and wait this short period for the clubface alignment and foot placement lights to be illuminated, after which he or she can take his or her stance, address the golf ball and play the golf stroke.

Alternatively, if the golf ball is placed in a known fixed position such as a spot, mark, cross or tee, or illuminated area, the algorithm programmed into computer 13 will calculate which lights in matrix bed 14 to switch on without the need for golf ball position sensors 11 and 12.

The lights in matrix bed of lights 14 can be in the form of known lights such as light-emitting diodes (LEDs). The matrix bed of lights 14 may comprise many small lights in close proximity to each other in order that shapes and/or lines illuminated and indicated by the matrix bed of lights 14 are shown clearly to the user with good definition. Alternatively, the matrix bed of lights 14 can be in the form of a computer, television or other similar screen. To indicate correct clubface alignment and position, immediately behind the golf ball relative to the target will be lit up in matrix bed of lights 14 a line of lights perpendicular, or roughly perpendicular, to the target line, equal or approximately equal in length to that of the clubface of the golf club. The individual can use this line of lights as a visual guide to align the clubface of his or her golf club squarely to the target or intended line of golf ball flight for potentially improved accuracy and consistency of golf stroke. The line to indicate clubface alignment and position may be either straight or slightly bowed to simulate, for example, the clubface of a wood.

Should the individual choose via touch sensitive screen 10 a straight ball flight golf stroke, the line of lights behind the golf ball relative to the target will be perpendicular or roughly perpendicular to the imaginary line between the golf ball and the target.

For ease of alignment and use, the imaginary target line running between the golf ball and the target, i.e. the line on which the clubface alignment lights are directing the golfer to aim the clubface and play a straight ball flight golf stroke, will, if the mat is of square or rectangular form, be parallel to the edge of the mat, in the case of a rectangular mat the short sides, unless the mat is of a non-square or rectangular shape, such as oval or round. The target is either out in the distance of a driving range, practice ground or similar, or else the back of a net placed in front of the device, or else a spot on the back of a net placed in front of the device.

If the device were placed in a driving range, it would be useful if it were placed facing out directly perpendicular to the driving range bay front margin. It will be appreciated that a straight ball flight stroke may be the most common a golfer will use during a practice session. Should the golfer align his or her address position for a straight ball

flight stroke correctly using the device, his or her alignment to the target or imaginary target will be perpendicular to the outer margin of the driving range bay. Since many golfers have a three-dimensional spatial awareness when aligning their golf strokes, there will be an added feeling to the golfer of correct alignment if the device is so aligned.

The device could also be adapted to indicate the target line by use of lights under the golf ball striking mat 3 or 4 as a further indication to the golfer. The device could also be adapted to allow the direction of the target line to be modified by the golfer to enable the golfer to play strokes at a target not directly in front of the device.

If this device optionally comes with a net into which golf balls are struck, the net can be either a separate entity sitting out in front of the device or else an object which is attached or removably attached to the device. The net may have a spot or spots or similar mark or marks at which the golfer may aim his or her stroke.

Should the individual choose via touch sensitive screen 10 that he or she wishes to play a right-to-left golf ball flight stroke, the line of lights lit up in matrix bed of lights 14 behind the golf ball relative to the target may aim directly at, or slightly left of, the imaginary target line.

Should the individual choose via touch sensitive screen 10 that he or she wishes to play a left-to-right golf ball flight stroke, the line of lights lit up in matrix bed of lights 14 behind the golf ball relative to the target may aim directly at, or slightly right of, the imaginary target line.

The angle of the clubface alignment line of lights relative to the target line will depend upon the degree or amount to which the individual using the device has chosen to shape the golf ball flight in either a right-to-left or left-to-right fashion, and/or also the intended golf ball trajectory (i.e. high or low or increments thereof) via the menu on touch sensitive screen 10.

Optionally, other shapes of lighting could be lit up in matrix bed of lights directly behind, and/or in front of and/or to the side(s) of, the golf ball to provide particular indications. For example, shapes such as iron clubhead or wood clubhead could be indicated with a set of lights, with the leading edge forming the straight or slightly bowed edge of the set of lights directly behind the golf ball, and other shapes could be square, rectangular, triangular or other such shapes. The lights or sets of lights could also flash for a period to attract the golfer's attention.

The device may, by way of either text on the screen 10, a computer or similar generated voice and/or arrows lit up or flashing on the matrix bed of lights 14, indicate to and/or instruct the golfer to align the leading edge of his or her club with the line or set of lights behind the golf ball for correct clubface alignment for playing the golf stroke, and if necessary explain the reasons behind having correct clubface alignment for playing golf strokes of optimal power, accuracy and consistency by way of text, graphics, sound and/or movie.

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Also, beneath standing area 9 in the matrix bed of lights 14 are lit up a pair of footprint-shaped (i.e. the filled-in two-dimensional shapes of the soles of shoes) sets of lights to indicate to the individual the correct positions and angles the individual should place his or her feet for addressing and striking the golf ball from its sensed, fixed or indicated position depending on the data the individual input into the computer 13 via data tag or touch sensitive screen 10 and also the algorithm programmed into computer 13 using address position data of a range of expert golfers.

The front such footprint-shaped set of lights (relative to the target, i.e. the left foot for a right-handed golfer and the right foot for a left-handed golfer), will typically be angled towards the target by around 10-30°, more preferably 20-25°. In other words, the angle between an imaginary line perpendicular to the imaginary target line and the axis from heel end to the toe end is typically in this range, although any angle can of course be indicated if appropriate.

Likewise, the rear footprint-shaped set of lights (relative to the target, i.e. the right foot for a right-handed golfer and the left foot for a left-handed golfer), will typically be angled perpendicular to the imaginary target line or angled slightly away from the target (i.e. in the range 0-10°). In other words, the angle between an imaginary line perpendicular to the imaginary target line and the axis from heel end to the toe end is typically in this range, although any angle can of course be indicated if appropriate.

The size of the footprint-shaped sets of lights shown will be determined by the shoe size entered by the golfer into computer 13 via touch sensitive screen 10 or other input. If no foot size data is available, a combination of the gender, height and build data can be used to estimate an appropriate foot size and shape. Or the foot size and shape can be estimated by the height and build data alone, or else by other available data. If no suitable data are available, a default size and shape can be used.

Both the width of the stance and the distance of the feet away from the golf ball will also be dependent on data entered by the golfer, the most relevant being, but not restricted to being, gender, height and build. These issues are discussed in Golf Magazine, April 1998, pages 146 to 147, Ben Hogan's book "Five Lessons; The Modern Fundamentals of Golf" and also "Ultimate Golf Techniques" by Malcolm Campbell (published by Dorling Kindersley Limited).

Suitable widths of stance, distance of the feet from the golf ball, alignment of the feet, angles of the feet and placement of the golf ball in the stance relative to the feet have been estimated by analysing the stance of both right-handed and left-handed professional and high-level amateur golfers of both genders of a large size and age range. These prior measurements are used in the algorithm programmed into computer 13 for calculating which lights in matrix bed of lights 14 to illuminate to indicate optimal foot and/or ball placement.

This analysis has shown that both the width of the stance and the distance of the feet away from the golf ball will increase on changing the golf club from the shortest clubs, i.e. lofted wedge irons through the irons and fairway woods, to the longest club, the

driver. The device also has the option of foot placement, ball position and clubface alignment guidance for a golfer using a putter and training aids or clubs such as a Momentus® golf club (www.momentusgolf.com).

The position of the centre of the golf ball may vary in position relative to the two feet from being approximately opposite the inside edge of the heel of the forward foot, relative to the target, of the golfer for the longest club, the driver, and will gradually move back in the stance towards being approximately in the middle of the stance, i.e. opposite the point mid-way between the inside edges of the golfer's two heels for the most lofted clubs, e.g. a sand wedge.

In general, the distance an individual should take his or her stance from the golf ball is governed by the lie, loft and shaft length of the golf club they are using. Typically, a tall person will stand with his or her feet slightly closer to the golf ball than a shorter person of the same gender, similar build and using the same golf club, assuming the golfers have their clubs fitted correctly for their height, gender and build, since the taller person will have a more upright posture and golf clubs with a more upright lie. Some junior golfers may stand closer to the ball than their taller adult counterparts due to the length of the shafts being smaller in junior golf clubs. An individual with a large shoulder width will typically have a wider stance, i.e. the feet will be further apart at address of the golf ball, than an individual of the same or similar height with a smaller shoulder width using the same golf club. Furthermore, a more senior golfer may have (but is not restricted to having) his or her rear foot, relative to the target, angled slightly more away from target, due to the individual's lower degree of body flexibility relative to younger golfers. All this information is ideally available to the golfer using the device.

Two example sets of data for expert golfers used by the algorithm programmed into computer 13 for indicating via matrix bed of lights 14 optimal foot placement as well as clubface alignment and positioning, relative to the position of the golf ball are provided below.

Example 1

Input data:

- Male, Caucasian, height: 5'11'' (180 cm), build: medium, age: 40 years, shoe size: UK 9
- Right handed golfer
- Club selection = 7-iron
- Golf ball placement selection = golf ball striking mat 3
- Intended golf ball flight: straight, regular trajectory

Indication data:

- Shortest distance from nearest part of golf ball to imaginary line running across the toe ends of the golfer's shoes approximately = 20 inches (50.8 cm)
- Distance between the inside edges of the heels of the golfer's shoes approximately = 14.5 inches (36.8 cm)
- Distance between the centres of the points of the toe ends of the golfer's shoes approximately = 19.5 inches (49.5 cm)
- Distance from point on target line perpendicularly opposite the inside edge of the heel of the golfer's left shoe to the centre of the golf ball approximately = 4 inches (10.2 cm) (i.e. the centre of the golf ball is back ca. 28% in the golfer's stance)
- Left foot splayed towards the target, from the axis of the heel end to the toe end, relative to an imaginary line perpendicular to the imaginary line extending from the centre of the golf ball to the target by an angle of approximately 20°
- Right foot splayed away from the target, from the axis of the heel end to the toe end, relative to an imaginary line perpendicular to the imaginary line extending from the centre of the golf ball to the target by an angle of approximately 7°
- Length of each sole of shoe shaped set of lights illuminated in matrix bed of lights 14 approximately = 11.75 inches (29.8 cm)
- Width of each sole of shoe shaped set of lights at widest (ball) part of feet illuminated in matrix bed of lights 14 approximately = 4.25 inches (10.8 cm)
- Distance of point of toe end of the golfer's left shoe to an imaginary line that runs parallel from the point of the toe end of the golfer's right shoe to the imaginary

line that runs from the centre of the golf ball to the target approximately = 0.3 inches (0.8 cm)

- Clubface alignment and position set of lights in matrix bed of lights 14: directly behind golf ball, straight line of approximate length 4 inches (10.2 cm) perpendicular to the imaginary line between the centre of the golf ball and the target lined up such that the golf ball is directly in front of the middle of the line of lights, or else, from the visual perspective of the golfer addressing the ball, the golf ball appears to be aligned with the centre of the clubface line of lights.

Example 2

Input data:

- Male, Caucasian, height: 6'3'' (191 cm), build: medium, age: 25 years, shoe size: UK 12
- Right handed golfer
- Club selection = 3-wood
- Golf ball placement selection = tee 6
- Intended golf ball flight: straight, regular trajectory

Indication data:

- Shortest distance from nearest part of golf ball to imaginary line running across the toe ends of the golfer's shoes approximately = 27 inches (68.6 cm)
- Distance between the inside edges of the heels of the golfer's shoes approximately = 16.5 inches (41.9 cm)
- Distance between the centres of the points of the toe ends of the golfer's shoes approximately = 22.5 inches (57.2 cm)
- Distance from point on target line perpendicularly opposite the inside edge of the heel of the golfer's left shoe to the centre of the golf ball approximately = 2 inches (5.1 cm) (i.e. the centre of the golf ball is back ca. 12% in the golfer's stance)
- Left foot splayed towards the target, from the axis of the heel end to the toe end, relative to an imaginary line perpendicular to the imaginary line extending from the centre of the golf ball to the target by an angle of approximately 20°

- Right foot splayed away from the target, from the axis of the heel end to the toe end, relative to an imaginary line perpendicular to the imaginary line extending from the centre of the golf ball to the target by an angle of approximately 7°
- Length of each sole of shoe shaped set of lights illuminated in matrix bed of lights 14 approximately = 12.3 inches (31.2 cm)
- Width of each sole of shoe shaped set of lights at widest (ball) part of feet illuminated in matrix bed of lights 14 approximately = 4.4 inches (11.2 cm)
- Distance of point of toe end of the golfer's left shoe to an imaginary line that runs parallel from the point of the toe end of the golfer's right shoe to the imaginary line that runs from the centre of the golf ball to the target approximately = 0.3 inches (0.8 cm)
- Clubface alignment and position set of lights in matrix bed of lights 14: directly behind golf ball, straight line of approximate length 4.3 inches (10.9 cm) perpendicular to the imaginary line between the centre of the golf ball and the target lined up such that the golf ball is directly in front of the middle of the line of lights, or else, from the visual perspective of the golfer addressing the ball, the golf ball appears to be aligned with the centre of the clubface line of lights.

Should the individual input data into computer 13 via touch sensitive screen 10 to the effect that he or she wishes to play a straight golf ball flight stroke of normal or full power, the device will indicate a square stance whereby the lights lit up in matrix bed 14 beneath standing area 9 will indicate feet position such that the individual's toes will line up parallel or approximately parallel to the imaginary target line and the line of lights lit up in matrix bed 14 beneath golf ball striking area 3 or 4 or tees thereon directly behind the golf ball to indicate clubface alignment will be substantially perpendicular to the imaginary target line. Since the golfer's front foot, relative to the target, may be somewhat splayed towards the target, the stance will appear to be slightly open, but only to the small extent that the point of the toes of the golfer's left foot will be further away from the ball than the imaginary line that runs parallel from the point of the toe end of the golfer's right foot to the imaginary line that runs from the centre of the golf ball to the target by approximately 0.3 inches.

Should the golfer indicate that he or she wishes to play a right-to-left golf ball flight stroke (i.e. a "draw" for a right-handed golfer or a "fade" for a left-handed golfer), the foot placement lights will be aligned such that the individual's toes will be aligned slightly right of parallel to the imaginary target line, i.e. "closed" for a right-handed golfer or "open" for a left handed golfer, and the clubface alignment will be perpendicular to, or aiming slightly left of, the imaginary target line. Also, optionally, the golfer's front foot, relative to the target, may be splayed towards the target at a slightly smaller angle than for a corresponding straight golf ball flight stroke, and the golfer's rear foot, relative to the target, may be splayed away from the target at a slightly larger angle than for a corresponding straight golf ball flight stroke. In general, the degree to which the foot placement lights may be aligned to the right of the target line and also the clubface alignment set of lights may be aligned to the left of the target line and also how much the splaying of the golfer's feet may vary from a straight ball flight stroke as described above will depend upon the degree of right-to-left golf ball flight shape the golfer chooses he or she wishes to play from the options on the menu shown on touch sensitive screen 10.

Should the golfer indicate that he or she wishes to play a left-to-right golf ball flight stroke, (i.e. a "fade" for a right-handed golfer or a "draw" for a left-handed golfer), the feet lights will be aligned such that the individual's toes will be aligned slightly left of parallel to the imaginary target line, i.e. "open" for a right-handed golfer or "closed" for a left handed golfer, and the clubface alignment will be perpendicular to, or aiming slightly right of, the imaginary target line. Also, optionally, the golfer's front foot, relative to the target, may be splayed towards the target at a slightly larger angle than for a corresponding straight golf ball flight stroke, and the golfer's rear foot, relative to the target, may be splayed away from the target at a slightly smaller angle than for a corresponding straight golf ball flight stroke. In general, the degree to which the foot placement lights may be aligned to the left of the target line and also the clubface alignment set of lights may be aligned to the right of the target line and also how much the splaying of the golfer's feet may vary from a straight ball flight stroke as described above will depend upon the degree of left-to-right golf ball flight shape the golfer

chooses he or she wishes to play from the options on the menu shown on touch sensitive screen 10.

Should the golfer indicate that he or she wishes to play a high trajectory ball flight stroke, whether this be with a straight, right-to-left or left-to-right flight, the feet lights may be aligned in the same or similar positions according to whether the golfer intends to play a straight, right-to-left or left-to-right flight stroke respectively, and the golf ball position may be located such that it is slightly further forward in the stance, i.e. closer to the target than for a regular trajectory stroke.

Should the golfer indicate that he or she wishes to play a low trajectory ball flight stroke, whether this be with a straight, right-to-left or left-to-right flight, the feet lights may be aligned in the same or similar positions according to whether the golfer intends to play a straight, right-to-left or left-to-right flight stroke respectively, and the golf ball position may be located such that it is slightly further back in the stance, i.e. further from the target than for a regular trajectory stroke.

The golfer may also have the option, for example via the menu on touch sensitive screen 10, of choosing a golf stroke to be played with a swing of significantly less than full power (i.e. an "easy" swing). The intended degree of power to be used for the golf stroke can be chosen by the golfer using the device via the menu on touch sensitive screen 10. In the case of such an easy swing golf stroke, the lights illuminated in matrix bed of lights 14 to indicate foot placement positions will aim parallel with, or slightly left of, the imaginary target line for a right-handed golfer and parallel with, or slightly right of, the imaginary target line for a left-handed golfer. Also, the stance may be narrower than for a corresponding full or normal power golf stroke. Also, the golfer's front foot, relative to the target may be splayed towards the target to a greater degree than for a corresponding full or normal power golf stroke. In general, the degree to which the indication lights in matrix bed of lights 14 for the stance is narrowed and the also the amount of splaying of the golfer's front foot, relative to a full or normal power golf stroke, may depend on how much lower than full or normal power the golf stroke is, which is chosen by the golfer using the device via the options on the menu on touch

sensitive screen 10. The easy swing golf stroke is particularly useful for practicing, using a training device embodying this invention, the iron clubs and more particularly the wedge iron clubs, where a less than full power stroke is typically often encountered during normal play on a golf course.

Figures 3a, 3b and 3c are schematic views of the lighting on matrix bed of lights 14 used to indicate to the golfer optimal clubface alignment and foot placement for a right-handed golfer to play example golf strokes of straight golf ball flight, left-to-right golf ball flight and right-to-left golf ball flight respectively.

Other shapes of lights which can be illuminated in the matrix bed of lights 14 to indicate to the golfer where he or she should place his or her feet for playing a golf stroke are suggested in the following non-exhaustive list: a line or lines outlining the shape of the shoe, straight lines at the desired angles, wavy lines at the desired angles, rectangles at the desired angles, ovals, circles, triangles, triangles at the desired angles, diamonds, diamonds at the desired angles, feet-shaped/foot-print shaped sets of lights (i.e. like bare feet showing individual toes) or an outline or outlines of this, a curve or curves outlining the toe-end of the shoes only, two curves showing where the heel should be placed and where the tips of the toes should be placed and other similar shapes.

Alternatively, lines of illuminated lights extending perpendicularly optionally either from the imaginary line between the golf ball and the target or the vicinity of the golf ball to the desired points at which the golfer should place the point of the toe end of each foot can be used (either instead of, or in conjunction with, any of the above shapes to indicate foot placement positions and angles). Also, optionally, a line of lights extending perpendicularly from the golf ball position to the vicinity of the golfer's feet can be illuminated. These lines may serve to give the golfer a good visual impression of the width of the stance and/or the golf ball position in the stance required for a particular golf stroke and thus adopt more correct positions on the golf course or similar without the use of a training aid.

Optionally, other indicating means can be used in combination with or instead of the lighting in matrix bed of lights 14 for indicating to the golfer optimal foot placement positions. These indicating means can be in the form of rods protruding from holes or gaps within the standing area mat 9 around the edges of the feet placement areas, and/or plates or rods which slide in from the edge of the mat to the edge of the foot placement areas, and/or arrows lit up in matrix bed of lights 14.

Alternatively, a computer, television or other similar screen could be provided within the base unit 1 beneath the standing area 9, with a surface protective layer; this screen could convey information to the golfer in a similar way as the matrix bed of lights 14.

Alternatively, all of the lights in matrix bed 14 can be lit up except those indicating correct clubface alignment and position and foot placement positions and angles. The lights illuminated in matrix bed 14 to indicate foot placement positions and angles and clubface alignment and position can be either on for a short period of time, for the period of the stroke, and/or can be flashing to attract the attention of the golfer.

Also, the device may, by way of either text on the screen 10, a computer or similar generated voice and/or arrows lit up or flashing on the matrix bed of lights 14, indicate to and/or instruct the golfer to place his or her feet precisely on the lit up lights in order for him or her to have the correct width of stance, correct alignment of stance, have the correct feet angles and be standing the correct distance from the golf ball for an individual of his or her gender, height and build for playing the golf stroke, and if necessary explain the reasons behind having each aspect of the golf address position and possibly others correct by way of text, graphics, sound and/or movie for playing golf strokes of optimal power, accuracy and consistency.

As another alternative, lighting can be used from a light, pair of lights or set of lights placed above and to the side of the device. These lights can be linked up to computer 13 and move at the instruction of the algorithm programmed into computer 13 to shine a footprint pair or other shaped pair or lights onto the mat (with no need for matrix bed of lights 14 in the device) to indicate to the golfer optimal foot placement positions for

playing a golf stroke depending on the data entered into computer 13 via the data tag or touch sensitive screen 10.

Alternatively, the lighting can have a footprint pair or other shaped pair or lights blacked out and when the lights are shone onto the mat (with no need for matrix bed of lights 14 in the device), the non-lit up areas will be the indication to the golfer of optimal foot placement positions for playing a golf stroke depending on the data entered into computer 13 via the data tag or touch sensitive screen 10.

Alternatively, optimal foot placement positions can be indicated to the golfer by a pair of platforms, each platform being roughly equal in size to a large foot, connected to arms which enable the platforms to be moved into position within a void or similar between the two golf ball striking mats 3 and 4, without the need for standing area 9. The two platforms would be moved into the correct positions using known means such as hydraulics, by use of the algorithm programmed into computer 13, depending on data entered into computer 13 via touch sensitive screen 10 or a data tag for the golfer to strike a golf ball from either it's sensed, fixed or indicated position. This means of indicating to the golfer optimal foot placement positions will not require either matrix bed of lights 14 or pressure responsive device 15, although one or more matrix beds of lights could still be employed beneath the golf ball striking areas for indicating optimal clubface alignment and position.

Pressure responsive devices 16 and 17, with their heel and toe pressure sensing components, can be housed within these two platforms for bodyweight distribution measurement. The heel and toe pressure sensing components, preferably being split in the centre of the platforms, may enable heel and toe pressure measurements no matter which way round an individual stands on the platforms, i.e. the heel and toe bodyweight distributions of both left-handed and right-handed golfers may be measured accurately using the devices. An embodiment for use in measuring and analysing bodyweight distribution is described in more detail below.

Other means of indicating relative placement and positioning of the feet in relation to the ball will be readily apparent to the skilled person. For example, audible instructions (for example in the form of computer-generated speech) could be given by the device to direct the user to move his or her foot or feet and/or the ball into the correct positions.

The individual using the device can choose, if he or she wishes, via the menu options, the foot placement guidance lighting from matrix bed of lights 14 (or other indication means) to be in delay form. In this foot placement guidance lighting delay mode, the golfer will set up to and play the golf stroke (or practice swing if the practice swing mode is chosen) with the chosen club as normal without the lighting coming on to indicate foot placement and/or clubface alignment, and pressure responsive device 15 (such as a known force transducer from manufacturers such as Honeywell) will detect the positions of the two feet of the golfer.

In this foot placement guidance lighting delay mode, the golfer can indicate to the device when he or she is ready to address the golf ball and play the golf stroke (or make a practice swing, in which case instead of a golf ball is used a spot of lights indicated by matrix bed of lights 14) from its static position on one of mats 3 or 4 or a tee thereon, by pressing a start button or using a voice controller or other suitable interface. This start signal will initiate a delay period, the length of which may, optionally, be chosen on the menu by the golfer, which will count down to when foot placement measurement will commence. Additionally, optionally, via touch sensitive screen 10, for further ease of use, an audible signal can be chosen by the golfer for the device to indicate to the golfer, once the delay period has elapsed, when the foot placement position measurements are starting. The device will know when the golf stroke is complete by use of microphone 18 to detect the impact of the golf club with the golf ball and/or use of one of golf ball position sensors 11 or 12, which will detect that a golf ball is no longer resting on the golf ball striking mat or tee. In practice swing mode, the device will allow a suitable fixed time for the golfer to make his or her practice swing, or else the golfer can choose from options on the menu a measurement period.

In this foot placement guidance lighting delay mode, once the golf stroke is complete, the device will show via lighting in matrix bed 14 where the golfer should ideally place his or her feet for addressing and playing the golf stroke (or practice swing) of the golf ball from it's known position (or in the case of practice swing mode the known position of where the golf ball would be situated) with the chosen club for the particular gender, height, build etc. data entered into the computer. Other instructional advice for foot placement which can be given to the golfer at this stage include a pair of soles of shoes shaped sets of lights where the golfer actually took his or her stance and/or arrows pointing to, if necessary from the used footprint placement areas, the soles of shoes shaped sets of lights in the correct position(s), text, graphics and/or a movie on the screen and/or a computer or other generated voice. The soles of shoes shaped sets of lights and/or arrows can be flashing to attract the golfer's attention.

Although it is described above that golf ball weight sensors 11 and 12 are provided to detect the position of the golf ball, each of golf the ball striking mats 3 and 4 can have one tee in a fixed position for placing the golf ball to be struck on, for use by all clubs, without the need for golf ball location sensors 11 and 12. Another means of detecting the position of the golf ball to be struck upon one of the golf ball striking mats could be a device above the mat such as a known photometric device for positional detection of the golf ball to be struck.

Other possibilities for ensuring a known golf ball position without the need for golf ball position sensors 11 and 12 include marking a cross, spot or other similar indication on each of the golf ball striking mats 3 and 4 on which the golf ball is placed. These crosses, spots or other similar marks can be on their own, or in combination with one or more tees protruding from the golf ball striking mats 3 and 4. In such cases, the individual would have the option, via touch sensitive screen 10, to choose which tee or mark the golf ball is to be struck from (each may have an indication such as a label or illuminated instruction alongside it for ease of reference), or else this can be chosen by default by the computer program and instructions given to the golfer as to where to place the golf ball for striking.

For example, if the golf club selected by the user via touch sensitive screen 10 to be used is the driver, the golfer could be instructed either by text on the screen, a computer generated voice and/or an arrow from lighting beneath the mat, to place the golf ball on the high tee. Or when a fairway wood is selected as the golf club to be used, the golfer could be instructed to place the golf ball on the low tee. Or when an iron club (e.g. 6-iron) is selected as the golf club to be used, the golfer could be instructed to place the golf ball on a particular one of the marks on the mat 3 or 4, depending on whether he or she entered data to the effect of right-handedness or left-handedness.

Two golf ball striking areas 3 and 4 are provided in the example described above so that the device can easily be used by both right and left handed golfers in an enclosed area such as a driving range bay where golf balls are struck in one direction. It will be appreciated that it is not essential to provide two such areas 3 and 4 where a single area would suffice.

There may optionally be more than four tees on the device, i.e. greater than two tee height options per golf ball striking mat. Similarly, there may optionally be more than two golf ball striking areas. The mat providing standing area 9 can either be the same mat or a separate mat to golf ball striking areas 3 and 4.

The construction and maintenance of base unit 1, surround 2 and mats 3, 4 and 9 will be apparent to someone skilled in the art. The edging of the surround 2 of base unit 1 holding mats securely in place may be held in place by screws, Allen key locks or other similar means. Mats 3, 4 and/or 9 may be lifted and/or removed by removal of the edging of surround 2, for cleaning, maintenance or replacement purposes and/or for replacement of the tees with different or new tees, for instance new tees of different height, which may protrude through holes in the mat(s). Golf ball striking mats 3 and 4, if they are separate mats to standing area mat 9, may be held in place either by Velcro® or other similar attachments on the underside, or else by having a lip around the bottom edge which is trapped all the way around by a sure-fitting edge on the underside of the larger mat 9.

Either the entirety or surface of standing area mat 9 and/or golf ball striking areas 3 and 4 can be made of for instance durable artificial grass such as Astroturf®, and the tees 5, 6, 7 and 8 can be made of for instance durable rubber, with the stalks of the tees protruding through holes in the mats 3 and 4 and supported and held by a base component trapped securely beneath the mats. Standing area mat 9 and/or golf ball striking mats 3 and 4 can be pale green or green in colour to simulate grass but still be transparent enough to allow lighting to show through from matrix bed of lights 14 beneath. These mats 9, 3 and 4 are sufficiently thick and strong to protect the layers of matrix bed of lights 14, golf ball position sensors 11 and 12, pressure responsive devices 15, 16 and 17 beneath from the impact of golf clubs from strokes and practice swings and also golf shoe spikes and other wear and tear. The surface of the transparent or semi-transparent mat (or mat with holes and/or gaps in) 9 can be made of either durable artificial grass such as Astroturf® or the same or similar durable transparent material used to cover aisle floor lighting in commercial aircraft or else other suitable material.

The surface of standing area mat 9 may be level with the surfaces of golf ball striking mats 3 and 4 or else it may be at a level slightly below those levels of the surfaces of the golf ball striking mats 3 and 4. The latter option may be more preferable in order to simulate the type of lie a golfer would encounter during a round of golf, in that typically the lowest part of the golf ball will rest at a higher level relative to the soles of the golfer's shoes on a golf course than on a golf driving range mat. The reasons for this are that typically the golfer's feet will depress the ground slightly on the grass of a golf course whereas typically they will not on the hard surface of a driving range mat, and also a golf ball may sit up slightly higher when resting on the blades of grass on a golf course relative to how it would rest on the flatter surface of a driving range mat.

A touch sensitive screen 10 is chosen in the example described above for durability and ease of use. However, other known types of computer apparatus, in combination with a screen, such as a joystick, remote control, keyboard, keypad, printer and/or mouse or other known devices could be used in conjunction with or instead of the touch sensitive screen 10. The computer may also be voice activated, which would be convenient for

instructing the computer to commence measurements in situations such as when the golfer is about to play a golf stroke. Another option is to enable the golfer to select or change options by convenient use of the golf club to allow him or her to do so without taking his or her hands off the club. This type of interface could be in addition to the already-described interface, and may be provided, for example, by way of touch or pressure sensitive devices under the striking mat or similar. With such an interface an option could be selected or changed (for example to change the type of stroke to be played or to indicate use of a particular mode of operation) by tapping an area associated with an indication as to what option or mode is changed or selected by tapping there.

In the above-described examples, it has been assumed that the golf ball position is measured or chosen, and that the indications as to feet positions and clubface alignment are determined based on the golf ball position and target direction. Another mode of operation is possible in which the golfer is allowed to take his or her stance without any indication from the device, with the positions and angles of the golfer's feet subsequently being measured by the device. Based on the measured positions and angles, the correct golf ball placement is then indicated to the golfer, by such means as via matrix bed of lights 14, based on the golfer's physical data as well as the intended type of stroke (e.g. draw or fade). Alternatively, the device can suggest a particular stroke or strokes which can be played with such a measured stance. The electronic circuitry of the device will be apparent to someone skilled in the art.

According to an embodiment of another aspect of the present invention, the individual has the option, via the menu on touch sensitive screen 10, of having bodyweight distribution measurement during the address of the golf ball and/or golf swing whilst playing a golf stroke or making a practice swing. For this purpose, known pressure responsive devices 16 and 17 (such as known force transducers from manufacturers such as Honeywell) are provided beneath standing area 9, each being approximately the same size as a large foot. The pressure responsive devices 16 and 17 will move to the positions and angles where the golfer should take his or her stance (i.e. where the golfer is instructed to place his or her feet by illumination from matrix bed of lights 14 and/or

instruction from the computer by way or computer or otherwise generated voice, and/or text, lines, arrows and/or movie via the screen or matrix bed of lights 14. The visual instruction may be flashing.). A sheet-like form of pressure responsive device 16 and 17 can also be employed which is responsive to force over a wide area to detect where the golfer has positioned his or her feet. The electronic circuitry of the device will be apparent to someone skilled in the art.

When using this mode, the golfer may be asked by the computer, via the menu on touch sensitive screen 10, to enter further data which may effect his or her bodyweight distribution and/or transfer during address and/or the swing. Such data may comprise some or all of the input data for the first aspect embodying this invention, as well as some or all of swing tempo (categorised as one of at least very slow, slow, medium slow, medium, medium fast, fast and very fast), shaft flex of the club to be used for the stroke to be played (e.g. extra stiff, stiff, firm, regular, senior, ladies, etc.) and clubhead speed at impact with a driver (e.g. >110 mph, 100-110 mph, 90-100 mph, 80-90 mph, 70-80 mph etc.). Should some of these data not be available, the parameters for use in comparing the golfer's bodyweight distribution and/or transfer with that of an expert golfer with the closest match can be estimated using a combination of the gender, age, height, build, handicap and shaft flex for the club to be used. Or the parameters can be estimated using a combination of the gender, age, height and build, or else by other available data.

During the address of the golf ball and during the golf swing, the pressure responsive devices 16 and 17 will electronically convey weight distribution data between the two feet, and also between the heel and toe areas of each of the two feet, to computer 13. The pressure responsive devices 16 and 17 are moved by hydraulics or other known means and may be each split 50/50 with heel area and toe area force transducers. If the force transducers are split halfway, there will be no need for them to turn round when a left-handed golfer uses the device after a right-handed golfer and vice versa. The computer will know which way round to collect and report data from the previously-input data relating to the right- or left-handedness of the golfer.

The golfer can give his or her indication when he or she is ready to address the golf ball and play the golf stroke (or make the practice swing if practice swing mode is chosen on the menu) from its static position on one of mats 3 or 4 or a tee thereon, by either pressing a start button, touching a start button area on the touch sensitive screen 10, using a voice controller or by some other interface. This start signal will initiate a delay period, the length of which can be chosen on the menu on touch sensitive screen 10 by the golfer, however for ease of use a default setting will also be programmed into the computer 13 which can be chosen if desired, which will count down to when bodyweight distribution measurement will commence. Additionally, for further ease of use, an audible signal could be chosen by the golfer for example via touch sensitive screen 10 which the device would emit to indicate to the golfer when the bodyweight distribution measurements are starting (once the delay period has elapsed).

The force transducers may measure bodyweight distribution between the right toe area, right heel area, left toe area and left heel area of the individual in a continuous manner for the duration of the measurement period. The computer will know when the golf stroke is complete by use of microphone 18 to detect the impact of the golf club with the golf ball and/or use of one of golf ball position sensors 11 or 12, which will detect that a golf ball is no longer resting on the golf ball striking mat or tee. If practice swing mode is employed, bodyweight distribution measurement will stop after a default period or else the period of time can be chosen by the golfer using the menu on touch sensitive screen 10.

Also, once the golf stroke is complete, the lights switched on in matrix bed of lights 14 may be switched off until the golfer indicates to computer 13 via touch sensitive screen 10 that he or she is satisfied with all of the data entered for the next stroke (amongst other things, the golf club selection and/or type of golf ball flight can be changed at this stage) and, if golf ball striking mode is chosen, another golf ball is placed upon golf ball striking areas 3 or 4 or one of the tees thereon.

Of course, the golf swing does not end with the impact of club against ball, but also comprises a follow-through period after impact. Since the moment of impact of the

golfer's club with the golf ball is detected by microphone 18, and the golf swing does not last for a great deal of time following the moment of impact, the device can be adapted to continue to measure bodyweight distribution for each golf swing a predetermined time after the moment of impact of the golfer's club with the golf ball, for example 1.5 seconds. Immediately after the weight distribution measurement has been switched off at the end of the golfer's swing, and the lights on the matrix bed 14 have been switched off, the screen may display weight distribution results as measured for the last golf swing taken.

Optionally, the golfer can choose (for example via the menu on touch sensitive screen 10) to have his or her bodyweight distribution at the address of the golf ball measured. The force transducers 16 and 17 will measure bodyweight distribution between the golfer's left toe area, left heel area, right toe area and right heel area. The golfer has the option, via use of the menu on touch sensitive screen 10, of having the address position bodyweight distribution measured only, without the need for a stroke, or else having this measurement taken together with that of the proceeding swing (for either a golf stroke or practice swing) associated with that address. Should the golfer choose to have the address position bodyweight distribution measured before the commencement of a swing, the data shown will be from one particular time measurement or else an average over a short time period. The golfer may wish to have an indication of a period of time in which he or she should remain steady in his or her address position for the address position bodyweight distribution measurement, and he or she may receive this from the device in the form of a countdown (the length of this can be adjusted by the golfer if so desired) and/or a visual or audible signal for the start and/or end of this period.

Once measurement is complete, the address bodyweight distribution measurement data can be displayed on the screen and/or mat via matrix bed of lights 14, and this data may be displayed either on its own or in conjunction with instructional advice and/or data for an expert golfer or golfers using the same club intending to play the same type of stroke for use by the individual using the device to potentially improve his or her bodyweight distribution both through the respective feet in general and also in the toe and heel areas of the respective feet at address of the golf ball. An example set of results of an

individual's address position bodyweight distribution measurement are shown in Figure 4a.

Figure 4b shows the results of the device user's address position bodyweight distribution shown in Figure 4a together with that of an expert golfer for the same type of chosen stroke. Also shown in Figure 4b is instructional advice given by the device for the golfer to modify his address position bodyweight distribution to a distribution resembling that of the expert golfer. The arrows and/or instruction and/or data may be flashing to attract the attention of the golfer. The golfer using the device has the option, via the menu on touch sensitive screen 10 to have the address position bodyweight distribution results shown as quadrant percentages, i.e. the percentage of the total bodyweight taken by the left toe area, left heel area, right toe area and right heel area. Figure 4c shows the results in quadrant percentage mode for the same measurements as taken for Figure 4b.

Descriptions of ideal bodyweight distributions and transfers can be found in "Ultimate Golf Techniques" by Malcolm Campbell (Dorling Kindersley Limited) and Golf Magazine, April 1998, pages 142 to 143.

For use of the device for golf swing bodyweight distribution measurement, information including such data as gender, height, build, weight, golfing handicap, swing tempo, clubhead speed at impact with a driver, club selection, club shaft flex and type of intended stroke (e.g. full power, low trajectory straight ball flight stroke) may be input by the golfer by use of the menu on touch sensitive screen 10 before a golf stroke or practice swing commences. Also, the countdown period and/or start and/or finish time of measurement may be selected. Pressure sensing devices 16 and 17 will measure bodyweight distribution both through the respective feet in general and also in the toe and heel areas of the respective feet. This bodyweight distribution measurement may be chosen to be carried out either in golf ball striking or practice swing mode by choosing from options on the menu on touch sensitive screen 10. Once measurement is complete, the bodyweight distribution measurement data can be displayed on the screen and/or mat via matrix bed of lights 14, and this data may be displayed either on its own or in

conjunction with instructional advice and/or data of an expert golfer or golfers of the closest match to the golfer using the device in terms of the data input by the golfer using the device, using the same club intending to play the same type of stroke for use by the individual using the device to potentially improve his or her bodyweight distribution through the respective feet both at address of the golf ball and during the golf swing.

An example graph of bodyweight distribution of a right handed male golfer during a golf swing playing a golf stroke is shown in Figure 5a, in which the x axis shows the time elapsed. In this graph, also displayed is the bodyweight distribution and transfer information for an expert golfer with the nearest match from a selection of input data including but not limited to gender, height, build, weight, swing tempo, club selection, clubhead speed at impact with a driver and type of stroke. The y axis is a weight distribution ratio scale, with "0% R : 100% L" at one extreme representing a distribution with all the golfer's weight on his left foot, and "100% R : 0% L" at the other extreme representing a distribution with all the golfer's weight on his right foot. Should the individual be using this measurement feature of the device in practice swing mode, there will of course be no golf ball impact indication in the graphs. Should the individual be using the device in golf ball striking mode and should he or she miss the ball, or if the impact of the club with the ball is so faint that the microphone does not detect it, the bodyweight distribution measurement graph for the swing will still be shown, however without the golf ball impact indication. Should the individual using the device not commence his swing at the same time as bodyweight distribution measurement commences, the computer program will provide a best fit curve for the expert golfer's bodyweight distribution curve overlaid on the device user's curve. For example, if the individual using the device commences his swing with a significant delay after the bodyweight distribution measurement has commenced, there will be a significant portion of address-only bodyweight distribution before the swing curve commences. The computer program will recognise this and either remove the address-only portion of the curve and start the device user's and expert golfer's curve in a synchronised form, or else the program can leave the address-only portion in, and best-fit the expert golfer's curve to start after the same or similar delay period.

It can be seen from Figure 5a that the golfer using the device has too much of his bodyweight on his left foot at address of the golf ball and does not transfer enough of his bodyweight to his right foot during the backswing as compared with the expert golfer. At impact of the golf club with the golf ball, the golfer has too much of his bodyweight distribution onto his left foot.

The golfer can, if so desired, repeat his or her golf swing and use the graphs as a training device for improving bodyweight distributions and transfers during his or her address position and/or golf swing. The results can be printed and/or saved for future reference.

The golfer has means, optionally, via touch sensitive screen 10, to set the x axis to bodyweight distribution instead, so that the graph can more easily be interpreted whereby bodyweight distribution information is from left to right, as per a golfer's feet during the golf ball address and swing. The swing results shown in Figure 5a are shown in this axis form in Figure 5b. Additional information can be marked on the graph, for example to clarify which part represent the address, which part represents the backswing, which part represents the foreswing, which part represents the moment of impact, and which part represents the follow through.

Once this graph is displayed, automated instruction can be provided by the device as to what aspects of his or her bodyweight distribution and/or transfers can be improved to be the same as or more like that or those of an expert golfer with an ideally balanced golf swing. This instruction can be in the form of text on the screen and/or a computer generated voice and/or arrows and/or animation on the graph and/or display of an instructional video, or by some other similar means. For the golf swing made by the golfer using the device producing the graph shown in Figure 5b, an example of a text-based instruction post-swing is shown in Figure 5c. The arrows and/or instructional text and/or graphs shown in Figure 5c can be flashing to attract the attention of the individual using the device.

It will be noted that a young or inexperienced golfer using the system may try to effect a transfer of bodyweight onto his or her rear foot, relative to the target, during the backswing and/or forward foot relative to the target during the foreswing by a swaying motion. This type of weight transfer can be detected by the training device, and immediate guidance and instruction can be provided to the golfer. Referring to Figure 6, there is seen a diagram of a guidance element of the system, for example located on the face of the pedestal 19 and/or provided on the screen 10, conveniently facing the golfer, which is an instructional diagram explaining to the golfer in simple terms the correct and incorrect means of transferring bodyweight during the golf swing. Such a guidance element explains to the golfer that the correct motion is to transfer bodyweight during the backswing by a turning motion of the shoulders and upper body (the so-called coil), and the incorrect motion during the backswing is via a swaying motion of the hips and upper body, with reduced or no turn of the shoulder and upper body (less coil). The training device is therefore able to offer specific advice to the golfer tailored according to the golfer's actual swing as determined from the measurements taken. The device can also tailor the advice based on the golfer's data, for example so that different advice can be offered according to the golfer's experience, gender, age or handicap.

The golfer, when using the device in golf ball striking mode, can also select the option (for example via touch sensitive screen 10) to have further measurement taken and displayed during the time around impact of the golf club with the golf ball. In addition to, or instead of the above diagrams and graphs, an arrow representation can be provided showing the golfer's measured bodyweight distribution and/or transfer between the right toe area, right heel area, left toe area and left heel area in a short period of time prior to, during, and after the moment of impact of the golf club with the golf ball during the golfer's swing. The moment of impact is known from the sound detected by microphone 18. Should the individual using the device in this mode miss the golf ball, or if the impact of the club with the ball is so faint that the microphone does not detect it, during the measurement period, the device may not be able to provide an accurate impact area measurement. The device may notify the individual of this via text on the screen, computer generated voice or some other means, in which case it may instruct him or her to attempt another stroke if so desired.

Figure 7a shows an example arrow representation of a golfer using the device in this mode together with an expert golfer. It will be seen in this example in Figure 7a that the right-handed golfer using the device, in the short period just prior to, during and just after the moment of impact, as compared to the expert right-handed golfer, has initiated the general transfer of bodyweight from his right side correctly (since the arrow for the golfer using the device starts from the same place as the arrow for the expert golfer), and generally from his right foot to his left foot to the correct degree (since the arrow for the golfer using the device is of the same width and length as the expert golfer), however he has transferred too much of his bodyweight onto his left toe area (as also indicated by the arrow), rather than onto the left heel area, as was done by the expert golfer. It can be seen that the expert golfer has transferred his bodyweight from his right foot (with the bodyweight distribution in the right foot being roughly equal across the heel and toe areas) towards the left foot, and more specifically to a bodyweight distribution across the left foot biased towards the heel area. Figure 7b shows the same data as shown in Figure 7a but with instruction.

Figure 7c shows another example arrow representation of a golfer using the device in this mode together with an expert golfer. This representation is for the same golf stroke as was used to generate the graphs in Figures 5a, 5b and 5c. It will be seen in this example in Figure 7c that the right-handed golfer using the device, in the short period just prior to, during and just after the moment of impact, as compared to the expert right-handed golfer, has initiated the general transfer of bodyweight with too much of his bodyweight on his left side (and consequently not enough bodyweight on his right side), since the arrow for the golfer using the device starts at a point well to the left of the right foot. Also, since the arrow for the golfer using the device is fatter and ends further left than for the expert golfer, the golfer's general bodyweight distribution is further to the left. Additionally, as also indicated by the arrow, the golfer transferred too much of his bodyweight onto his left toe area, rather than onto the left heel area, as was done by the expert golfer. Figure 7d shows the same data as shown in Figure 7c but with instruction.

In a similar fashion to the instruction given by the device to the golfer shown in Figure 5c, arrows, text and/or a computer generated voice or similar can instruct the golfer using the device how to improve his bodyweight distribution and/or transfer during the time around the impact of the golf club with the golf ball. Examples of this are shown in Figure 7b, Figure 7d, Figures 8b and Figure 8c. The text, arrows, and/or instructional arrow can be flashing to attract the attention of the individual using the device.

In another example, Figure 8c shows a graph for the entire swing and arrows for the impact area made by a right-handed golfer striking a golf ball using the device, in which a swing with a so-called "reverse- pivot" is used, i.e. bodyweight is transferred onto the forward foot (the left foot) relative to the target during the backswing and onto the rear foot (the right foot) relative to the target during the foreswing. Figure 8c also shows an example of instruction given to the golfer.

As described above, a device is provided for indicating optimal clubface alignment and positioning and foot placement positions and angles for a wide range of golfers to make practice swings and play golf strokes using a wide range of golf clubs and training aids or clubs. The device also measures and indicates to the golfer optimal bodyweight distribution and bodyweight transfers during the address position and golf swing. The system comprises a base unit containing a matrix bed of lights, beneath a transparent or semi-transparent mat, which illuminate to form a line behind the golf ball to indicate correct clubface alignment and positioning and footprint-shaped sets of lights to indicate optimal foot placement positions and angles. The information given by the lighting depends on data entered into the computer by the golfer including gender, height, build, right or left handedness, shoe size, club selection and type of stroke to be played, as well as the position of the golf ball on one of the golf ball striking areas or tees of the mat, which can be either from a known or selected fixed position or else the golf ball position can be elucidated by a weight sensor. Also, two force transducers, each with heel and toe components, beneath the mat measure bodyweight distribution and transfers between the respective feet during address of the golf ball and all of the swing. Graphs of bodyweight distribution and transfer information of ideally balanced expert

golfers playing golf strokes using a range of golf clubs using a range of swing tempos and playing a range of types of golf strokes are provided for use by the golfer in comparing with his or her data for use in training his or her golf swing. Also measured and displayed are the bodyweight distribution through the right toe area, right heel area, left toe area and left heel area at the address position and also bodyweight distribution and transfer through the right toe area, right heel area, left toe area and left heel area through the impact area for the individual using the device as well as a range of expert golfers using a range of golf clubs. Instruction is given by the device to highlight to the golfer what he or she needs to do with his or her bodyweight distribution and transfers in general between the two feet during his or her full swing and also between the toe and heel areas of his or her two feet during both the address position and the impact area in order to be more like an ideally balanced expert golfer. Variations and modifications of this are described above.

The functionality of the computer 13 (or similar calculating or operating device) described above can be implemented in hardware or software, or a combination thereof. A program for use in directing the computer can be stored on a computer-readable medium or could, for example, be embodied in a signal such as a downloadable data signal provided from an Internet website. The appended claims are to be interpreted as covering a computer or operating program by itself, or as a record on a carrier, or as a signal, or in any other form.

It should be noted that the appended claims are also intended to cover a device used in the practice swing mode described above in which no actual ball is employed during use, either at address or during the stroke.

It will be appreciated that embodiments of the present invention have been described specifically in relation to a golf training aid. It is also possible that the same or equivalent principles are applied to provide a training aid for use with other sports. For example, the principles can be applied to provide a training aid for improving a snooker player's stance, or for improving the stance and weight distribution of a baseball/softball pitcher.

Claims:

1. A golf training device for improving a user's address of a golf ball, comprising:

input means for inputting influence data comprising information which might affect how the user should address the ball;

calculation means for calculating address data, based on the input influence data, specifying one or more aspects of an appropriate address for the user; and

indication means for indicating address information to the user, based on the calculated address data, the information relating to how the user should address the ball.

2. A golf training device as claimed in claim 1, wherein the calculation means calculate the address data based on pre-collected influence data and associated address data for a reference golfer or golfers.

3. A golf training device as claimed in claim 2, wherein the calculation means use an algorithm derived from the pre-collected data.

4. A golf training device as claimed in claim 2 or 3, wherein the calculation means use a store of such pre-collected data, selecting the closest match from the store based on the input influence data and using the associated address data for the closest match.

5. A golf training device as claimed in any preceding claim, wherein the address data comprises information relating to the user's stance at address.

6. A golf training device as claimed in claim 5, wherein the address data comprises information relating to the placement of the user's feet in relation to each other and to the ball.

7. A golf training device as claimed in claim 6, wherein the address data comprises information relating to positions and angles of the user's feet.

8. A golf training device as claimed in claim 6 or 7, wherein the address data comprises information relating to the position of the ball.

9. A golf training device as claimed in claim 6, 7 or 8, wherein the address data comprises information relating to the distance between the ball and the user's feet.

10. A golf training device as claimed in any preceding claim, wherein the address data comprises information relating to the clubface placement in relation to the ball.

11. A golf training device as claimed in claim 10, wherein the address data comprises information relating to alignment of the clubface.

12. A golf training device as claimed in any preceding claim, wherein the influence data comprises one or more of the following items of information: gender; age; height; weight; build; race; neck size; shoulder width; waist size; chest size; shoe size; inside leg measurement; distance from tips of fingers to floor when standing fully erect with arms hanging by the side; right or left-handedness; club selection for the stroke to be played; length of club for the stroke to be played; lie of the club for the stroke to be played; strength of the stroke to be played; intended golf ball flight of the stroke to be played; golfing experience; golfing handicap; and manufacturer and model of club for stroke to be played.

13. A golf training device as claimed in any preceding claim, further comprising a playing surface on which the user and ball are positioned at address.

14. A golf training device as claimed in claim 13, wherein the indication means are operable to indicate the address information to the user by illuminating a part or parts of the playing surface.

15. A golf training device as claimed in claim 14, when dependent on claim 6, wherein the indication means are operable to illuminate parts of the playing surface that specify the user's feet placement for the address.

16. A golf training device as claimed in claim 14, when dependent on claim 6, or claim 15, wherein the indication means are operable to illuminate a part of the playing surface that specifies the ball placement for address.

17. A golf training device as claimed in claim 14, 15 or 16, wherein the indication means comprise an array of light-emitting devices beneath the playing surface that are selectively illuminated to indicate the address information to the user.

18. A golf training device as claimed in any preceding claim, further comprising means for detecting the position of the ball.

19. A golf training device as claimed in any preceding claim, further comprising means for detecting the positions of the user's feet.

20. A golf training device as claimed in claim 18 or 19, when dependent on claim 13, wherein the detecting means comprise a pressure-responsive device beneath the playing surface.

21. A golf training device as claimed in any preceding claim, wherein the indication means are operable to indicate the address information relating to a stroke after the user has completed that stroke.

22. A golf training device as claimed in any preceding claim, wherein the input means comprise a device for receiving an electronic data tag holding the influence data.

23. A golf training device as claimed in any preceding claim, wherein the input means comprise a touch-sensitive screen.

24. A golf training device as claimed in any preceding claim, further comprising measurement means for providing a bodyweight distribution measurement.

25. A golf training device as claimed in claim 24, wherein the indication means are operable to provide an automated instructional indication to the user involving a comparison of the bodyweight distribution measurement at address against a corresponding ideal bodyweight distribution.

26. A golf training device for improving a user's weight distribution during a golf stroke, comprising:

measurement means for providing a time series of bodyweight distribution measurements during a predetermined period of the stroke;

storage means for storing the time series of measurements;

indication means for providing an automated instructional indication to the user after completion of the stroke involving a comparison of at least part of the stored time series of measurements against a corresponding ideal bodyweight distribution.

27. A golf training device as claimed in claim 26, wherein the predetermined period at least includes address of the ball.

28. A golf training device as claimed in claim 26 or 27, wherein the predetermined period at least includes address of the ball and impact of the ball.

29. A golf training device as claimed in claim 26, 27 or 28, wherein the predetermined period at least includes the follow-through.

30. A golf training device as claimed in any one of claims 26 to 29, wherein the indication means comprise a display device for displaying the instructional indication.

31. A golf training device as claimed in claim 30, wherein the instructional indication comprises a plot of the measured bodyweight distribution of the user together with a plot of the ideal bodyweight distribution.

32. A golf training device as claimed in any one of claims 26 to 31, further comprising calculation means for determining differences between the measured bodyweight distribution and the ideal bodyweight distribution.

33. A golf training device as claimed in claim 32, wherein the instructional indication comprises advice relating to how the user should change his or her address and/or swing to reduce the determined differences.

34. A golf training device as claimed in any one of claims 26 to 33, wherein the measurement means are operable to measure bodyweight distribution between the heel

end and toe end of one or both of the user's feet as well as bodyweight distribution between respective feet.

35. A golf training device as claimed in claim 34, when dependent on claim 30, wherein the instructional indication comprises a graphical representation based on the measured change in bodyweight distribution between the respective feet and between heel end and toe end of both feet during a predetermined short period of the stroke together with a graphical representation of the ideal change in bodyweight distribution between for that short period.

36. A golf training device as claimed in claim 35, wherein the graphical representation is in the form of an arrow.

37. A golf training device as claimed in claim 35 or 36, wherein the predetermined short period includes the moment of impact with the ball.

38. A golf training device as claimed in claim 37, further comprising means for detecting the moment of impact.

39. A golf training device as claimed in claim 38, wherein said detecting means comprise a microphone.

40. A golf training device as claimed in any one of claims 26 to 39, further comprising a playing surface on which the user and ball are positioned.

41. A golf training device as claimed in claim 40, wherein the measurement means are located beneath the playing surface.

42. A golf training device as claimed in any one of claims 26 to 41, wherein the measurement means comprise one or more pressure-sensitive devices.

43. A golf training device as claimed in any one of claims 26 to 42, further comprising input means for inputting influence data comprising information which

might affect the user's weight distribution, and wherein the instructional indication is provided by the indication means in dependence on the input influence data.

44. A golf training device as claimed in any one of claims 26 to 43, wherein the ideal bodyweight distribution is based on pre-collected bodyweight distribution data for a reference golfer or golfers.

45. A golf training device as claimed in claim 44, wherein the indication means use an algorithm derived from the pre-collected data to determine the ideal bodyweight distribution.

46. A golf training device as claimed in claim 45, when dependent on claim 43, wherein the indication means use a store of such pre-collected data, selecting the closest match from the store based on the input influence data and using the bodyweight distribution for the closest match.

47. A golf training device as claimed in any one of claims 26 to 46, wherein the predetermined period at least includes address of the ball and the indication means are operable to provide an automated instructional indication to the user involving a comparison of a single one of the stored time series of measurements during the address, or an average measure relating to a plurality of the stored time series of measurements during the address, against a corresponding ideal bodyweight distribution.

48. A golf training device as claimed in any preceding claim, operable in a practice swing mode in which no ball is used during the address and/or the stroke.

49. An operating program which, when loaded into a device, causes the device to become one as claimed in any preceding claim.

50. An operating program as claimed in claim 49, carried on a carrier medium.

51. An operating program as claimed in claim 50, wherein the carrier medium is a transmission medium.

52. An operating program as claimed in claim 50, wherein the carrier medium is a storage medium.

53. A method of providing golf training, comprising directing a person to use a device as claimed in any one of claims 1 to 48.

54. A golf training device substantially as hereinbefore described with reference to the accompanying drawings.

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Application No: GB0420080.4 **Examiner:** Roland Whaite

Claims searched: 1 and 26, at least **Date of search:** 5 January 2005

Patents Act 1977: Search Report under Section 17

Documents considered to be relevant:

Category	Relevant to claims	Identity of document and passage or figure of particular relevance
Y	1, 5-15	JP07051421 A SUGINO MACH LTD... see English language abstract in PAJ database
Y	1, 2, 4, 5, 6, 9, 10	US 4891748 A MANN.... see especially column 6, lines 51 to 68; column 34, lines 43 to 52 with Fig 19A
Y	1, 5	US 6533675 A FUNK..... see especially column 4, lines 25 to 28, column 9, lines 2 to 10 and lines 42 to 62
Y	26 to 30, 32, 40	US 6567536 A McNITT et al/GOLFTEC..... see especially passage bridging columns 11 and 12 and column 14, lines 36 to 64 in association with measurements shown on screen display of Figure 8
Y	26 to 30, 32 and 40	EP 0447712 A OH-YOH KK..... see especially page 3,lines 20 to 24 and page 10, lines 32 to 39

Categories:

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
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The following online and other databases have been used in the preparation of this search report

Online: EPODOC JAPIO WPI