

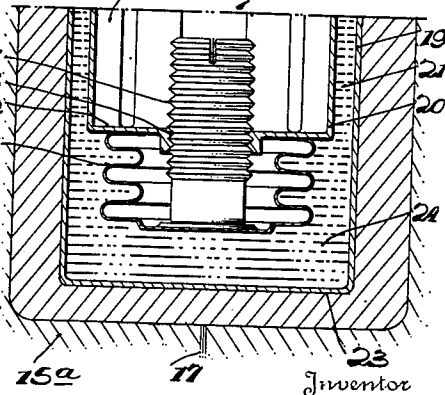
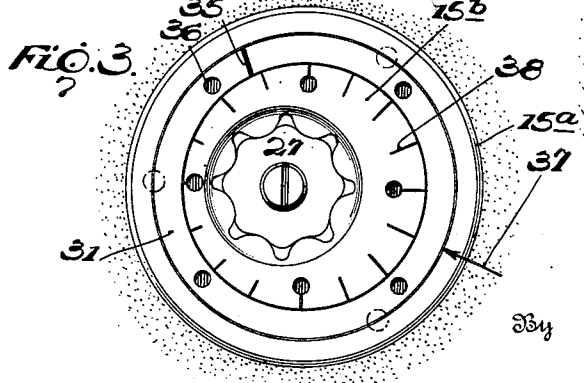
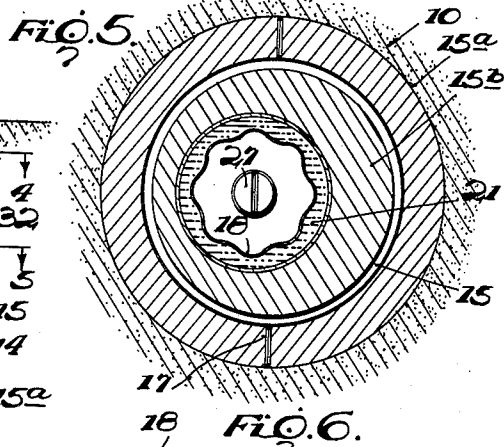
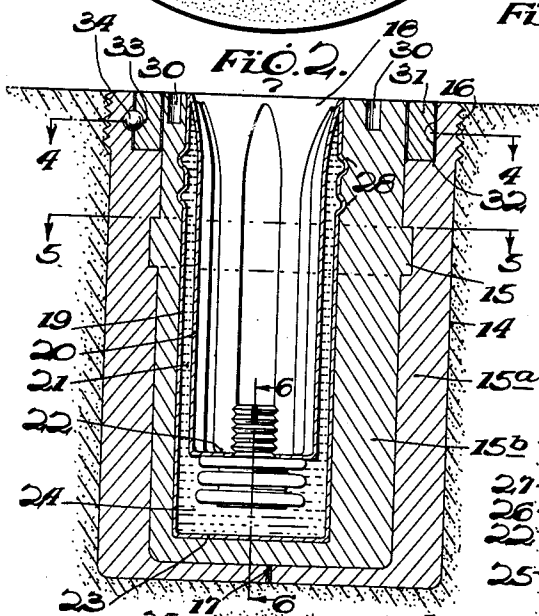
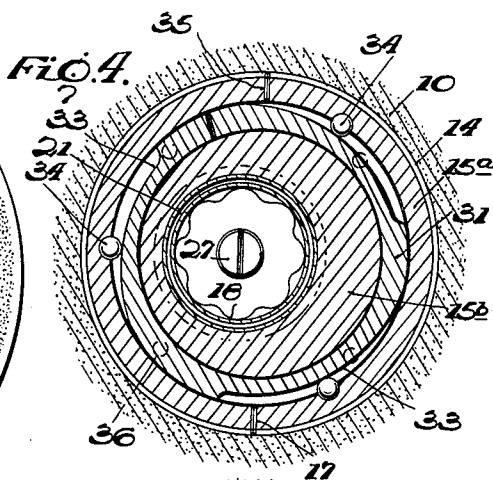
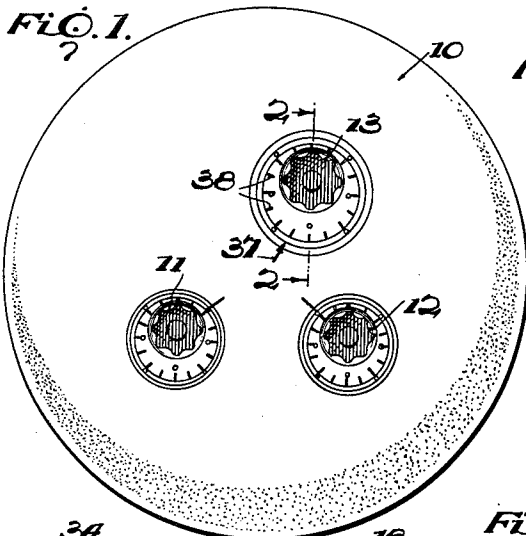
April 3, 1945.

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2,372,959

BOWLING BALL

Filed April 10, 1943.



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UNITED STATES PATENT OFFICE

2,372,959

BOWLING BALL

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Application April 10, 1943, Serial No. 482,627

12 Claims. (Cl. 273—63)

The present invention relates to game balls and more particularly to bowling balls used in playing ten pins, and provides an improved device of the general type that forms the subject of my copending application Serial No. 481,128 filed March 30, 1943.

In that application I disclosed and claimed a bowling ball or the like having finger and thumb openings made individually adjustable as to size and adjustably spaced apart. The present invention provides a somewhat similar construction having certain superiorities in respect of simplicity, cost of manufacture, ease of operation, and other advantages, including the provision of locking means for the adjustment by which the openings are spaced at variable distances from each other, and including also a novel disposition of the means for varying the size of each opening which will be proof against its becoming accidentally maladjusted.

The general purposes and advantages of rendering the openings individually adjustable as to size and adjustable as to the distances by which they are spaced apart are sufficiently set forth in my earlier application. The present improvement is intended to attain all those objects and advantages and to include certain additional ones that will be evident to those skilled in the art from the following specification.

The accompanying drawing shows a preferred form of construction embodying the new principles but is illustrative merely and is not intended to impose any limitations to its specific features except insofar as they may be expressly recited in the claims or may be required by the state of the prior art.

In the accompanying drawing,

Figure 1 is a plan view of a bowling or similar ball provided with a thumb and two finger openings each including the adjusting assembly contemplated by the present invention;

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

Fig. 3 is a top plan view of the area of the ball which contains an opening provided with one of the adjusting assemblies;

Fig. 4 is a transverse sectional view taken along the line 4—4 of Fig. 2;

Fig. 5 is a transverse sectional view taken along the line 5—5 of Fig. 2; and

Fig. 6 is a fragmentary diametrical section showing the lower part of an adjusting assembly, taken along the line 6—6 of Fig. 2.

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 inventive principles of the present disclosure and to 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 15a, in which is nested an inner thimble or cup 15b, is secured in the opening 14 by a drive, frictional fit or by engagement of threads 16 formed on the outer cup 15a 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, it 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 in the case of the outer cup if it is made in one piece with the split, shown at 17, 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 15a has a bore which is concentric with the outer cylindrical wall of the cup, while the inner cup 15b 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 an interfitting circular rib and groove 15 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 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 axes of the bores of the other opening or openings 11, 12 and 13. In effect, such rotation of any inner cup 15b 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 15a and 15b, whether made integral or separate, surrounds and contains an insert generally designated 18, which forms the wall of the opening 11, 12 or 13 with which the finger or thumb of the player contacts in use of the ball. This insert or liner, best shown in Fig. 2, is preferably a substantially cylindrical cup having an outer wall 19 and an inner wall 20 spaced concentrically from each other to provide a peripheral chamber 21 and having an inner bottom wall 22 and an outer bottom wall 23 axially spaced to provide a bottom chamber 24. The walls 20 and 22 and 19 and 23 are respectively integral or integrally connected, so that the chambers 21 and 24 communicate with each other. The entire insert 21 may be made of some elastic material such as rubber or an elastic plastic, but it is necessary only that the inner wall 20 be elastic since this wall provides the distensible surface which is moved inwardly or outwardly, in the manner to be explained hereinafter, to vary the cross sectional size of the finger or thumb opening.

In order to make the bore of the liner 18 adjustable in respect of cross sectional size, the chambers 21 and 24 are filled with a fluid, preferably a liquid, and means is provided for adjustably displacing fluid from the bottom chamber to the peripheral chamber, or vice versa, to vary the pressure exerted by the fluid radially inwardly on the inner wall 20 and thereby displace that wall inwardly or outwardly toward the axis of the opening so as to vary its cross sectional size.

A convenient means for thus adjusting pressure on the fluid is shown in the illustrated embodiment of the invention and comprises an expansible bellows 25 surrounding a threaded opening 26 in the inner bottom wall 22 of the liner

and projecting down into the bottom chamber 24. This bellows is sealed across its bottom and secured in fluid-tight engagement to the inner bottom wall 22, so that escape of fluid from the chambers into the bore of the liner is prevented. The bellows, which as shown is best made of resilient metal or a suitable plastic, is inherently contractile, but may be distended to increase the space which it occupies in the lower chamber and thereby displace fluid therefrom into the peripheral chamber. A convenient means for distending the bellows and for allowing it to contract is a threaded stud 27 engaged in the threaded opening 26 and bearing against the closed bottom of the bellows. This stud has its upper end appropriately formed for engagement by a tool which can be inserted into the bore of the liner to turn the stud up or down so as to expand the bellows or permit it to contract. As shown, the stud is slotted to receive a common screw driver, but of course it may be polygonally headed to receive a socket wrench, and any other well known shape or formation may be adopted to cooperate with any sort of insertable tool.

The inner wall 20 of the liner is elastic, as has been seen, and inherently tends to assume an outwardly displaced position providing maximum cross sectional bore size. Elasticity may be promoted by fluting or pleating the inner wall as shown in the drawing. This formation has the additional advantage of tending to keep the bore approximately cylindrical when its diameter is varied by displacing more or less of the fluid into or out of the peripheral chamber 21.

In the form of construction shown in the drawing, the liner 18 is an originally independent and separate element having inner and outer walls integrally connected at the outer lip of the liner, which is in the spherical plane of the ball surface. However, it is possible to make a liner having a single wall only, which will be analogous to the inner wall of the illustrated liner. Such a single wall is connected to the surrounding socket member at the lip of the opening and is elsewhere spaced from the socket member to provide the peripheral and bottom chambers. If, as is preferred, the double walled liner is used, it can be fixed in the socket member by forming cooperating ribs and grooves 28 on the outer wall of the liner and the inner wall of the socket member. If the socket member be made in one piece, it need not be split or divided to receive the ribbed liner because the liner is resilient enough to be compressed and sprung into place, and for the same reason the inner element 15b of a socket member made in two parts need not be split or divided.

It will be evident that rotation of the stud 27 will result in passing fluid between the bottom and peripheral chambers to exert varying pressure in the peripheral chamber against the elastic reaction of the inner wall of the liner, with the result that this inner wall will be moved inwardly or outwardly with relation to the axis of the opening to alter the cross sectional size of the opening.

If the socket member be made in two parts, the inner element is held in the outer by engagement of the circular rib 15 and cooperating groove hereinabove referred to. It will be evident that these two elements are readily engaged by bringing the two halves of the outer element around the inner one, or by springing the split outer element

around the inner one, after which the assembly

can be fitted into the ball opening and threaded and/or cemented in place therein.

Adjustment of the spacing between the several finger openings and the thumb opening is made by rotating the inner cup element 15b of the socket member. To this end the outer edge of this rotatable element may be provided with a series of small sockets 30 adapted to be penetrated by the prongs of a spanner wrench or the like. In order to make each adjusted position of the rotatable element easily recognized and identified, a marking index 37 may be scribed on the ball surface and/or on the end of the outer cup 15a to cooperate with indicia 38 scribed on the rotatable element. These indicia 38 preferably bear identifying numerals or letters, not shown in the drawing because of space limitations.

It is of course desirable that the several adjustments (by which the openings are spaced from each other and by which the size of each opening is varied) be more or less locked so that a desired adjustment will not become accidentally changed. The cross sectional size of the opening will be found sufficiently fixed against accidental change by the friction of the threads of the stud 27 and the cooperating threads of the opening 26 in the inner bottom wall 22 of the liner. Since this stud is well protected by being located down inside the finger or thumb opening, it is not apt to be moved except by deliberate insertion of the adjusting tool. However, the rotational adjustment of the socket member is susceptible to accidental movement because the end of the socket member lies in the peripheral plane of the ball. In order to lock the socket member in any desired adjusted position I provide a locking ring 31 which fits in a peripheral groove 32 counterbored in the outer end of the outer cup element 15a. This ring is adapted to bear against the outer wall of the inner cup element 15b which it surrounds, and means is provided for causing this ring to be moved to exert locking pressure against the inner cup member or, when desired, to free the inner cup member for rotation.

The ring 31 has at one or more points about its periphery an indented cam surface 33 in the form of a channel or groove the contour of which is half circular at its deepest points and gradually becomes shallower as the groove merges into the cylindrical wall of the ring. A projection or lug, which may be a small ball 34, is set in the outer cup member 15a and extends into the counterbore 32 so that it projects into a cam groove 33. It will be apparent that when the ring is rotated in one direction the deeper parts of these cam surfaces will be engaged by the lugs 34 so that the ring will exert little or no radial pressure on the rotatable inner cup member 15b, so that this member may be rotated, while when the ring is oppositely rotated to bring the shallower parts of a cam groove into engagement with a lug, the ring will be constricted around the cup member 15b to lock it in place. If the material of the ring 31 is not sufficiently resilient, it may be found desirable to split the ring, as shown at 35, to make it more readily contractile.

The ring may be rotated by engagement of the prongs of a spanner wrench in sockets 36, in the same manner as the inner cup 15b is rotated.

The fluid contained in the chambers is preferably a liquid because such a fluid is substantially incompressible and will accurately transmit all minute increases and decreases in the pressure from one chamber to the other. However, I do not exclude the possibility of using a gas fill for

the chambers to suit players who may prefer the softer feel of a liner backed by a more or less highly compressible fluid.

If a liquid is used, it should of course be one which will have no deleterious effect on the material forming the chamber walls. Many standard pressure transmitting oils are available for this purpose.

As has been stated, practically all the structural elements of the combination may be made of plastic. The plastic materials will be appropriately chosen with respect to such qualities as elasticity, rigidity and resilience for the various parts. Thus, the outer cup 15a should be made of resilient material if used in the split form, or it may be made of quite rigid material if two separable halves are used. The inner cup 15b may be made of rigid material, while the substance used for the liner or insert 18, particularly for the inner wall 20 thereof, should be elastic. In the present state of development of plastic materials it is thought unnecessary to suggest any limitations to the specific materials of which the various parts should be made.

It is thought that the foregoing description of a preferred embodiment will sufficiently explain the construction and advantages of the invention. Numerous modifications are contemplated, all of which are deemed to be within the scope of the inventive concept to the extent that they embody the principles pointed out by the appended claims.

I claim:

1. 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 surrounded by a peripheral chamber and having axially spaced bottom walls providing a base chamber communicating with the peripheral chamber, a body of fluid confined in said chambers, and means for adjustably varying the pressure on said fluid to move said inner wall radially for varying the size of said bore.

2. 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 outer wall maintained against radial expansion and an elastic inner wall defining a substantially cylindrical bore surrounded by a peripheral chamber between the walls and having axially spaced bottom walls providing a base chamber communicating with the peripheral chamber, a body of fluid confined in said chambers, and means for adjustably varying the pressure on the fluid in the base chamber to transmit pressure to the fluid in the peripheral chamber to react between the inner and outer walls and move the inner wall radially for varying the size of the bore.

3. 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 a substantially cylindrical bore defined by spaced peripheral walls including an elastic inner wall and spaced bottom walls providing respectively peripheral and bottom chambers communicating with each other, a body of fluid in said chambers, a displacing element adjustably movable in the bottom chamber, and means for moving said element to pass fluid from the bottom chamber to the peripheral chamber for reaction against the inner peripheral wall to cause

the same to move radially to vary the size of the bore.

4. 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 a substantially cylindrical bore defined by spaced peripheral walls including an elastic inner wall and spaced bottom walls providing respectively peripheral and bottom chambers communicating with each other, a body of fluid in said bottom wall into the bottom chamber to displace fluid therefrom, and means accessible from within the opening for adjusting the displacing effect of the bellows so as to pass fluid from the bottom chamber to the peripheral chamber for reacting against the inner peripheral wall to cause the same to move radially to vary the size of the bore.

5. 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 a substantially cylindrical bore defined by spaced peripheral walls including an elastic inner wall and spaced bottom walls providing respectively peripheral and bottom chambers communicating with each other, a body of fluid in said bottom wall into the bottom chamber to displace fluid therefrom, and a stud threaded through the inner bottom wall and engageable with the bellows for adjusting the displacing effect of the bellows so as to pass fluid from the bottom chamber to the peripheral chamber for reacting against the inner peripheral wall to cause the same to move radially to vary the size of the bore.

6. In a bowling or similar ball having a finger opening, a flexible liner mounted in said opening and providing a bore therefor, means for flexing the liner inwardly to vary the cross sectional size of said bore, means for shifting the axis of the liner circumferentially of the ball, and means for locking the liner in circumferentially shifted position.

7. In a bowling or similar ball having a finger opening, a flexible liner mounted in said opening and providing a bore therefor, means for flexing the liner inwardly to vary the cross sectional size of said bore, means for shifting the axis of the liner circumferentially of the ball comprising a sleeve rotatable in the opening and having an eccentric bore containing the liner, and means for locking said sleeve in rotated position comprising a member adapted to be compressed between the sleeve and the portion of the wall surrounding said opening.

8. In a bowling or similar ball having a finger opening, a flexible liner mounted in said opening and providing a bore therefor, means for flexing the liner inwardly to vary the cross sectional size of said bore, means for shifting the axis of the liner circumferentially of the ball comprising a

sleeve rotatable in the opening and having an eccentric bore containing the liner, and means for locking said sleeve in rotated position comprising a ring rotatably surrounding the sleeve and having a cam surface adapted when the ring is rotated in one direction to force the ring into locking contact with the sleeve.

9. In a bowling or similar ball having a finger opening, a flexible liner mounted in said opening and providing a bore therefor, means for flexing the liner inwardly to vary the cross sectional size of said bore, means for shifting the axis of the liner circumferentially of the ball comprising a sleeve rotatable in the opening and having an eccentric bore containing the liner, and means for locking said sleeve in rotated position comprising a ring rotatably surrounding the sleeve and having a cam surface and a lug having a fixed position relatively to the wall engageable with said cam surface when the ring is rotated in one direction to force the ring into locking contact with the sleeve.

10. In a bowling or similar ball having a finger opening, a liner for said opening, means for shifting the axis of the liner circumferentially of the ball comprising a sleeve rotatable in the opening and having an eccentric bore containing the liner, said sleeve being peripherally spaced from the portion of the ball surrounding said opening, and means for locking said sleeve in rotated position comprising a member in said space adapted to be compressed between the sleeve and the portion of the ball surrounding said opening.

11. In a bowling or similar ball having a finger opening, a liner for said opening, means for shifting the axis of the liner circumferentially of the ball comprising a sleeve rotatable in the opening and having an eccentric bore containing the liner, said sleeve being peripherally spaced from the portion of the ball surrounding said opening, and means for locking said sleeve in rotated position comprising a ring in said space rotatably surrounding the sleeve and having a cam surface adapted when the ring is rotated in one direction to force the ring into locking contact with the sleeve.

12. In a bowling or similar ball having a finger opening, a liner for said opening, means for shifting the axis of the liner circumferentially of the ball comprising a sleeve rotatable in the opening and having an eccentric bore containing the liner, said sleeve being peripherally spaced from the portion of the ball surrounding said opening, and means for locking said sleeve in rotated position comprising a ring in said space rotatably surrounding the sleeve and having a cam surface and a lug having a fixed position relative to the wall engageable with said cam surface when the ring is rotated in one direction to force the ring into locking contact with the sleeve.

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