April 3, 1945. G. KEITH 2,372,958

BOWLING BALL

Filed March 30, 1943

FIG. 1.

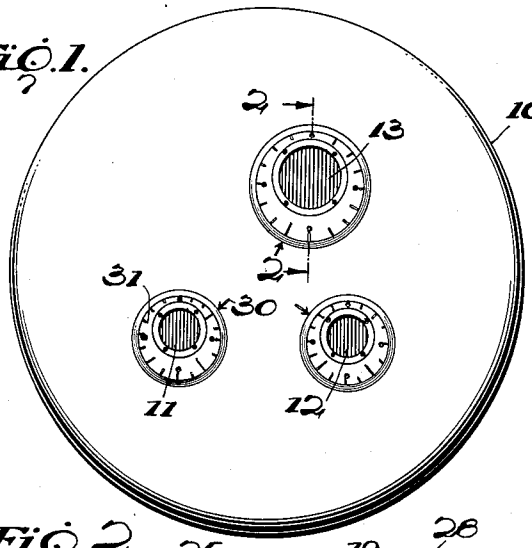


FIG. 2.

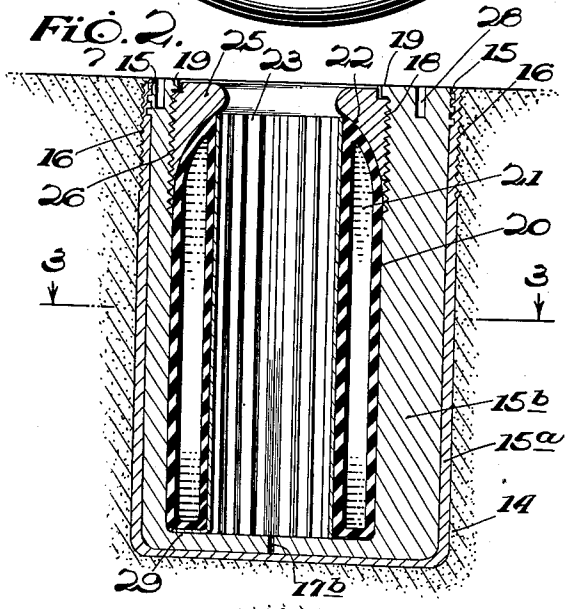


FIG. 3.

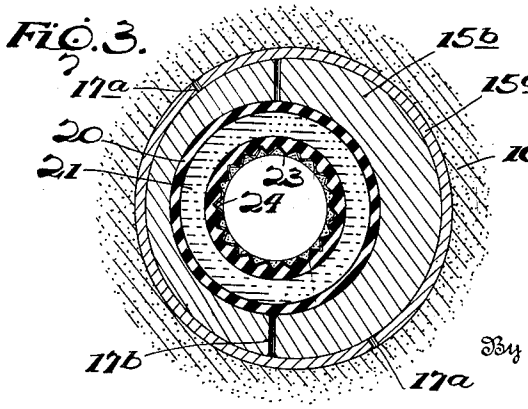
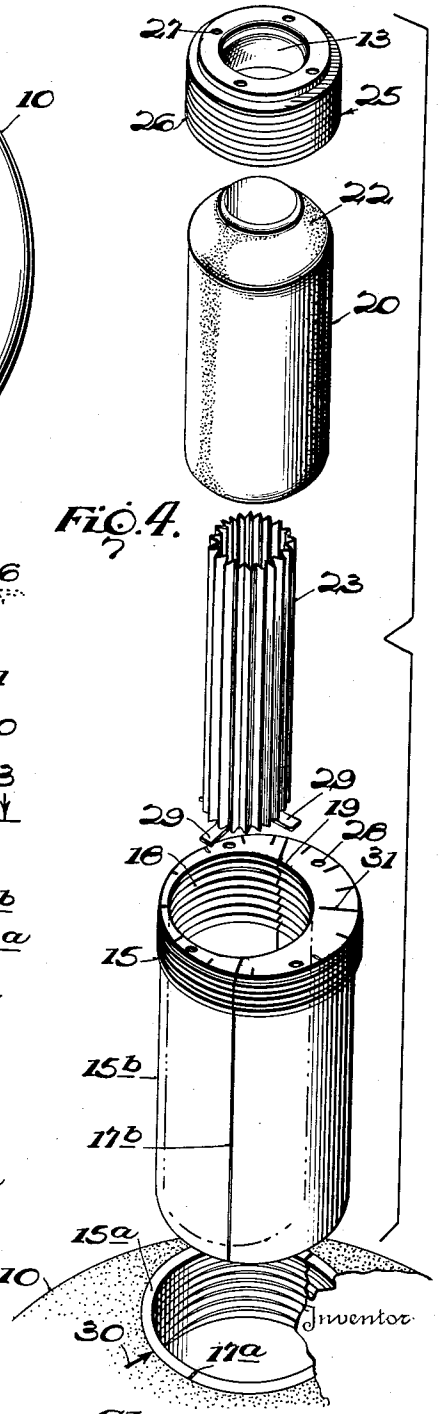


FIG. 4.



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UNITED STATES PATENT OFFICE

2,372,958

BOWLING BALL

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Application March 30, 1943, Serial No. 481,128

24 Claims. (Cl. 273—63)

This application is a continuation in part of my copending application Serial No. 461,736 filed October 12, 1942.

The present invention relates to game balls and more particularly to bowling balls used in playing ten pins.

Because such balls are generally too large to be securely grasped in the palm of a single hand, they are provided with two or three openings, one for the thumb and one or two for the fingers. It is of great importance to the player that the thumb opening particularly be of exactly the right size to make good fit with his thumb and many skilled players think it scarcely less important than the finger openings make exactly the right fit with the fingers. It is common practice in bowling alleys to provide balls having various sized thumb openings, from which the individual players select those which most nearly conform to their preference. It is seldom that a player finds in such necessarily limited assortment a ball having a thumb opening which exactly suits him. Some players find that an opening of a size which is satisfactory at some times and under some conditions is unsatisfactory at other times or under other conditions. From a necessarily limited assortment of fixed sizes it is impossible to suit all players at all times.

One principal object therefore of the present invention is to provide a ball having an opening which is adjustable as to size within rather considerable limits so that the size of the opening may readily be regulated to suit a number of different players or to satisfy the changing preference of a particular player at different times and under different conditions. In this way the invention overcomes one serious objection to the ordinary bowling ball.

A further objection to the conventional type of bowling ball results from the fact that the separation or spacing of the several openings from each other is necessarily fixed and non-adjustable. A player whose hand is large or whose fingers are long cannot comfortably, naturally or easily hold a ball in which the spacing of the openings is positioned properly for a player whose hand is small or whose fingers are short. In actual practice a standard compromise spacing has been adopted to accommodate what may be regarded as a hand of average size. However, very few players have hands of average size, and it results that most players find the fixed standard spacing too wide or too narrow.

A further principal object of the present invention is therefore to provide a ball in which the spacing of the several openings from each other can readily be adjusted to accommodate the hand size and finger length of practically any player.

A related object is to provide calibrated indicia associated with the spacing adjustment means so that once a player has experimentally determined the spacing which best suits him he may very quickly adjust any ball to such spacing by the simple expedient of setting the indicia to those values which experience has shown him produce the most satisfactory spacing. In this way a single ball may be used by several persons playing in rotation even though each player requires a different finger spacing, since each can adjust the spacing just prior to his turn at rolling the ball by an adjusting operation requiring no appreciable effort or care and no more than a moment to perform.

A further object is to provide a ball of the character indicated in a form of construction which is easy and inexpensive to make and in which the several kinds of adjustment can be readily set at very fine degrees of value by the players themselves or by an attendant without requiring the use of anything but a very simple tool, such as a spanner wrench.

A further important object is to provide an adjustable opening in which the inner lining with which the thumb contacts during use remains accurately cylindrical throughout its whole range of adjustment.

Other objects and advantages of the invention will be apparent to those skilled in the art from the description hereinafter of a preferred form of embodiment.

In the accompanying drawing I have illustrated a form of construction which embodies the inventive concepts but which is illustrative merely and is not intended to impose any limitations to its specific features except in so far as limitations are expressly recited in the appended claims or are required by the state of the prior art.

In the drawing,

Figure 1 is a plan view of a bowling or similar ball provided with three finger openings each of which is made adjustable by a construction following the principles of the present invention;

Fig. 2 is a fragmentary sectional view taken more or less radially through the ball and diametrically through the adjusting construction, along the line 2—2 of Fig. 1;

Fig. 3 is a transverse sectional view taken along the line 3—3 of Fig. 2; and

Fig. 4 is an expanded perspective view of the

several elements which comprise the adjusting assembly.

Referring to the drawing, the reference numeral 10 designates a bowling ball which may be made of any suitable material, such as the usual hard, dense composition. Three more or less radial and cylindrical openings are shown in the figure, the openings 11 and 12 being comparatively small and adapted to be entered by two fingers of the player and the third opening, 13, being larger and intended to receive the player's thumb. In the illustrated embodiment of the invention each of these openings differs from the usual construction, in which it is plain and non-adjustable, by being provided with the novel adjusting device which forms the subject of the present invention.

It will of course be understood that while I have shown all three openings made adjustable per se and relatively to each other as will be explained hereinafter, which construction I prefer because it is productive in full measure of all the benefits of the invention, it is nevertheless possible to achieve some of the important advantages of the invention by a construction in which one or two of the openings are made adjustable per se or relatively to the other opening or openings. Such embodiments of less than all the features shown in the illustrated and preferred embodiment are deemed to be within the scope of the invention to the extent that they incorporate the novel and inventive principles of the present disclosure and come within the purview of the appended claims.

Figure 2 illustrates more in detail the component parts of the adjusting device and their assembled relationship to each other. To prepare the ball to receive this assembly the ball is first bored to provide an oversize cylindrical opening 14. A composite socket member, in the form of an outer thimble or cup 15*a*, in which is nested an inner thimble or cup 15*b*, is secured in the opening 14 by a drive, frictional fit or by engagement of threads 16 formed on the outer cup 15*a* and tapped in the bore in the ball. If desired or thought necessary, the cup may be additionally secured in the ball by the use of cement.

In order to permit the outer cup to receive the inner cup, and to permit the inner cup to receive the elements which it in turn surrounds, each of the cups is split diametrically into two halves or down one side and through its bottom, so that it can be expanded when not confined in the opening 14. The cups are made of metal, plastic or the like, which is preferably relatively resilient, particularly if each cup is made in one piece with the split, shown at 17*a* for the outer cup and at 17*b* for the inner cup, extending across the bottom and down one side only.

The inner and outer cups together constitute a socket member which has a cylindrical outer wall and a cylindrical inner wall or bore. This socket member may be made of one piece of material if the finger or thumb opening which it is to provide is to be made adjustable per se merely, that is to say, if such opening is to be made adjustable as to diametrical size to accommodate fingers or thumbs of different size. The socket member will be made of inner and outer cups, as shown, if the finger or thumb opening which it is to provide is to be made adjustable relatively to one or both of the other finger or thumb openings, that is to say, if the spacing of the several openings is to be made adjustable. In the latter case, which constitutes the illustrated and preferred construction, the outer cup 15*a* has a bore which is concentric with the outer cylindrical wall of the cup, while the inner cup 15*b* has a bore which is appreciably eccentric to the outer cylindrical wall of the inner cup and to the bore of the outer cup. These two cups are nested, as shown in Fig. 2, and are held against relative axial movement by interfitting circular ribs 15, which are not spiral or screwthreaded, so that the inner cup may be rotated in the outer without axial movement. With the outer cup held fast in the ball opening 14 by the threads 16*a* and/or cement as has been explained, rotation of the inner cup will shift or displace the axis of its bore toward or away from the axis of the bores of the other opening or openings 11, 12 and 13. In effect, such rotation of any inner cup 15*b* displaces or translates the bore of a socket member toward or away from the other socket member or members and thus adjusts the spacing of the finger and thumb openings.

The socket member, i. e., the combination of the two cups whether made integral or separate, is internally threaded along its upper marginal zone or lip, as shown at 18, and an inwardly directed flange 19 slightly overhangs this thread. The outer or upper surface of the socket member is made parti-spherical to conform to the periphery of the ball, so that when the member is seated in the opening 14 its upper surface will be continuous with the curvature of the ball.

Seated in the socket member and surrounded by it is an annular cylindrical sac 20 made of some resilient distensible material, such as rubber or a rubber composition. This sac is preferably hollow and filled with a fluid 21 which is preferably a comparatively incompressible liquid. The sac is seated on the floor of the socket member and extends to less than the full height of its interior. At its top it is downwardly and outwardly bevelled to provide a conical surface 22.

An inner liner member 23 is set inside the sac with its outer surface surrounded by and engaged with the inner wall of the sac. This liner is yieldable and contractile, and is best made as a metallic or plastic bushing having a pleated or bellows shape as shown in the drawing. The construction and material are such that the liner will respond to radial pressure imposed by the sac in such a way that when the pressure is increased the diameter of the liner will be reduced, while the diameter will be increased by the inherent resilience of its material when radial pressure is reduced.

Inasmuch as the inner surface of this liner is contacted by the player's thumb or finger when the ball is grasped, the liner is so dimensioned that its inner diameter makes an opening appropriately sized for a thumb or finger hole. If desired, this surface may be formed by an inner layer of rubber composition or other suitable material 24 shown only in Fig. 3, which will make comfortable contact with the thumb or finger. If preferred, the liner 23 may have its inner surface uncovered, as shown in Figs. 2 and 4, so that the serrations formed by the pleats will constitute the thumb or finger contact surface.

A plug 25 of generally annular shape has an outer screw thread 26 which is engaged with the internal thread 18 of the socket member or inner cup element thereof and has a lower bevelled surface complementing the conical surface 22 of the sac and engaged therewith. The assembly is shown in Fig. 2, from which it will be observed that when the plug is turned down into

the socket member pressure will be exerted on the sac and transmitted therefrom to the liner, equally along all points on the outer surface of the liner. This pressure results in evenly and equally reducing the diameter of the liner along all levels between its inner and outer ends, so that the liner remains accurately cylindrical while the opening which it provides becomes reduced. Unscrewing the plug will release pressure on the sac and on the liner, permitting the liner to expand by its inherent resilience. In this way the effective size of the opening 11, 12 or 13 is accurately and finely adjusted by turning the plug one way or another in the socket member.

The plug may be turned by a spanner wrench or similar tool (not shown) the teeth of which may be engaged with sockets 27 in the upper surface of the plug.

Similar sockets 28 may be provided in the upper surface of the inner cup 15b for engagement with a larger spanner wrench or other tool to displace or translate the bore of the socket member toward or away from the other openings.

The plug 25 is retained in the socket member by having its outer margin overlapped by the flange 19. A suitable shoulder, complementing this flange, is formed around the outer edge of the plug.

The liner 23 is retained in the socket member by having small ears 29 stuck out radially from its lower end and overlapped by the bottom of the sac, as shown in Fig. 2. Thus it is seen that the entire assembly is maintained against separation from the outer cup 15a and from the ball when the outer cup is secured in place in the ball opening 14.

It will be observed that the socket member flange 19 makes the diameter of the socket member opening somewhat smaller at the lip thereof than at the internally threaded area 18. Since the socket member is preferably closed at its bottom, it is necessary to insert the plug 25 from the top. This insertion is easily accomplished if the socket member be expanded, when out of the opening 14, by separating its two halves or by temporarily slightly distorting it by opening the split 17. With the socket member opened up, the liner 23 and sac 20 are dropped in place and the plug 25 is inserted. The entire assembly is then secured in the opening 14 in the ball. Of course, if the socket member be of the composite, double cup type, which is preferred, the assembling operation includes the additional step of separating the halves of the outer cup, or expanding the outer cup by opening up the split 17a therein, and then inserting the inner cup until the ribs 15 on the two cups are interfitted.

It will be apparent that very fine, accurate adjustments of finger or thumb opening size may be made by turning the plug to suit the requirements of an individual player or to suit a number of different players. The range of adjustment can be made sufficiently great to accommodate a relatively large number of thumb and finger sizes.

It will also be evident that the eccentricity of the bore of each inner cup 15b to the associated outer cup 15a and opening 14 permits the spacing or mutual separation distance of the several openings 11, 12 and 13 to be adjusted by rotating one or another of the inner cups. It will be found sufficient by some persons to have only one of the openings provided with a two-cup adjustable socket member; others will prefer two such socket members; and of course three of them provide maximum adjusting range.

As hereinabove stated, it is desirable to have each spacing setting indicated by some means that will permit such setting to be restored readily after the spacing has been changed to some other setting, thus making it unnecessary for a player who picks up a ball that has been adjusted to suit someone else to experiment to find the adjustment that he prefers. Such means is easily provided by scribing an index mark, such as the arrow or pointer 30, on the surface of the ball or the edge of the outer cup 15a opposite each of the adjustable socket members, and by scribing cooperating graduations 31 on the end or edge of the inner cup 15b. These graduations 31 are best designated by numerals or letters associated with them (not shown on the drawing because of space limitations), so that they comprise a scale whose setting with reference to the mark 30 can be read in terms of numerals or letters. A player will learn that the setting of the several openings which best suits him is the one obtained when a certain three of the graduations 31 are opposite their respective index marks 30. He will remember these three graduations by their numerals or letters, and a glance at the scales when the ball is picked up will show whether the setting is the one desired. If it is not, the change to the required setting can be made immediately.

In the appended claims the term "finger" is used generically. Of course the opening made adjustable by my invention may be any one or all of the finger openings provided in the ball, including the opening for the player's thumb.

It is recognized that the details of the construction may be varied from those shown in the illustrated embodiment. All such modifications, as long as they are within the spirit of the invention as pointed out by the appended claims, are to be considered within the scope and purview thereof.

I claim:

1. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a contractile liner for the opening, a contractile element surrounding the liner, and means for applying pressure to the element to contract the element against the liner.

2. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a liner for the opening which is adapted to contract when radially compressed and to expand upon release of such pressure, means reacting between the liner and the body of the ball to transmit radial pressure to the liner, and means for applying pressure to the last named means.

3. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a liner for the opening which is adapted to contract when radially compressed and to expand upon release of such pressure, an annular sac surrounding the liner and outwardly confined by the body of the ball, and means for applying pressure to the sac for transmission to the liner to contract the same.

4. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a liner for the opening which is adapted to contract when radially compressed and to expand upon release of such pressure, an annular sac containing a relatively incompressible fluid surrounding the liner and outwardly

confined by the body of the ball, and means for applying pressure to the sac for transmission to the liner to contract the same.

5. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a liner for the opening which is adapted to contract when radially compressed and to expand upon release of such pressure, a generally cylindrical, annular sac containing a relatively incompressible fluid surrounding the liner and outwardly confined by the body of the ball, and means for applying pressure to the sac for transmission to the liner to contract the same.

6. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a liner for the opening which is adapted to contract when radially compressed and to expand upon release of such pressure, means reacting between the liner and the body of the ball to transmit radial pressure to the liner, and wedge means reacting between said means and the body of the ball to exert pressure on said means.

7. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a screw-thread at the lip of the opening, a contractile liner and a radially contractile element surrounding the liner and disposed with the liner in the opening, and an annular plug engaged with said screw-thread and having wedging engagement with the element for contracting the same.

8. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a screwthread at the lip of the opening, a contractile liner and a radially contractile element surrounding the liner and disposed with the liner in the opening, an annular plug engaged with said screwthread and having wedging engagement with the element for contracting the same, and a flange at the outer end of the screwthread overlapping the plug to prevent removal of the plug from the opening.

9. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a socket member lining the opening and having its lip portion internally screw-threaded and inwardly flanged, a radially contractile element seated in the socket member, an annular plug engaged with the thread and retained in place by said flange, said plug having wedging engagement with the element for contracting the same, and a contractile liner surrounded by the contractile element and adapted to be contracted when the plug is turned inwardly in the socket.

10. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a screwthread at the lip of the opening, a contractile liner and a radially contractile element surrounding the liner and disposed with the liner in the opening, an annular plug engaged with the thread and overlapping the element to hold the element in the opening and to exert increasing pressure on the element as the plug is screwed into the opening, and an ear turned out from the liner and underlying the element to hold the liner in the opening.

11. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a screw-thread at the lip of the opening, a contractile liner and a radially contractile element surrounding the liner and disposed with the liner in the opening, an annular plug engaged with the thread and overlapping the element to hold the element in the opening and to exert increasing pressure on the element as the plug is screwed into the opening, means surrounding the plug to prevent its removal from the opening, and an ear turned out from the liner and underlying the element to hold the liner in the opening.

12. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a socket member lining the opening and having its lip portion internally screw-threaded and inwardly flanged, a radially contractile element seated in the socket member, an annular plug engaged with the thread and retained in place by said flange, said plug having wedging engagement with the element for contracting the same, a contractile liner surrounded by the contractile element and adapted to be contracted when the plug is turned inwardly in the socket, and an ear turned out from the liner and underlying the element to hold the liner in the opening.

13. In a bowling or similar ball having a plurality of cylindrical finger openings, a contractile liner for at least one of the openings, means for contracting the liner to adjust the effective size of said opening, and means for rotating the liner contracting means and the liner to selected adjusted positions in the opening to shift the axis of the liner toward or away from the axis of another of the openings.

14. In a bowling or similar ball having a plurality of substantially radial finger openings, a socket member for at least one of said openings comprising an outer member fixed in the ball and having a cylindrical bore and an inner member nested in the outer member and having a bore eccentric to the bore of the outer member and rotatable therein to shift the axis of the eccentric bore to selected adjusted positions circumferentially of the ball toward or away from the axis of another of said openings.

15. In a bowling or similar ball having a substantially radial finger opening, a socket member for said opening comprising an outer member fixed in the ball and having a cylindrical bore, an inner member nested in the outer member and having a bore eccentric to the bore of the outer member and rotatable therein to shift the axis of the eccentric bore to any one of a plurality of adjusted positions circumferentially of the ball, and cooperating indicia on the inner member and a fixed portion of the structure for indicating the position of the inner member.

16. In a bowling or similar ball having a plurality of substantially radial finger openings, a socket member for each of said openings comprising an outer member fixed in the ball and having a cylindrical bore and an inner member nested in the outer member and having a bore eccentric to the bore of the outer member and rotatable therein to shift the axes of the eccentric bores to selected adjusted positions circumferentially of the ball toward and away from each other.

17. In a bowling or similar ball having a plurality of substantially radial and cylindrical finger openings, a cylindrical socket member fitting at least one of the openings and having a bore eccentric to the opening and mounted for rotation therein to selected adjusted positions to shift the axis of its bore circumferentially of the ball toward another one of the openings.

18. In a bowling or similar ball having a substantially radial and cylindrical finger opening,

a cylindrical socket member fitting the opening and disposed for rotation therein and having a bore eccentric to the opening so that rotation of the socket member will shift the axis of its bore circumferentially of the ball, a contractile liner for said bore adapted to contract when radially compressed and to expand on release of such pressure, means reacting between the liner and the socket member to transmit radial pressure to the liner, and means for applying pressure to the last named means whereby the size of the bore of the liner may be adjusted.

19. In a bowling or similar ball having a substantially radial and cylindrical finger opening, a socket member disposed in said opening and comprising an outer cup of cylindrical shape fixed in the opening and having a concentric bore and an inner cup nested in the outer cup for rotation therein and having an eccentric bore, an annular sac containing a relatively incompressible fluid nested in the inner cup, a liner nested in the sac, and an annular plug threaded in the inner cup and rotatable for axial movement therein to exert pressure on the sac and thereby contract the liner to adjust the diametrical size thereof, whereby rotation of the inner cup relatively to the outer cup will shift the common axis of the eccentric bore, the sac, the liner and the plug circumferentially of the ball.

20. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a yieldable lining wall, a chamber containing a fluid disposed outwardly of said wall, and means for applying pressure to said fluid to move the lining wall and thereby vary the size of the opening.

21. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a resilient, stretchable lining wall, a body of fluid confined behind said wall, and means for applying adjustable pressure to said fluid to vary the pressure applied by said fluid to the wall and thereby stretch the wall to adjust the size of the opening.

22. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising an elastic lining wall, means confining a body of fluid behind said wall, and means for adjustably applying pressure to said fluid to transmit said pressure to the fluid and move the wall to vary the size of the opening.

23. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising a substantially cylindrical elastic lining wall, a chamber surrounding said wall containing a body of fluid, and means for adjustably applying pressure to said fluid to react radially against said wall and move the same to vary the side of said opening.

24. In a bowling or similar ball having a finger opening, means for adjusting the size of the opening comprising an insert lining the opening having spaced substantially concentric walls including an elastic inner wall defining a substantially cylindrical bore, a body of fluid confined in the space between said walls, and means for adjustably varying the pressure on said fluid to move said inner wall radially for varying the size of said bore.

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