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3,463,593

CUE BALL ANGLE COMPUTER INCLUDING A CURVED MIRROR FOR
INDICATING AN IMPACT POINT

Filed April 6, 1966

2 Sheets-Sheet 1

FIG. 1

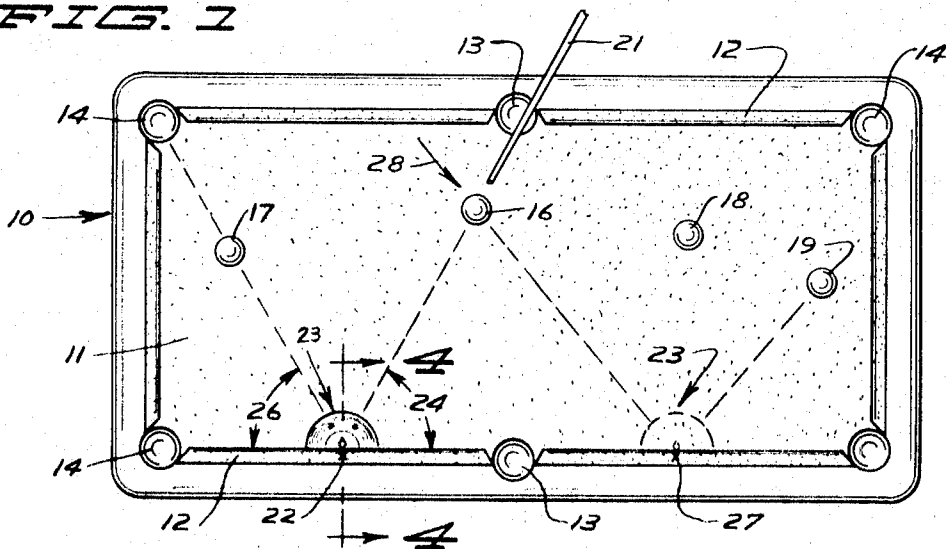


FIG. 2

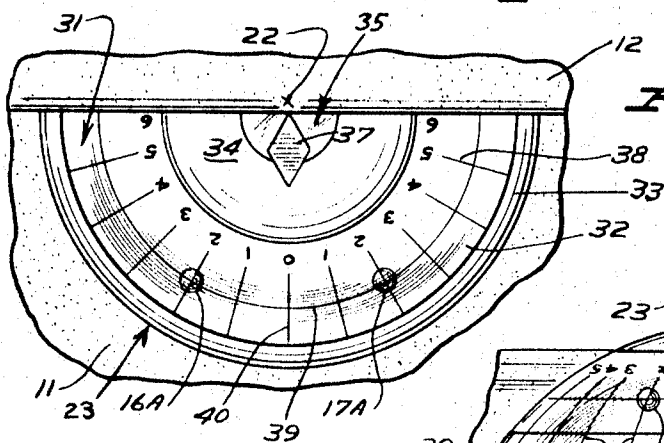


FIG. 3

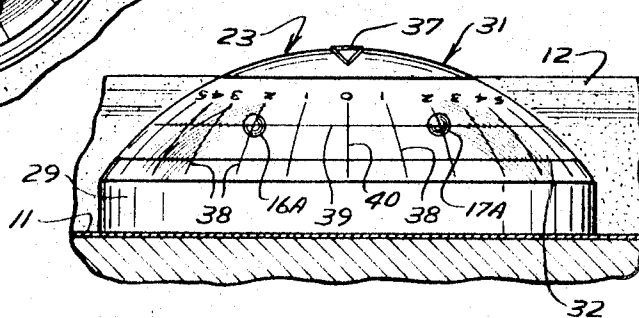
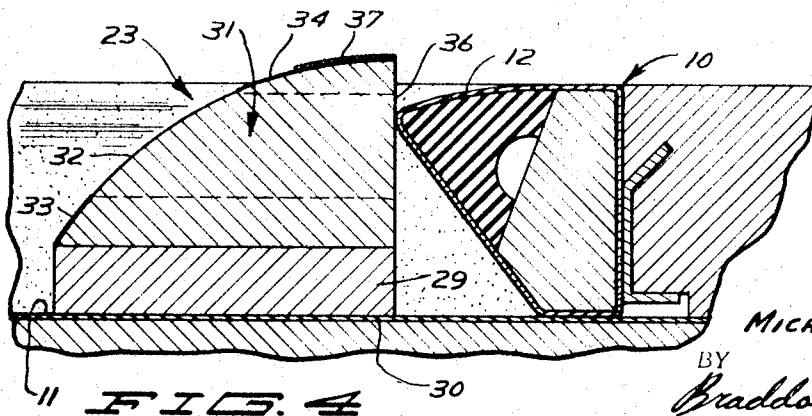


FIG. 4

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FIG. 5

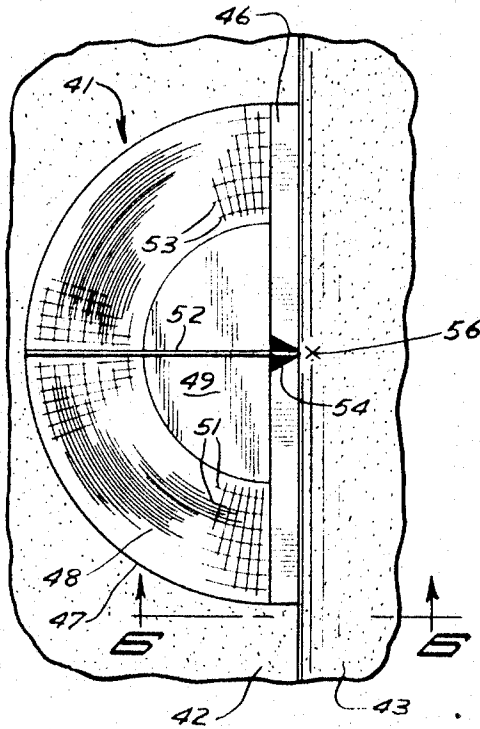
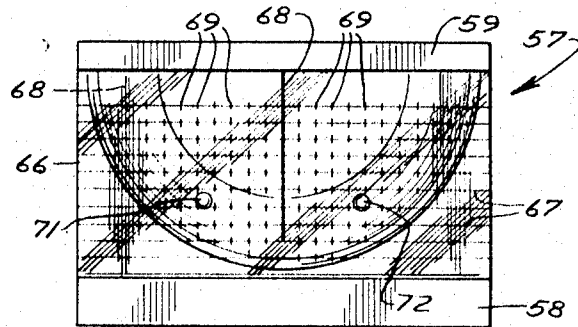


FIG. 7

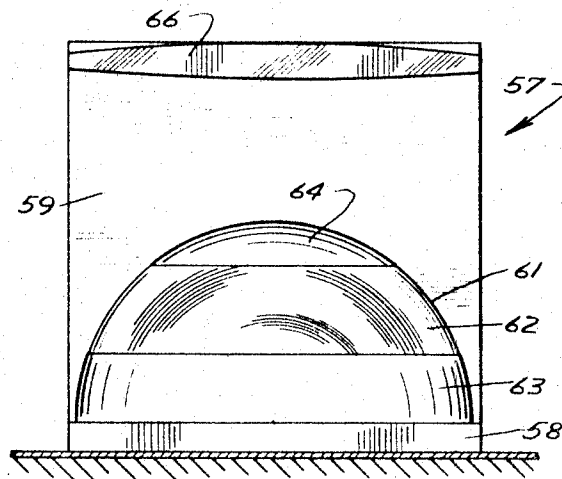


FIG. 8

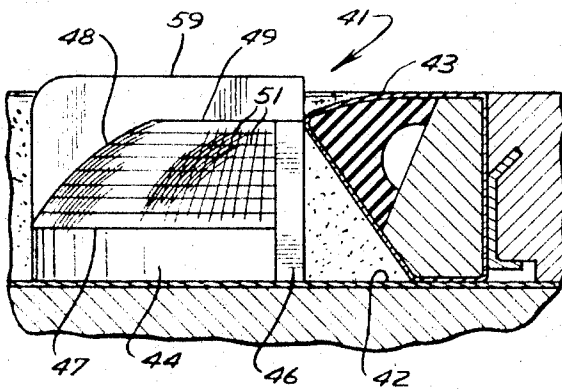


FIG. 6

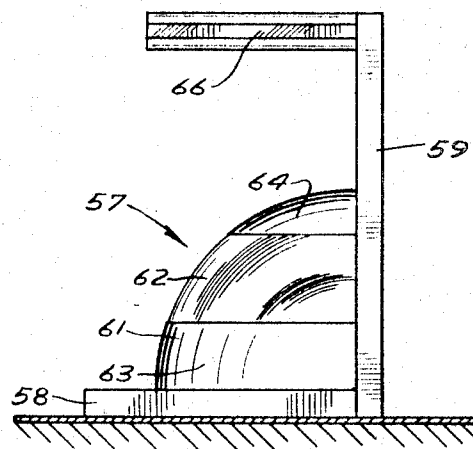


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CUE BALL ANGLE COMPUTER INCLUDING A CURVED MIRROR FOR INDICATING AN IMPACT POINT

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7 Claims

ABSTRACT OF THE DISCLOSURE

A cue ball angle computer for locating an impact point on a pool table cushion rail for a cue ball. The computer has a one-half hemispherical shaped mirror which reflects a diverging image of the entire top of a pool table. Indicia lines divide the reflecting surface of the mirror on opposite sides of a vertical plane bisecting the mirror. When the cue ball and selected ball angle of incidence and the angle of reflection are equal, a pointer on the computer will indicate a point on the cushion rail which the cue ball must hit in order to hit the selected ball.

This invention relates to a device for indicating the point of impact of a cue ball on a cushion rail which the cue ball must strike to hit a selected ball. More particularly the invention is a cue ball angle computer used to accurately locate a point on a pool table cushion rail which the cue ball must hit to complete a successful bank shot or determine if it is impossible to perform a bank shot from a cushion rail.

It is known that a cue ball, when hit dead center with a cue, will always rebound from a cushion rail at precisely the same angle to the rail as the cue ball entered the cushion rail. This physical phenomenon is identical to the light reflection law wherein the angle of incidence is equal to the angle of reflection. The angle computer of this invention utilizes the light reflection law to accurately locate the point on the pool table cushion rail which must be hit by a cue ball in order to complete a successful bank shot.

Briefly described, the cue ball angle computer comprises a base having a substantially flat surface used to horizontally position the computer on the horizontal playing surface of a billiard table. Projected upwardly from one side of the base is an upright flat surface adapted to engage the horizontal edge of a cushion rail longitudinally locating the computer along the rail. A convex light reflecting means mounted on the base projects forwardly from the upright surface to produce a diverging image of the entire pool table surface. The light reflecting means is one-half of a hemispherical shape mirror having a convex curved shape in vertical cross section which reflects a diverging image of the entire pool table surface from any location on the cushion rail. Location lines are used in conjunction with light reflecting means to provide a visual index indication of the cue ball relative to the other balls on the table. The location lines are appropriately identified to accurately equate the angles between cushion rail and cue ball image and the cushion rail and the selected ball image. When these angles are equal a pointer on the computer will indicate the point on the cushion rail which the cue ball must hit in order to hit the selected ball. If another ball is viewed in the light reflecting means between the cue ball and the ball desired to be hit, it is impossible to hit the first ball with a bank shot from the particular cushion rail. The computer can be used to determine if additional bank shots are available from any of the other three cushion rails.

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In the drawings:

FIGURE 1 is a plan view of a billiard table showing the cue ball angle computer of this invention used to determine the point of impact of a cue ball on the cushion rail which the cue ball must strike to hit a selected ball;

FIGURE 2 is an enlarged plan view of the cue ball angle computer of FIGURE 1 showing the images of the cue ball and the ball selected to be hit by the cue ball;

FIGURE 3 is a front elevational view of the angle computer of FIGURE 2;

FIGURE 4 is an enlarged sectional view taken along the line 4-4 of FIGURE 1, looking in the direction of the arrows;

FIGURE 5 is a top plan view of a modification of the cue ball angle computer of this invention;

FIGURE 6 is a sectional view taken along the line 6-6 of FIGURE 5;

FIGURE 7 is a top plan view of a further modification of the cue ball angle computer of this invention;

FIGURE 8 is a front elevational view of the angle computer of FIGURE 7; and

FIGURE 9 is a side elevational view of the angle computer of FIGURE 7.

Referring to FIGURE 1 of the drawing, there is a table indicated generally at 10 shown as a conventional billiard table having a rectangular, flat and horizontal top surface 11 and upright cushion rails 12 located around the periphery of top surface 11. Side pockets 13 equally separate each of the side cushion rails. Corner pockets 14 are located in each corner of the table. Table 10 may be a billiard table, pool table, bumper pool table or like tables used in playing the games of billiards, pool and the like.

Positioned on playing surface 11 is a cue ball 16 separated from a first ball 17, a second ball 18, and a third ball 19. Cue 21 is in position to strike cue ball 16 impelling it toward side cushion rail 12 at an impact point 22 to complete a bank shot to strike first ball 17 as indicated by the broken line paths of movement of cue ball 16. To accomplish this shot cue ball 16 must strike cushion rail 12 at point 22. This point is usually determined by a sight calculation with reference to white diamond markings on the top of the cushion rail of the angle of movement of the cue ball toward side rail 12 and equal angle of movement of the cue ball away from side rail 12.

The angle computer of this invention, indicated generally at 23, is used to accurately determine point 22 so that the cue ball 16 will rebound from cushion rail 12 and hit first ball 17 thereby completing a successful bank shot. Under these circumstances the angle of incidence 24 is equal to the angle of reflection 26.

To determine the impact point 27 on cushion rail 12 which cue ball 16 must strike in order to hit third ball 19, computer 23 is moved along cushion rail 12 to a new position as shown in broken lines until the cue ball 16 is angularly aligned with third ball 19. At this position balls 16 and 19 are visible at complementary locations on the computer. When cue ball 16 is hit dead center with the cue, as indicated by arrow 28, cue ball 16 will strike point of impact 27, rebound from cushion rail 12 and strike third ball 19 as shown in broken lines.

Referring to FIGURES 2, 3 and 4, angle computer 23 is located on top surface 11 adjacent cushion rail 12 with the image 16A of cue ball 16 and the corresponding image 17A of first ball 17 shown in broken lines at complementary portions of the computer. At this location the computer indicates impact point 22 which cue ball 16 must strike in order to rebound off cushion rail 12 and strike first ball 17. The computer 23 comprises a semicircular flat base 29 having a flat bottom 30 positioned on the

horizontal top surface 11 of table 10. Secured to the top of base 29 is a segment of a sphere indicated generally at 31 having a light reflecting mirror surface 32 of a general convex shape. Surface 32 in plane (FIGURE 2) has a semicircular or one-half hemispherical outline and in transverse section (FIGURE 4) a convex curvature. A non-reflecting horizontal band 33 is located below the light reflecting surface. A similar semi-circular non-reflecting top band 34 located above surface 32 separates surface 32 from a top light reflecting surface 35. The non-reflective surfaces may be black to provide maximum contrast with light reflecting surface 32. Surface 32 may be a polished metal, plated metal reflector glass or plastic material having the characteristics of a convex mirror. Spherical segment 31 and base 29 have a common upright back wall 36 positioned in a plane normal to flat bottom 30. Wall 36 engages the horizontal edge of cushion rail 12 along a linear line positioning the vertical plane bisecting the segment 31 substantially normal to cushion rail 12 so that the light reflecting surface 32 extends 180° about any given point on the cushion rail.

As shown in FIGURE 2, non-reflective surface 34 and light reflective surface 35 supports an indicator 37 located with a longitudinal axis in the vertical bisecting plane of spherical segment 31. Indicator 37 has a diamond shape and a color, as green, which contrasts with the black color of non-reflective surface 34.

Light reflecting mirror surface 32 is equally divided with circumferentially spaced radial lines 38 and concentric semicircular lines 39 forming a polar coordinate locating system. Zero radial line 40 is located in the vertical plane bisecting spherical segment 31. Each radial line numbered consecutively on opposite sides of zero radial line 40 indicate vertical plane which intersect at the forward point of indicator 37 which is substantially coincident to impact point 22 on cushion rail 12.

Referring to FIGURES 5 and 6, there is shown a modification of the cue ball angle computer of this invention indicated generally at 41 positioned on horizontal top surface 42 of a pool table having an upright cushion rail 43. Computer 41 has a flat semicircular shape base 44 attached to an upright flat back 46. The bottom surface of base 44 is flat and located normal to a flat outside surface of back 46. Back 46 has a horizontal top positioned generally in the horizontal plane of the inwardly directed horizontal edge of cushion rail 43.

Secured to the top of base 44 is a member 47 having a light reflecting mirror surface 48 which is semicircular in horizontal outline and has a convex shape in vertical cross section. Member 47 has a flat top surface 49 in alignment with the top of back 46. Surface 49 is coated with a light absorbing material, as black paint. Light reflecting mirror surface 48 has circumferentially spaced radial location lines 51 dividing the spherical surface into a plurality of radial segments on opposite sides of an upright rib or fin 52 secured to semicircular member 47 along the vertical plane bisecting light reflecting surface 48. The radial location lines 51 intersect with a plurality of concentric and semicircular indicator lines 53 forming a polar coordinate locating system. Lines 51 and 53 may be etched onto the light reflective surface 48. An indicator 54 in the shape of an arrowhead mounted on the top of the back 46 adjacent opposite sides of the rib 52 provides a visual indicator showing impact point 56 on cushion rail 43 which must be hit by the cue ball to complete a successful bank shot.

Referring to FIGURES 7, 8 and 9 there is shown a further modification of the cue ball angle computer of this invention indicated generally at 57 for determining the point of impact that a cue ball must hit in order to complete a successful bank shot. Angle computer 57 comprises a rectangular flat base 58 secured to a flat upright back 59. Base 58 has a flat bottom surface located normal to the flat outside face of back 59. Base 58 and back 59 form an L-shaped support for a spherical segment 61

mounted on base 58 in engagement with back 59. Spherical segment 61 is one-quarter of a sphere, as a metal ball, having a one-half hemispherical convex light reflecting mirror surface 62 located in a horizontal band above base 58. A non-light reflective surface 63 in the form of a band is located on the sphere below surface 62. In a similar manner a non-light reflective surface 64 covers the top of spherical segments 61.

As shown in FIGURES 8 and 9, back 59 projects upwardly from the top of spherical segments 61 and carries a horizontally disposed viewing lens 66 located above mirror surface 62. Lens 66 is a double convex lens which magnifies the images on the light reflective surface or convex mirror 62. Lens 66 may be flat. As shown in FIGURE 7, lens 66 has parallel grid lines 67 extended longitudinally of the lens in vertical planes which bisect the vertical plane bisecting spherical segment 61. Lens 66 has a heavy center line 68 indicating the vertical plane which bisects spherical segment 61. Located on opposite sides of center line 68 are a plurality of equally spaced broken lines 69 which intersect longitudinal lines 67 to provide a rectangular coordinate system covering the semicircular light reflecting mirror surface 62.

Longitudinal lines 67 are used in conjunction with the transverse lines 69 to accurately align the images of balls 71 and 72 to complementary locations on opposite sectors of the light reflective mirror surface 62 to precisely determine the impact point which the cue ball must strike the cushion rail in order to complete a bank shot at a selected ball.

In use, the cue ball angle computer is placed on the playing surface 11 of the table with the upright back wall 36 in linear engagement with the cushion rail 12. The computer is viewed from above to locate the cue ball image as well as the entire playing surface showing the location of all the balls on the table. In viewing the computer from above when a portion of the viewers image can be seen in light reflective surface 35 on opposite sides of indicator 37 the viewer is in correct alignment for sighting the cue ball and the ball selected to be hit with the cue ball. After the cue ball has been located and the ball selected to be hit, for example, ball 17, the computer is moved along the cushion rail to the right or the left until the images of cue ball 16A and ball 17A are located on opposite sides of the bisecting line 40 at the same numerical grid location shown as number 2 in FIGURE 3. The forward end of diamond indicator 37 points to the location of impact point 22 on cushion rail 12 which cue ball 16 must hit for it to rebound into ball 17 as shown in broken lines in FIGURE 1.

In viewing mirror surface 32 of the computer from above, all other balls are visible. In the event that a ball is between cue ball 16 and selected ball 17 it is impossible to strike ball 17 and because at least one non-selected ball is in the rolling path of the cue ball. Under these playing conditions it is impossible to make the bank shot from the selected cushion rail. One of the remaining three cushion rails must be used to perfect a bank shot at the selected ball. The angle computer is used with any of the other three cushion rails to determine if there is a bank shot available to strike the selected ball with the cue ball.

In the modified cue ball angle computer 57, shown in FIGURES 7, 8 and 9, spherical light reflecting mirror surface 62 is viewed through the lens 66 providing a visual indication of the entire table and of all the balls located on the table. Computer 57 is moved along the cushion rail from left to right until the cue ball and the selected ball are located on opposite sides of the center line 68 as well as along the same grid line 67. The end of the center line will indicate the exact impact point on the cushion rail that the cue ball must hit so that the cue ball will rebound into the selected ball.

Various omissions, changes in form and details of the cue ball angle computer, as illustrated, and described in

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the preferred embodiments, may be made by those skilled in the art without departing from the invention as defined in the following claims.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A computer for indicating an impact point on a cushion rail of a pool table that a cue ball must hit to complete a bank shot at a selected ball comprising: light reflecting mirror means showing an image of the entire pool table, said mirror means having aligning means engageable with a cushion rail for aligning the mirror means with said cushion rail and a generally convex curved reflector surface symmetrical about the aligning means, said reflector surface being symmetrical about and bisected with a vertical plane, said aligning means when located in engagement with a cushion rail positions the vertical plane normal to the cushion rail whereby the impact point on the cushion rail is indicated when the images of the cue ball and the selected ball are in corresponding locations on the reflector surface on opposite sides of the vertical plane.

2. The computer defined in claim 1 wherein said reflector surface is one-half of a hemisphere.

3. The computer defined in claim 1 including a base having a means to horizontally position the computer on the playing surface of a pool table, said light reflecting mirror means being mounted on said base.

4. The computer of claim 1 including magnification

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viewing lens means located over said light reflecting mirror means and means supporting said lens means over said mirror means.

5. The computer defined in claim 1 including location line means dividing the reflector surface into substantially equal areas to accurately determine the corresponding locations of the cue ball image and selected ball image.

6. The computer defined in claim 5 wherein said location line means are on the reflector surface in a polar coordinate arrangement.

7. The computer defined in claim 1 wherein the reflector surface is a horizontal curved band extended from a vertical surface engageable with a cushion rail of a pool table and a base supporting the mirror means, said base having a horizontal flat bottom.

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