March 14, 1967 P. H. KNOTT 3,309,088

BUBBLE PIN BALL GAME

Filed Feb. 12, 1965 4 Sheets-Sheet 1

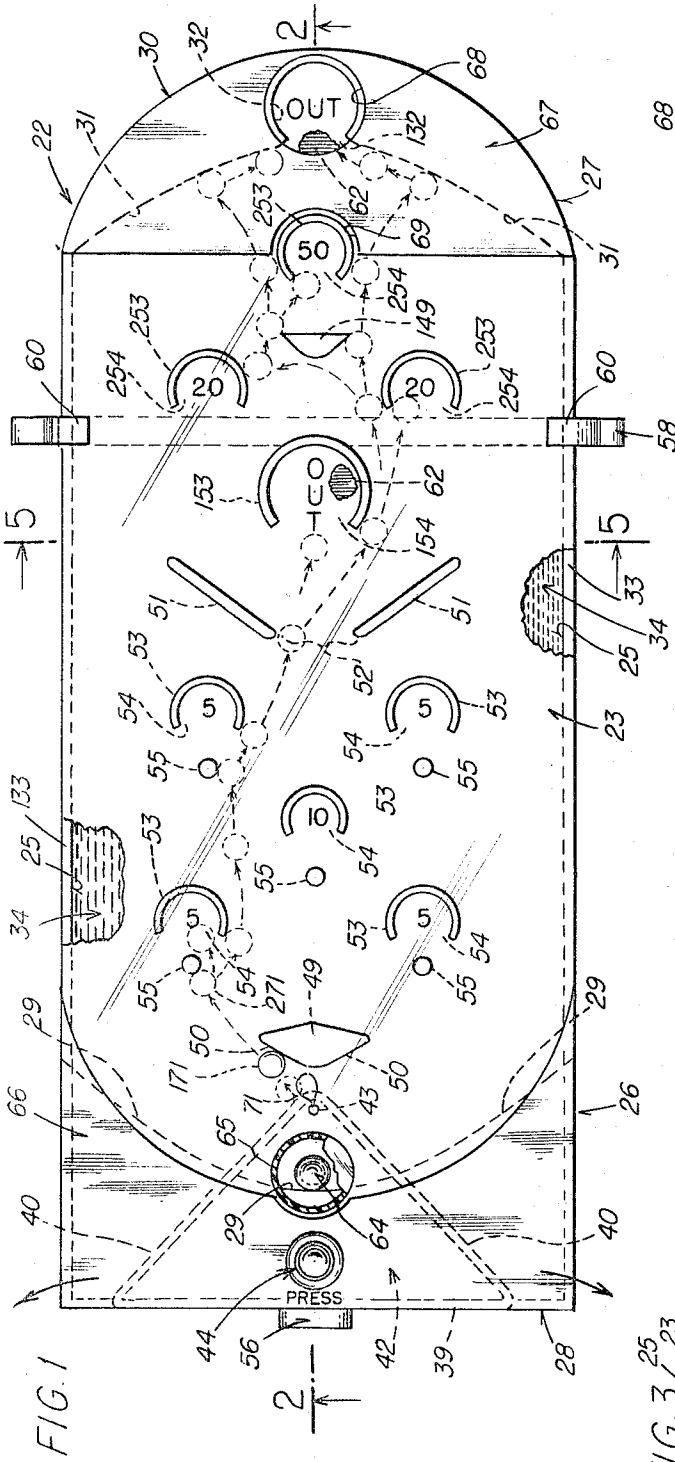

FIG. 1

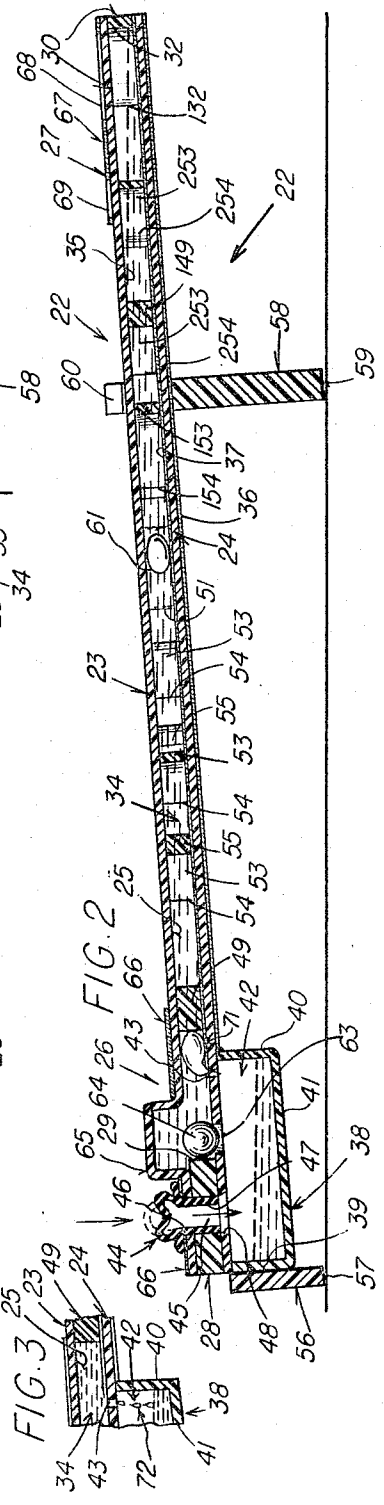

FIG. 2

FIG. 3

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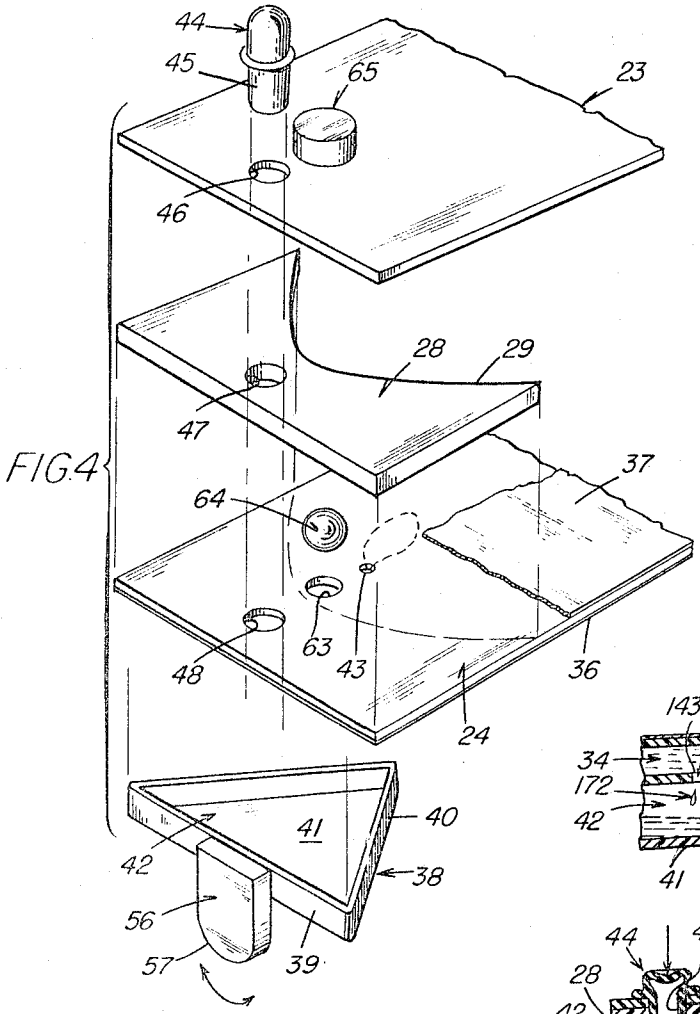

FIG. 4

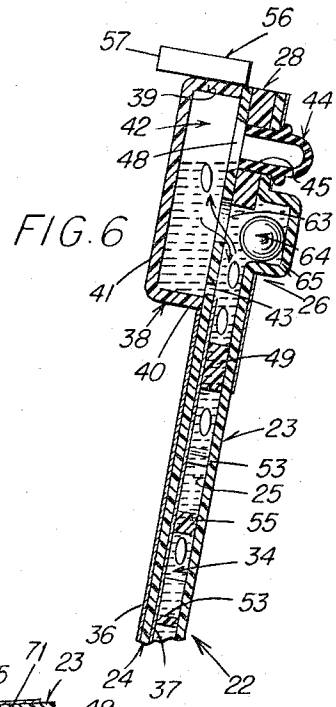

FIG. 6

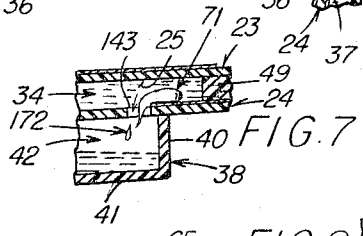

FIG. 7

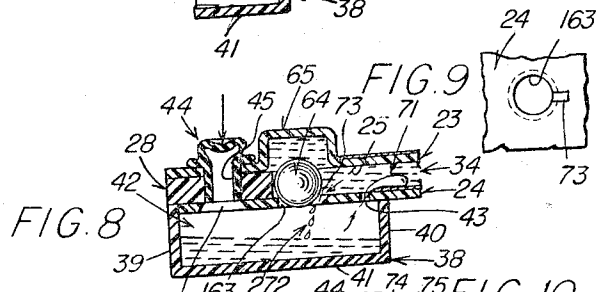

FIG. 8

FIG. 9

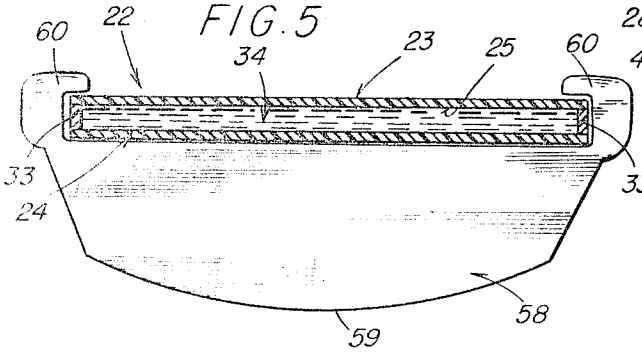

FIG. 5

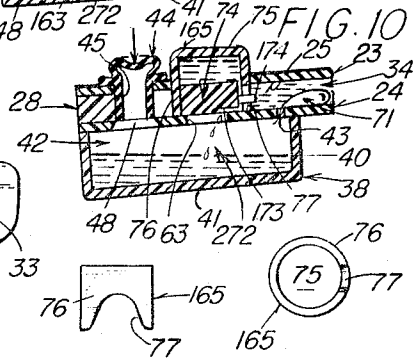

FIG. 10

FIG. 11

FIG. 12

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FIG. 15

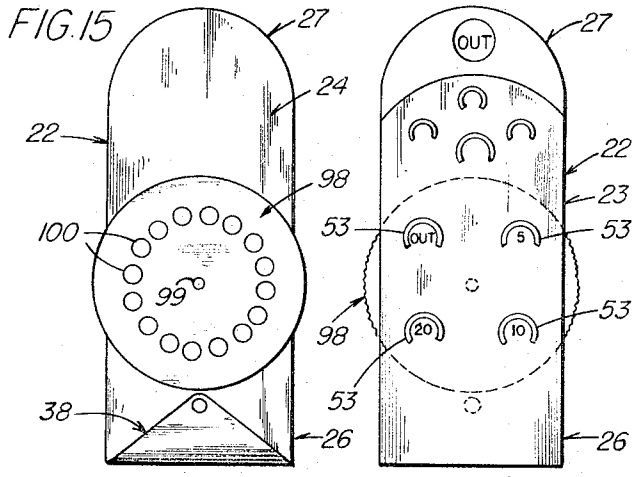

FIG. 13

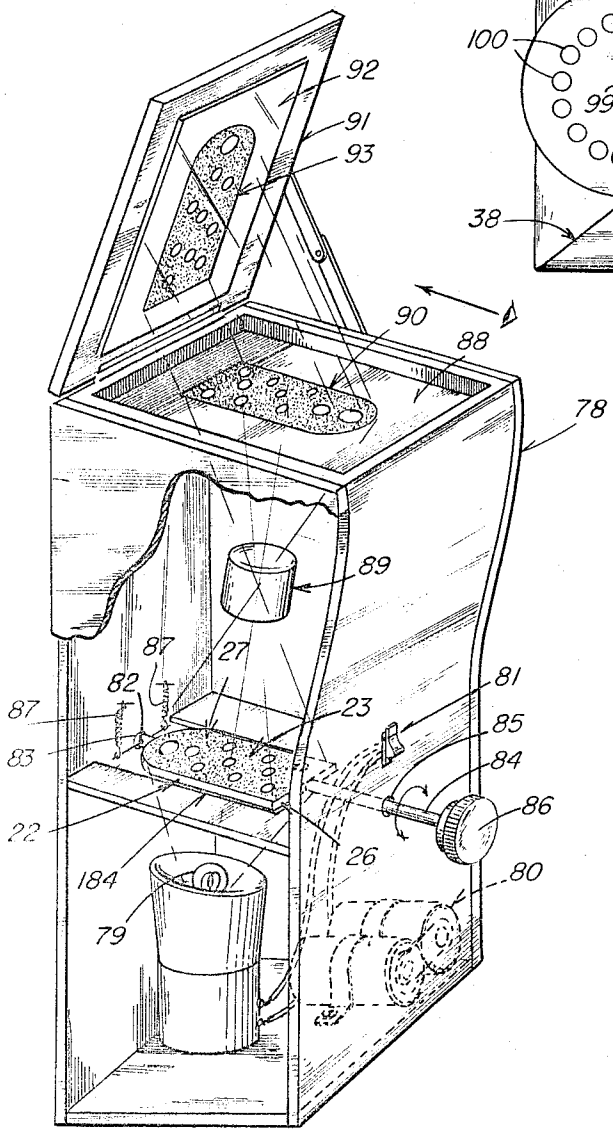

FIG. 16

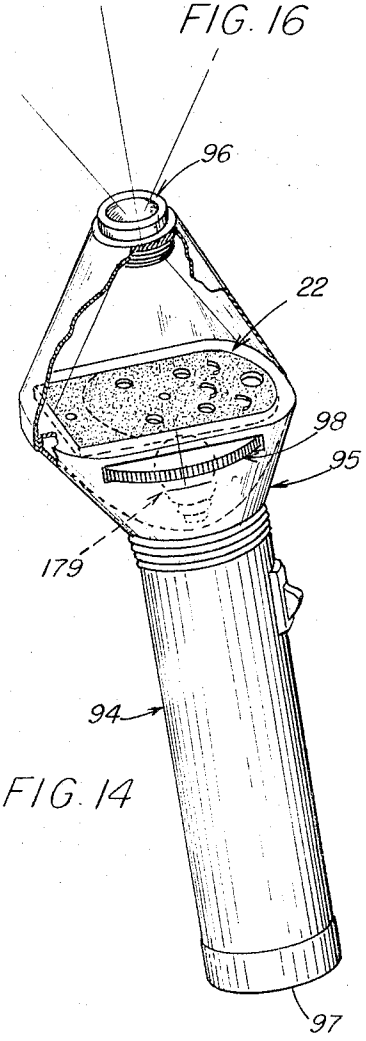

FIG. 14

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BUBBLE PIN BALL GAME

Filed Feb. 12, 1965 4 Sheets-Sheet 4

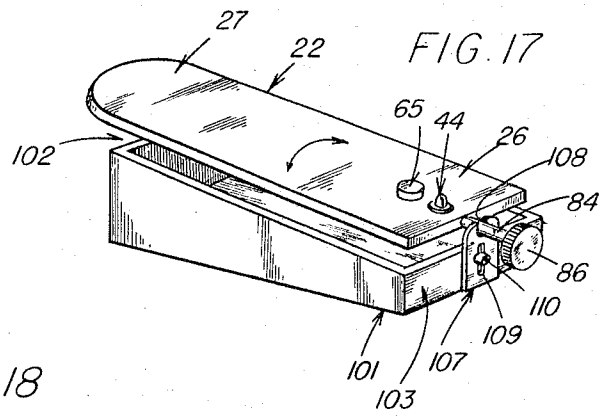

FIG. 17

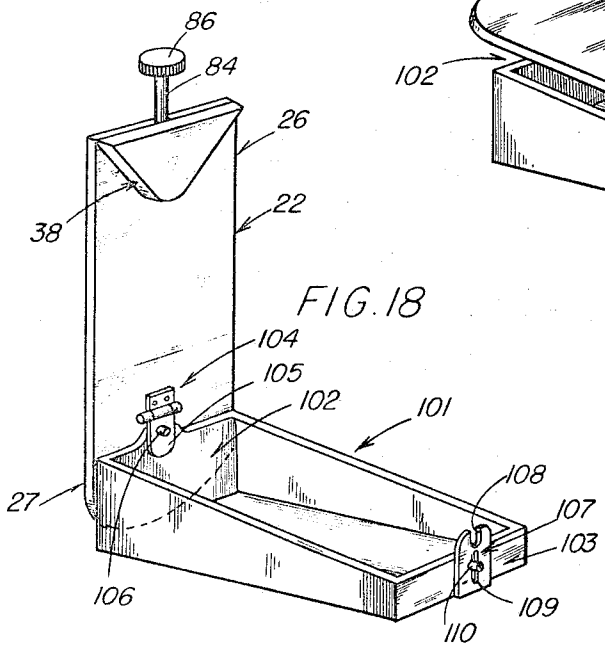

FIG. 18

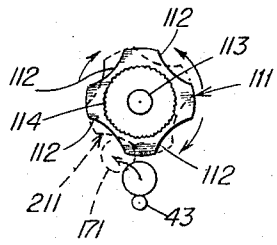

FIG. 19

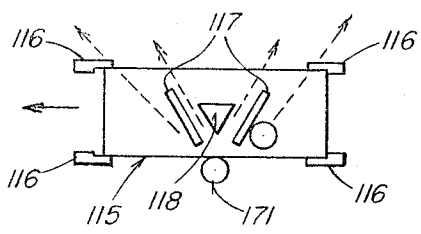

FIG. 20

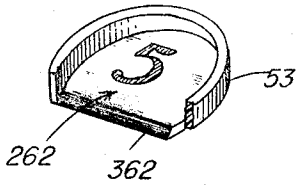

FIG. 21

United States Patent Office

3,309,088

Patented Mar. 14, 1967

3,309,088

BUBBLE PIN BALL GAME

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Filed Feb. 12, 1965, Ser. No. 432,264
20 Claims. (Cl. 273—110)

The present invention relates to a pin ball type of game in which successive play pieces are caused to travel along a play plane to various locations where each may register a particular score forming an increment of an ultimate cumulative score.

It is a general object of the present invention to provide various embodiments of such a pin ball game in which bubbles of gaseous medium in a liquid body are employed as the play pieces and to do so in a simple and effective manner adapting them to efficient use and ready manipulation for guiding such bubbles selectively to such scoring locations.

Another object of the invention is to provide such a game in the form of an elongated frame defining a closed liquid-containing chamber having a sight front or top panel through which bubble action may be observed, the chamber being equipped at various locations with score-indicating, bubble-catching means and associated with a supply of gaseous medium, such as air, communicated with a lower end of the chamber to release into the liquid contained therein successive quantities of this gaseous medium to form bubbles which will traverse a field of play defined by the chamber, with the frame being manually manipulatable to guide at will the travel of the bubbles toward selections of the scoring locations.

A further object of the present invention is to provide such game devices in forms which permit after the completion of the game rapid return of the accumulated quantity of such gaseous medium which had been employed in the formation of the separate play pieces in the form of separated bubbles back to the supply of this gaseous medium for reuse in the play of a successive game.

Still another object of the present invention is to provide structural embodiments of the device which may be readily constructed and which will permit efficient use and operation thereof.

Other objects of the invention will in part be obvious and will in part appear hereinafter.

The invention accordingly comprises the features of construction, combinations of elements, and arrangement of parts, which will be exemplified in the constructions hereinafter set forth, and the scope of the invention will be indicated in the claims.

For a fuller understanding of the nature and objects of the invention reference should be had to the following detailed descritpion taken in connection with the accompanying drawings, in which:

FIG. 1 is a top plan view, with parts broken away and in section, of an embodiment of the present bubble pin ball game invention;

FIG. 2 is a longitudinal section of the device shown in FIG. 1, taken substantially on line 2—2 thereof;

FIG. 3 is a sectional detail, with parts broken away, of the structure in the vicinity of the gaseous medium or air supply passage or port communicating between the gaseous medium or air supply compartment and the main play chamber of the device shown in FIGS. 1 and 2;

FIG. 4 is an exploded view of elements of the apparatus shown in FIGS. 1 to 3 incl. at the lower bubble supply end section of the device, with parts broken away;

FIG. 5 is a transverse sectional view taken substantially on line 5—5 of FIG. 1;

FIG. 6 is a longitudinal section of the lower part of the device shown in FIG. 2, with parts broken away, showing

the game apparatus inverted for return of the gaseous medium or air to the compartment which previously supplied the same for the bubble play pieces, illustrating countercurrent upward flow thereinto of the gaseous medium and downward flow of the liquid therefrom through the valved rapid return flow passage;

FIG. 7 is a sectional detail, with parts broken away, similar to FIG. 3, showing in a modified form of the device the employment of an enlarged bubble delivery passage or port which simultaneously serves as a liquid countercurrent flow passage leading from the main play chamber to the gaseous medium or air supply compartment;

FIG. 8 is a longitudinal section, with parts broken away, of the lower bubble supply end section of the device shown in FIG. 2, and illustrating a further modified form of liquid countercurrent flow passage leading from the main play chamber to the gaseous medium or air supply compartment;

FIG. 9 is a detail plan view, with parts broken away, of the ported valve seat of the structure shown in FIG. 8 for a fuller understanding of the nature of the liquid flow passage at this ported valve seat;

FIG. 10 is a longitudinal sectional view similar to FIG. 8 showing another form of fact gaseous medium return valve, the cage for the valve element and liquid flow passage leading from the main play chamber back to the gaseous medium or air supply compartment;

FIGS. 11 and 12 respectively are side elevational and bottom views of the valve element cage shown in FIG. 10;

FIG. 13 is a perspective view, with parts broken away and in section, of another embodiment of the present invention which associates an optical projecting system with the game device which may be of the type illustrated in FIGS. 1 and 2;

FIG. 14 is a perspective view, with parts broken away and in section, of still another modified form of apparatus employing the game device of the present invention which may be of the type illustrated in FIGS. 1 and 2 and which is associated with an additional type of optical projecting system, this apparatus being equipped with means for changing at will score-indicating values assigned to certain bubble catching pockets thereof;

FIG. 15 is a bottom plan view of the game board frame and the changeable score-indicating means of the FIG. 14 structure;

FIG. 16 is a top plan view of the structure shown in FIG. 15;

FIG. 17 is a perspective view of still another modified form of the game device shown in FIGS. 1 and 2, illustrating a different type of base means which supports the game board frame;

FIG. 18 is a perspective view of the apparatus shown in FIG. 17, illustrating inversion of the game board frame for the gaseous medium or air return action illustrated in FIG. 6;

FIG. 19 is a plan view of a rotary adjustable bubble diverting means which may be embodied in various of the forms of the game board device illustrated in FIGS. 1 to 12 incl.;

FIG. 20 is a plan view of another form of bubble diverting means which may be employed in lieu of the FIG. 19 structure in various forms of the device, and

FIG. 21 is a perspective view, with parts broken away and in section of a modified form of a bubble catching and score-indicating pocket which may be employed in various forms of the game board device of the present invention.

Referring to the drawings, in which like numerals identify similar parts throughout, it will be seen that in various forms of the present invention therein illustrated it comprises a game of the pin ball type which uniquely

employs bubbles of gaseous medium or air as play pieces. In the FIGS. 1 to 6 incl. embodiment, the game device comprises game board frame means 22 which includes an elongated see-through top panel 23, bottom closing means 24, which may also be in the form of a planar panel, and end walls and sidewalls bridged between these top and bottom panels to close off an intervening space as a main play chamber 25. Since, as will be explained later, the elongated chamber 25 which is defined by such frame means is to be cantable longitudinally in an oblique play position illustrated in FIG. 2 this chamber thus has a lower bubble supply end section 26 and an upper end section 27. The end wall in the lower bubble supply end section 26 preferably is in the form of a bridging block 28 which, as will be best seen from FIG. 4, preferably has an inside concaved curved edge 29. The end wall in the upper end section 27 preferably is also in the form of a bridging block 30 having an inside concaved edge 31 provided medially with a C-shaped cutout or recess 32. Opposed sides of the chamber 25, intervening the end bridging blocks 28 and 30, may be in the form of flat bridging strips 33 and 133 which together, in cooperation with the end bridging blocks, close off the internal chamber 25 so that the latter may house a body 34 of liquid of appreciable quantity which may, if desired, approach complete filling of the chamber.

While the top and bottom panels 23 and 24, the end bridging blocks 28 and 30 and the sidewall strips 33 and 133 may be of any suitable material they may be formed from any suitable rigid plastic. The plastic top panel may be transparent and of any particular tint or water clear, so that the operator may readily see therethrough to observe the play action of the bubble play pieces, and its inside face 35 is substantially planar since the bubble play pieces are intended to travel therealong in contact therewith when the chamber is canted longitudinally, such as in the position of FIG. 2. In some embodiments when light rays are to pass through the bottom closing panel 24 it is also preferably transparent or at least of a light-transmitting character. In other forms, such as in FIGS. 1 to 6 incl., the bottom panel 24 may be opaque or it may be covered by an opaque layer 36, which may be paper, foil or sheet plastic, so as to be non-light transmitting. Also it may be desirable to coat the inside face of the chamber bottom closing means or panel 24 with light-reflecting material, or to apply thereto a web thereof, such as a reflective foil 37. The body of liquid 34 which is housed in the main play chamber 25 may be water-white and transparent, such as a body of ordinary water, since bubbles of gaseous medium or air moving therein can be observed through the see-through or transparent top panel 23. Other liquids are suitable for use such as an oily medium which is more viscous than common water that would slow up travel of the bubble play pieces, or material, such as a small amount of starch, may be added to water to thicken it for a like purpose. Any such liquids may be ornamentally enhanced by adding color thereto to give them distinctive hues for greater contrast with the clear bubbles, and such colored liquids may be transparent or light transmitting, or even substantially opaque if each play piece bubble when occupying a catch pocket will substantially excluded therefrom any such opaque liquid and will serve as a sight lens for reading a score indicator located in the bottom of the pocket through the resulting window provided by the bubble and extending from the bottom of the pocket to contact of the inside face 35 of the top panel 23.

The lower bubble supply end section 26 of the game board frame structure of the embodiment shown in FIGS. 1 to 6 incl. is provided with suitable means to deliver successively to the body of liquid 34 relatively small segregated quantities of the gaseous medium each to form a separate play piece bubble in the liquid that will travel upward longitudinally along the obliquely canted inside face 35 of the see-through top panel 23. For this purpose an aspirating bulb having a delivery tube connected to

the chamber lower end may be employed, and the development of excessive pressure in the chamber may be avoided by providing its upper end with a check valve-controlled vent. However, it is preferred that the lower bubble supply end section 26 be equipped with a separate gaseous medium supply compartment for this purpose.

Such separate gaseous medium supply compartment may be in the form of a triangular tray 38 having a transverse end wall 39 and a pair of converging sidewalls 40 sealed off at the bottom by triangular bottom wall 41, as will be best understood from FIG. 4. The top of compartment walls 39 and 40 may be sealed in a fluid tight manner to the bottom face of the bottom closing panel 24 in any suitable manner, such as by means of cement, together to define a leak-proof closed space 42. The gaseous medium supply compartment space 42 is communicated with the bubble supply end section of the main play chamber 25 through a relatively small passage 43 and, for this purpose, may be in the form of a port of small daimeter through which is to be successively discharged or delivered to the liquid body 34 relatively small segregated quantities of a gaseous medium contained in the compartment space to form separate play piece bubbles in the liquid.

In order to expel from the compartment space 42 such relatively small segregated quantities of the gaseous medium contained therein means are provided to reduce the capacity of this gaseous medium supply compartment for expelling through the delivery passage or port 43 each bubble-forming quantity of the gaseous medium. While such capacity reducing means may be provided by making the compartment bottom wall 41 flexible for expulsion depression it may be preferred to provide this expelling means in the form of a collapsible bulb 44 having a tubular neck 45 snugly fitted in aligned holes 46 and 47 formed through the top panel 23 and the bridging block 28 for communication of the passage of this neck with the compartment space 42 through a port 48 in the bottom panel 24, as will be understood from FIGS. 2 and 4.

In order to provide score-indicating means in the main play chamber 25 containing the body of liquid 34 and to enhance the action of the bubble play pieces as they travel in the liquid this chamber is equipped with a plurality of bubble catching pockets and bubble diverting means. For example, a bubble diverting block 49 may be mounted in the chamber 25 in front of the bubble delivery passage or port 43, with this block having oblique faces 50 opposed to the port 43. This bubble diverting block 49 is mounted to extend down from the top panel inside face 35 since the delivered bubbles will travel up along this inside face and, for simplicity, may constitute a bridge between the top and bottom panels 23 and 24. Additional oblique bubble diverting bridges 51 may be mounted in the chamber 25 beyond the block 49 with a bubble-passing gap 52 intervening their lower ends.

Between the bubble diverting block 49 and oblique strips 51 are arranged a plurality of bubble-catching pockets, each of which may be in the form of a circuitous sidewall 53 extending transversely back away from the inside face 35 of the top panel 23 and having a bubble entrance gap 54 in its side facing back toward the bubble supply end section 26 or the bubble delivery port 43. As is indicated in FIG. 1 such bubble-catching, C-shaped or inverted U-shaped pockets 53 may be arranged in a pattern so that bubbles diverted by either of the oblique faces 50 of the diverting block 49 will be in a path of travel to either one side or the other for facilitating guidance of bubbles to one or more thereof. The gap 52 between the oblique bubble diverting strips 51 may be backed by an enlarged C-shaped pocket 153 so as to tend to catch therein bubbles which may escape through this gap, and the space therein may be designated in suitable manner to indicate a miss or no score. Further, bubble-catching U-shaped pockets 253 may be distributed in a section of the chamber 25 beyond the

pocket 153, and a further diverting bridging block 149 may be associated therewith. A terminal C-shaped pocket may be provided by the cutout 32 in the bridging end block 30 having an open mouth 132 which, in cooperation with the oblique faces 31 of this end block, will provide a collecting head space for bubbles which travel the length of the play chamber 34 without being caught in scoring pockets or the miss pocket 153. Further, entrance gaps of one or more of the C-shaped scoring pockets, such as those at 53, may have associated therewith bubble blocking pins 55 to make more difficult guidance of bubbles thereinto.

As is indicated in FIG. 2 the frame of the game device of FIGS. 1 to 6 incl. is to be supported for use with the elongated chamber 34 cantable longitudinally to an oblique play position to facilitate travel of the bubble play pieces from the lower bubble supply end section toward the upper end section thereof, so that some of them may be intercepted by the score-indicating pockets. In order to permit the operator easily to manipulate the game device in a manner to tend to facilitate such score-indicating interception the frame 22 thereof is mounted upon a support to provide the longitudinal canting of the chamber to an oblique position such as that shown in FIG. 2. For this purpose such frame support means is of a nature that will allow lateral tilt of one of the longitudinal sides of the chamber relative to the other to guide delivered bubbles along longitudinal side paths in the chamber 25 for directing each bubble toward the gap in the sidewall or mouth of a selected one of the score-indicating bubble-catching pockets. For this purpose the support means may be in the form of laterally rockable cradle means which may comprise a downwardly-projecting and relatively shallow transverse rocker 56 which, as may be best seen in FIG. 4, has a curved bottom end rockably to seat upon a flat supporting surface. The rocker 56 may be mounted to the frame 22 by being fastened to end wall 39 of the compartment 38. This rockable cradle means also includes a deeper transverse rocker 58 which also has a curved bottom end 59, as will be best seen from FIG. 5. Transverse rocker 58 is movably mounted beneath the frame 22 for longitudinal adjustment therealong so as to vary the oblique canting of the chamber 25. For this purpose the rocker 58 may be provided with opposed side hooks 60 which will engage over the sides of the frame 22 while permitting this rocker to slide longitudinally therealong, so that the selected position of this rocker will determine the angle of oblique canting of the frame, which in turn will be determinative of the speed of travel of the bubble play pieces through the body of liquid 34.

When the liquid-containing play compartment 25 is defined between the flat see-through top panel 23 having an inside planar face 35 and the bottom flat panel 24 (covered by a sheet of foil 37), and with this bottom panel arranged substantially parallel to this top see-through panel, it may be desired to have the latter spaced from the opposed inside face of the top panel a distance less than the normal diameter of at least some of the passage-delivered bubbles when such bubbles are free floating in the body of liquid 34, as has been previously explained and will be understood from FIG. 2. The oblique canting of the frame 22 and its liquid-containing chamber 25, as is determined from the dimensions of the rockers 56 and 58 and the position of the latter along the frame, and the size of the bubble delivery passage or port 43 are factors determining the normal diameter of a relatively large proportion of the bubbles delivered from the air head in the supply compartment space 42. By limiting the spacing of the planar inside face 35 of the top see-through panel 23 and the inside face of the bottom panel 24, or its facing foil 37, to less than this normal diameter, such bubbles delivered into the body of liquid 34 are forced to assume an ovoid shape, as is indicated by the shape of the bubble at 61 in FIG. 2. This causes such an ovoid-shaped bubble to serve as a window in the liquid body 34, so that one may readily observe through the liquid, particularly when it is tinted or has a degree of opacity, the inside face of the bottom panel 24. This permits ready reading through such bubble windows, as the bubbles are caught in the bubble-catching pockets 53, 153 and 253, of the score-indicating indicia which may be printed within these pockets upon the inside face of the bottom panel 24, or on the foil 37 covering areas of the former therein, as well as any distinctive color applied to these areas. For example, the "OUT" bubble-catching pockets 153 beyond the gap 52 and that defined by the C-shaped recess 32 may have these inside bottom panel surfaces within this pocket and recess carrying such indicia to indicate no score, and it may be tinted or colored red to be further indicative of such a miss, as is indicated at 62 in FIG. 1.

Since the game of FIGS. 1 to 6 inclusive is designed for repeated play of a scored game it is desirable to provide means for returning the gaseous medium or air rapidly back to the supply compartment space 42 from the chamber 25 after it has been collected therein by delivery of the play piece bubbles. For this purpose a return flow passage of relatively large size is preferably provided which communicates the play chamber 25 back to the bubble supply compartment space 42 and which is suitably equipped with a check valve blocking flow through this return passage when the frame 22 is in its oblique playing position, and with this valve being openable automatically upon an inversion of the frame that locates its bubble supply compartment 38 above the play chamber to attain such rapid return of the gaeous medium or air.

Such rapid return flow passage may be in the form of a port 63 provided in the chamber bottom closing means or panel 24 at a point nearer the outer end 28 of the bubble supply end section 26 of the liquid-containing play chamber 25 than the location of the bubble delivery passage or port 43. The port 63 forms a ported valve seat into which may be nested a check valve element 64, which may be in the form of a relatively heavy valve ball. The see-through top panel 23 may be provided with a suitable valve element cage, either as a separate member or as a cup 65 molded integral therewith. The interior of this cup 65 provides space into which the valve element may move by gravity when the frame 22 is suitably inverted, such as is proposed in FIG. 6 and described more fully hereinafter in a recital of the operation of the embodiment of the device illustarted in FIGS. 1 to 6 inclusive.

Since the see-through top panel 23 may be unitary and consist of a sheet of relatively rigid transparent plastic, suitably shaped to provide the valve element cage 65, it may be desired to mask certain areas thereof, such as by applying thereto coatings, films or sheets of suitable opaque material to obtain such masking. For example, as will be seen from FIG. 1, a piece 66 of opaque sheeting, such as paper, may be laid over the top surface of panel 23 in the lower bubble supply end section 26. Another piece 67 of such masking sheeting may be laid over the upper end section 27 with a circular cutout or hole 68 formed therein to reveal the gaseous medium or air collecting miss or "OUT" recess or pocket 32, this piece of masking material also being provided with a C-shaped cutout 69 to permit complete observation of the central bubble-catching and score-indicating pocket 253. If the bottom panel 24 is to be light-transmitting, particularly where the device is embodied in an optical apparatus, its ouside coating film or sheet 36 and its inside coating or reflective foil 37 should either be omitted or be of a light ray-transmitting character.

In operation of the embodiment of the game device of the present invention illustrated in FIGS. 1 to 6 inclusive let it be assumed that the operator sets up the frame 22 by resting its rockers 56 and 58 upon a flat surface, such as that diagrammatically illustrated at 70 in FIG. 2, and slides the rocker 58 longitudinally there-

along to an arbitrarily selected position to obtain a certain oblique inclination which the operator supposes will give to the bubble play pieces the speed he desires; and after trial he may adjust the longitudinal position of the slide rocker **58** to obtain the approximate speed of travel through the liquid **34** which he desires. Then by collapsing or depressing the pressure-creating bulb **44** he expels a small quantity of gaseous medium or air from the head space **42** within the supply compartment **38**, up through port **43** into the liquid-containing chamber **25**. As a resut, a bubble, such as that illustrated at **71** in FIG. 2, is emitted from this delivery port **43** to serve as a play piece. As this bubble breaks free from the port **43** the operator may tilt one side of the frame **22**, such as that defined by the sidewall strip **33**, downwardly relative to the other sidewall strip **133** so as to cause the delivered bubble (which may be that indicated by the circle at **171** in FIG. 1) to ride along the left oblique face **50** of the diverting block **49**, for travel to a left side longitudinal path. Such bubble (in the position of **271** indicated in FIG. 1) may then engage the blocking post **55** in front of the mouth **54** of the left side lowermost bubble-catching pocket **53**, to swing thereabout and perhaps enter this pocket mouth for indicating a score of a value assigned to this pocket. The weight of the valve element ball **64** is such that when the bulb **44** is compressed to deliver a bubble-forming segregated quantity of gaseous medium or air through the port **43** into the play chamber **25** this valve ball remains securely seated against the annular top edge of the return flow valve port **63** to prevent flow of the gaseous medium up therethrough.

After the operator so formed the bubble **171** at the delivery port **43** in the body of liquid **34** for rising up therethrough by rolling along the inside face **35** of the see-through top panel **23** he may release the aspirating or expelling bulb **44** to permit it to return to its fully expanded shape (shown in FIG. 4), and then concentrate on manipulative tilt of the sides of the frame **22** to guide the play piece bubble toward some one of the selected score-indicating pockets. Release of the bulb **44** to permit its expansion to its initial shape will reduce the pressure within the bubble supply compartment **38**. Thus, as the bubble **71** is freed from delivery port **43** the head of the body of liquid **34** in play chamber **25** upon this port will create a greater pressure on the top end of this delivery port than that now imposed on its bottom end. Consequently, liquid from chamber **25** will drip or trickle through the bubble delivery port **43** back into the supply compartment **38**, as is indicated at **72** in FIG. 3, until the pressures in this chamber and compartment become balanced. Then countercurrent flow of the liquid back into the supply compartment **38** will cease provided that the diameter of the port **43** is small enough, such as of the size approximately of a pinhole or even as large as about one-sixteenth of an inch (1/16") in diameter, depending upon the viscosity of the liquid.

The operator will then repeat the operation of depressing the bulb **44** for delivering the next bubble through the delivery port **43** into the liquid-containing chamber **25** for repeated manipulation of the frame **22** to guide its path of travel toward a selected one of the score-indicating pockets. The number of times which the operator repeats these operations for successively delivering a plurality of bubble play pieces into the liquid **34** housed in the chamber **25** may be dictated by his wishes or may be in accordance with a predetermined rule of play of a complete game.

After the operator has, in this manner, completed the play of a game by successively delivering a plurality of such bubble play pieces into the liquid **34** housed in the play chamber **25**, he may then wish to recondition the device for playing another game. For this purpose, he must return back into the supply compartment **38** a quantity of the gaseous medium or air which has collected in the score-indicating pockets **53** and **253** and the miss pockets **153** and **32**, and in the head space of the upper end section **27** of the play chamber. In order to speed such return the check valve-controlled passage or port **63** was provided. By inverting the lower end section **26** of the chamber-defining frame **22** to an uppermost position, as is illustrated in FIG. 6, and longitudinally tilting it forward the valve ball **64** is permitted to roll forward into the valve cage **65** for uncovering or opening the relatively large fast return port **63**. Consequently, gaseous medium or air in the play chamber **25** will bubble up through this valve port **63** into the supply compartment **38** with countercurrent flow of the liquid down therethrough back into the play chamber **25**, which actions are indicated by the arrows in FIG. 6. After the surface of the body of liquid in the supply compartment **38** has been lowered by the return of the gaseous medium or air into the head space **42** of the supply compartment to a point where countercurrent flow of the liquid can no longer pass through the valve port **63** the remaining portion of the liquid in this supply compartment may then drain through the bubble supply port **43**. It is for this reason that the bubble supply port **43** is located at a point substantially at the top portion of the supply compartment in the inclined play position of the device illustrated in FIG. 2, in addition to the reason that there is greater assurance of proper delivery of a bubble-forming segregated quantity of the gaseous medium of air up through the port **43** in the FIG. 2 position while the rapid return flow passage **63** is being securely closed by the valve ball element **64** as a result of a greater head of liquid acting upon the latter. However, the operator is not required to maintain the inverted position of FIG. 6 until all of the liquid collected in the supply compartment **38** has been drained out since the capacity of the head space **42** in the latter may be provided in such volume as to assure a sufficient quantity of gaseous medium or air in this head space when the liquid flows back through the fast return port **63** to a terminating level as to permit a repeat play of the game while some liquid still remains in the supply compartment.

It is possible to provide the device of the present invention in a form which does not require inclusion of the valve-controlled fast return passage. This may be accomplished by considerably enlarging the bubble delivery passage or port, as is illustrated at **143** in FIG. 7. If the liquid **34** in the play chamber **25** is of relatively low viscosity, such as that of water, such modified form of the device may, when mounted in the inclined play position of FIG. 2 permit countercurrent trickle of liquid through this delivery port, as is indicated at **172**, back into the supply compartment while a bubble-forming quantity of the gaseous medium or air is flowing up through this port, as is indicated at **71**. With the use of such a low viscosity liquid the countercurrent flow port **143** may be of a diameter of about three-sixteenths of an inch (3/16"). Also, it may not be necessary to equip the supply compartment with a pressure-creating device such as a collapsible bulb. In the absence of such collapsible bulb or other means for periodically reducing the capacity of the supply compartment **38** the inclination of the frame **22** of the device in the play position of FIG. 2 may be so related to the viscosity of the liquid as to cause the proper speed of delivery of each bubble-forming segregated quantity of gaseous medium or air up through the dual function port **143** and a rate of travel of each play piece bubble therefrom up through the liquid-containing chamber **25** that will permit the operator tiltably to manipulate the play chamber for attainment of a proper guidance of each bubble play piece up along the inside surface of the top see-through panel **23** toward any selected one of the score-indicating pockets.

As is indicated in FIGS. 8 and 9 a quantity of the liquid **34** may be permitted to trickle back into the supply compartment **38** from the play chamber **25** as each bubble-forming segregated quantity of gaseous medium

is delivered up through the small delivery port 43 by way of a separate trickle passage. Such separate trickle passage may be provided at the valve-controlled fast return port, such as by providing a notch 73 in the ported valve seat 163 through which countercurrent trickling of the liquid may occur, as is indicated at 272 in FIG. 8.

It is also indicated in FIG. 10 that such a countercurrent trickle passage may be provided in a portion of the valve element. As is therein proposed the valve element may be in the form of a free block or cylindrical slug 74 which fits loosely in valve cage cup 165 and rests upon to cover the top end of the ported valve seat 63. A small radial notch 173 in the bottom end of valve element 74 will provide such a countercurrent trickle passage for flow of liquid back from the chamber 25 into the supply compartment 38 as gaseous medium or air is delivered through the port 43 to form the bubble 71. As is also proposed in FIG. 10, supplemented by the showings in FIGS. 11 and 12, the valve cage 165 may be in the form of an inverted cup having a closed top end 75 and a cylindrical sidewall 76 suitably notched at 77 to provide communication between its interior and the play chamber 25. A pin 174 fixed to the side of valve element 74 may ride in the cage side notch 77 to limit rotation of the valve element and assure that trickle notch 173 continues to be directed toward the liquid-containing chamber 25. It is to be understood that such a modified form of the valve element cage may be substituted for that illustrated at 65 in FIGS. 1 to 6 incl. and FIG. 9.

The game device of the present invention may be embodied in various forms of apparatus which employ optical systems for projecting images of the game devices proper. Forms of such optical apparatus are illustrated in FIGS. 13 to 16 incl., by way of example. In the construction depicted in FIG. 13 a casing or cabinet 78 may be provided which houses a suitable projecting light source 79 powered in any suitable manner, such as by connecting it into the usual wiring system of buildings or a battery supply source such as that diagrammatically illustrated in dotted lines at 80. Such an electrical circuit may be controlled by an externally accessible manually-operated switch 81. An embodiment of the game device of the present invention may be movably supported above the light source 79 within the casing 78 in a manner to be transversely tilted, and such form of the game device may be similar to that shown in FIGS. 1 to 6 incl. The game device 22 may thus include see-through or transparent panel 23 and a similar see-through or transparent bottom panel 184, so that these opposed panels between which the play chamber 25 is defined will permit light rays from the light source 79 to be transmitted therethrough. The game device unit 22 is pivotally supported in an oblique or inclined position so that its top end section 27 is at a higher elevation than its bottom end section 26. A stub shaft 82 extends longitudinally from the top end section 27 to be rotatably supported in a hole or journal 83 in the back side of the casing or cabinet 78. Another stub shaft 84 extends forward from the bottom end section 26 and is anchored thereto for rotation of the game device 22 thereby. The stub shaft 84 extends out through a hole or journal 85 in the front side of the casing or cabinet 78 and carries a manually-engageable knob 86 for tilting the game device from side to side to perform the function of the rockers 56 and 58 in the FIGS. 1 to 6 incl. embodiment. Suitable spring means 87 may bias the game device 22 substantially in a lateral position without side tilt, so that, after the knob 86 is turned for transverse tilting to guide bubble travel, release of the latter will permit these springs to return the game device frame back to its initial position. The top of the casing or cabinet 78 may be defined in the form of a translucent screen 88, which may be of ground glass or the like, on which will be projected by optical condenser 89 a composite image 90 of the game device 22 and the travel of the bubbles from the lower end to the upper end therein. The liquid housed in the frame of the game device 22 may have a degree of opacity to cast a shadow of the liquid body upon the screen 88 in which will be defined brilliant spots of light transmitted through the traveling bubbles serving as windows. A cover 91 for the cabinet 78 may be hingedly mounted thereon and swung up above the screen 88 to a readily observable position so that a mirror 92 on its inner face will carry a reflected image 93 of the image 90 projected to the screen 88.

The use of the mirror 92 on the hinged cover 91 may be avoided by reversing the game device 22 end for end so that its top end section 27 has fixed thereto the rotatable tilting shaft 84 and its bottom end section 26 has fixed thereto the stub shaft 82 which is biased by springs 87. When this change is made the game device 22 must be longitudinally canted in the opposite direction so that its top end section 27 adjacent the front side of the cabinet is higher than its bottom end section 26 which is now located adjacent the back side of the cabinet. This will reverse the image 90 cast upon the screen 88 for proper direct observation and reading without requiring the necessity of the mirror 92 for reflecting image 93 to the observer. Of course, the optical elements of the optical system may be preferably so chosen that the image 90 will substantially fill the screen 88.

In the FIGS. 14 to 16 incl. embodiment an optical projector may be provided which has a tubular housing 94 in which may be enclosed a power source, such as batteries or dry cells, for energizing a projecting light source 179 in the bottom of hood 95. The game device 22 embodied therein may be similar to that employed at 22 in the FIG. 13 cabinet structure. An optical condenser 96 may be supported by the top end of the hood 95 above the game device 22 for projecting an image of the latter upon any surface which may serve as a screen, such as the ceiling of a room. While it is intended that the device of FIG. 14 may be grasped in the operator's hand for support, for inclining the game device 22 from end to end to a disposition similar to that proposed in FIG. 2, and also for tilting the same from side to side for bubble guidance, a rocking cradle (not shown) may be provided which has a socket in which the lower end 97 of the battery housing 95 may be inserted. Such rocking cradle may support the FIG. 14 device upon a flat surface with suitable inclination from end to end of the game device 22 and also to tilt it from side to side in the manner of the rockers 56 and 58 of the FIGS. 1 to 6 incl. embodiment, and for a like purpose.

FIGS. 15 and 16 illustrate that there may also be embodied in the structure of FIG. 14 means for changing the score values which may be assigned to certain of the bubble-catching pockets. Since the bottom panel 24 is to be of light ray-transmitting character, as is the top panel 23, the means for changing the assigned values to certain of the bubble-catching pockets 53 may be in the form of a transparent rotary disk 98 pivotally mounted at 99 to the outer face of the bottom panel 24 for manual rotation upon having projecting arcuate sectors thereof engaged by the operator's fingers. The disk 98 may carry a circular series of annularly-spaced areas 100, each of which may bear a certain number to represent a score, or an indicia indicating a miss (such as the word "OUT"). Upon rotation of the score-adjusting disk 98 certain of such areas may be brought to alignment with the bubble-catching pockets 53 so that the operator can observe in the bottom of each pocket an image of the particular score arbitrarily assigned thereto by such disk rotation. Such a score-adjusting structure may be embodied in other forms of the game device.

Another embodiment of the device is shown in FIGS. 17 and 18 which includes an inclined supporting base 101 having a relatively deep back wall 102 and a shallower front wall 103. The top end section 27 of the game de-

vice frame 22 may be swingably supported on the base back wall 102 by a hinge 104 having one of its leaves 105 pivotally supported by pivot pin 106 to this back wall for transverse swinging action. Front wall 103 may support a vertically adjustable bracket 107 having a notch 108 in in its top end in which to cradle shaft 84 fixed to the bottom end section 26 of the game device 22. The bracket 107 may be vertically adjustable by being provided with a vertical slot 109 in which rides the shank of a clamping screw 110 threadably supported by the base front wall 103. Vertical adjustment of the bracket 107 will determine the longitudinal inclination of the game device frame 22. The manual knob 86 may be turned to tilt the game device frame 22 transversely for bubble guidance.

In FIGS. 1, 2 and 6 incl. there is illustrated at 49 a fixed block which constitutes traveling bubble diverting means that is located in the chamber 25 beyond the bubble delivery passage or port 43 in the path of bubbles delivered from the latter. As is illustrated in FIG. 19 such bubble diverting means may comprise a rotatable adjusting camming means or disk 111, which may have the general shape of star wheel, with its peripheral edge provided with curved notches 112 each to serve selectively as a camming surface. Such rotary camming means 111 may be mounted within the liquid-containing chamber 25 beyond the bubble delivery port 43, such as in the position of the diverting block 49. Camming wheel 111 may be fixed upon a vertical shaft 113 extending up through a fluid-tight seal in the top panel 23 to carry a manual knob 114 affixed thereon above this top panel. When the diverting wheel 111 is rotated by manual manipulation of the knob 114, it may be pivoted to a question, such as to the dotted line position 211, where one of the curved notches 112 will be located to receive thereagainst a released bubble indicated in dotted lines at 171. Thus the opposed edge of such curved notch 112 will serve as a guide along which the bubble 171 will travel to be diverted to a side path. The problem of providing a secure liquid seal about shaft 113 if it passes through top panel 23 may be avoided by confining it within the chamber 25 and making the camming wheel 111 freely rotatable. When a delivered bubble hits this freely rotatable diverting wheel eventually to ride along the edge of one of the notches 112 it may urge the wheel to turn slightly to present differently directed guiding edges to the next bubble, and this action may be repeated with each successively delivered bubble to cause each bubble to be diverted to a different path.

In FIG. 20 is shown such a bubble diverting means in the form of a transversely slidable member or plate 115 supported in the liquid-containing chamber 25 by suitable guides 116 for limited easy transverse reciprocation. The diverting plate 115 may carry oblique fins 117 and a camming block 118 for selective guidance of successive bubbles released into the play chamber 25, such as that indicated at 171. The diverting plate 115 may slide transversely back and forth in its guides 116 as the game device embodying it is rocked laterally to tilt its side edges relative to each other as is taught above.

As will be seen from FIG. 21 any one of the bubble-catching and score-indicating pockets 53 may have inserted therein a bottom plate 262 for reducing the effective depth of the pocket, with the front edge 362 of this plate being obliquely arranged for permitting a bubble readily to climb up therover into the pocket. By reducing the depth of any one of such bubble-catching pockets 53 with the insert plate 262 the bubble may be caused to spread out over a wider area for serving as a convex lens to magnify the score-indicating indicia carried by its top surface. Such insert plate 262 may be opaque if employed in an embodiment of the device of the type illustrated in FIGS. 1 to 6 incl. or it may be transparent if light rays are to be transmitted therethrough as in FIGS. 13 to 16 incl. embodiments.

It will thus be seen that the objects set forth above, among those made apparent from the preceding description, are efficiently attained and, since certain changes may be made in the above constructions without departing from the scope of the invention, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the following claims are intended to cover all of the generic and specific features of the invention herein described, and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

Having described my invention, what I claim as new and desire to secure by Letters Patent is:

1. A game of the pin ball type employing bubbles of gaseous medium as play pieces comprising, in combination,

(a) frame means defining an elongated chamber cantable longitudinally to an oblique play position and having a lower bubble supply end section and an upper end section in such oblique position with the chamber housing a body of liquid of appreciable quantity,

(b) said frame means including an elongated see-through panel closing the top of the chamber and having an inside planar face cantable longitudinally with the chamber, and a chamber bottom closing means

(c) gaseous medium supply means located at the lower end of said frame means and communicating with the bubble supply end section of the chamber through a relatively small passage for successive delivery to the body of liquid of segregated relatively small quantities of the gaseous medium each to form a separate play piece bubble in the liquid that will travel upward longitudinally along the obliquely canted inside face of said see-through panel, and

(d) means defining a plurality of bubble-catching and score-indicating pockets distributed in the chamber and mounted adjacent the inside face of said see-through top panel beneath the surface of the liquid in the chamber for selectively catching and holding bubbles that travel upwardly along said face.

2. The bubble game of claim 1 in which each of said pockets is in the form of a circuitous sidewall extending transversely back away from said inside face and having a bubble entrance gas in its side facing back toward the bubble supply end section of the chamber.

3. The bubble game of claim 1 in which said chamber bottom closing means is in the form of a substantially flat panel.

4. The bubble game of claim 3 in which said bottom panel is arranged substantially parallel to said top see-through panel and has a planar inside face spaced from the opposed inside face of said top panel a distance less than the normal diameter of at least some of the passage-delivered bubbles would be if the bubbles were free-floating in the liquid.

5. The bubble game of claim 4 in which the inside face of said bottom panel is of light reflective material at least in the areas within said pockets.

6. The bubble game of claim 1 in which are provided means defining said gaseous medium supply means as a separate compartment, and a separate liquid flow passage leading back to the gaseous medium supply compartment from said bubble supply end section of the chamber at a point lower than the point of communication of the bubble delivery passage with the chamber when said frame is in its canted oblique position for countercurrent flow of liquid from the chamber when gaseous medium is delivered to the latter to form the bubbles.

7. The bubble game of claim 1 in which means are provided to define said gaseous medium supply means in the form of a separate compartment, and means to re-

duce at will the capacity of the gaseous medium supply compartment for expelling therefrom through the communicating bubble delivery passage a bubble-forming quantity of the gaseous medium.

8. The bubble game of claim 7 in which said capacity reducing means is in the form of a manually collapsible hollow bulb.

9. The bubble game of claim 1 in which are provided means defining said gaseous medium supply means as a separate compartment, and a relatively large gaseous medium rapid return flow passage communicating back to the bubble supply compartment from the chamber and a check valve blocking flow through this return passage when said frame is in its oblique play position, said valve being openable automatically upon an inversion of said frame that locates its bubble supply compartment above the chamber for rapid return to the latter of the gaseous medium delivered to the chamber in the form of bubbles.

10. The bubble game of claim 9 in which are provided means mounting the compartment beneath the chamber bottom closing means at the bubble supply end section of the chamber with the bubble delivery passage extending through this closing means, and with the valved rapid return passage also extending through this closing means at a point nearer the outer end of the bubble supply end section of the chamber than the location of the bubble delivery passage.

11. The bubble game of claim 10 in which said chamber bottom closing means is in the form of a planar panel with the bubble delivery and rapid return passages being formed therein as through ports communicating the compartment with the chamber, said check valve including a gravity-biased valve element at the chamber entrance end of the rapid return port with this entrance end serving as the ported seat of this valve, and means defining a cage at the ported valve seat in which said valve element is there confined while allowing separation of said valve element from the latter upon such inversion of said frame.

12. The bubble game of claim 1 in which means are provided that define a support for said frame in the canted oblique position of the chamber while allowing lateral tilt of one of the longitudinal sides of the chamber relative to the other to guide delivered bubbles along longitudinal side paths in the chamber for directing each bubble toward a selected one of said catching pockets.

13. The bubble game of claim 12 in which said support means is in the form of laterally rockable cradle means.

14. The bubble game of claim 13 in which said rockable cradle means comprises a downwardly-projecting and relatively shallow transverse rocker carried by the lower end of said frame, and a deeper transverse rocker movably mounted beneath said frame for longitudinal adjustment along the latter to vary the oblique canting of the chamber.

15. The bubble game of claim 12 in which said support means includes means pivotally supporting opposite ends of said frame for lateral swing about the longitudinal axis of the latter, and manually-engageable means connected to said frame for rotating the latter back and forth about this axis.

16. The bubble game of claim 1 in which said chamber bottom closing means is in the form of a planar panel of light-transmitting character, and an optical projecting system including a light source located beneath said bottom panel and optical means to project beyond said top panel an image of the chamber, said bubble catching pockets mounted therein and the travel of bubbles through the liquid housed in the chamber.

17. The bubble game of claim 1 in which means are provided to define traveling bubble diverting means within the chamber beyond the bubble delivery passage in the path of bubbles delivered from the latter.

18. The bubble game of claim 17 in which said bubble diverting means comprises a manually-operable and rotatably-adjustable camming means.

19. The bubble game of claim 17 in which said bubble diverting means comprises a transversely slidable member located in the chamber, manually-engageable means connected to said slidable member extending to the exterior of the chamber for adjusting the position of said slidable member transversely of said frame, and bubble diverting oblique guiding means carried by said slidable member.

20. The bubble game of claim 2 in which one or more of said bubble catching pockets are located on the circumference of a circle, a rotary disk pivotally mounted to said frame at the center of this circle with areas of this disk observable through said top panel in the one or more areas of the pockets arranged on the circumference of the circle, said disk carrying in these areas indicia indicating different scoring values, and means to rotate said disk manually from the exterior of the chamber to change at will the scoring values of these one or more pockets.

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