June 12, 1956 J. E. BORAH 2,750,222

SUCTION CUP

Filed July 21, 1952

FIG. 1.

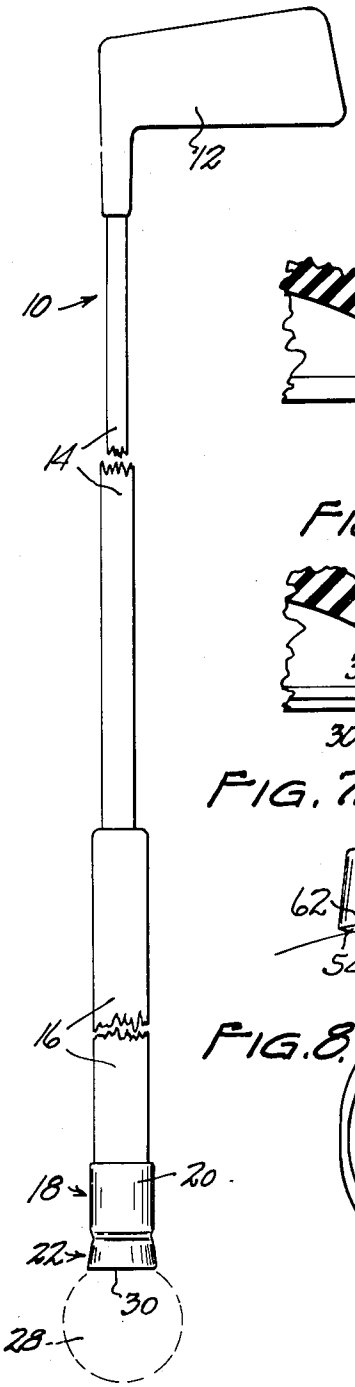


FIG. 2.

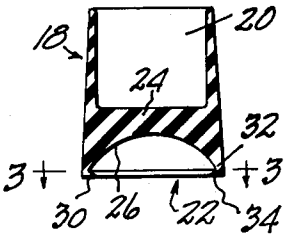


FIG. 3.

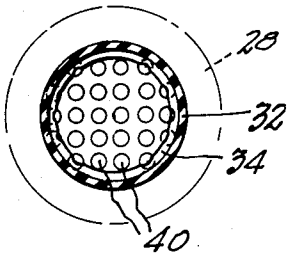


FIG. 5.

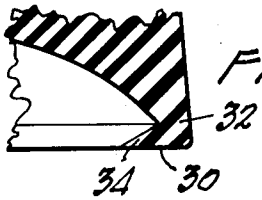


FIG. 4.

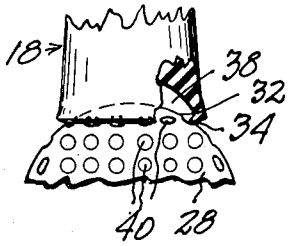


FIG. 6.

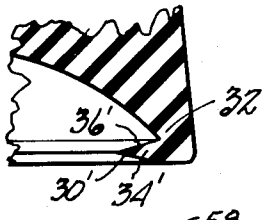


FIG. 7.

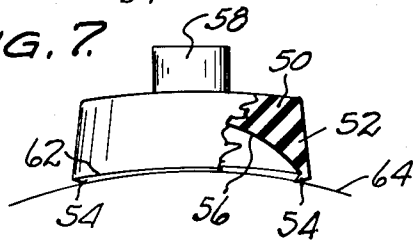


FIG. 9.

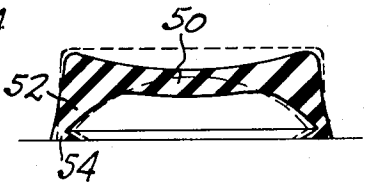
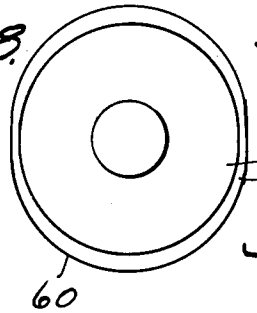


FIG. 8.



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SUCTION CUP

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5 Claims. (Cl. 294—19)

This invention relates to improvements in suction cups.

The primary object of the invention is to produce a device of this character which is adapted to adhere to surfaces which are non-planar, which are not flat, and which may either be curved or roughened or pebbled.

A further object is to provide a device of this character which has a lip formed at its margin and projecting inwardly therefrom, said lip tapering to a sharp free edge.

A further object is to provide a device of this character which is well suited for use as a retriever for golf balls, and whose circumferential size is not substantially greater than the circumferential size of the handle of a golf shaft and is substantially less than the diameter of a golf ball, and which is light in weight so that it does not interfere with the handling of a golf club and does not unbalance the club or otherwise interfere with its normal use.

Other objects will be apparent from the following specification.

In the drawing:

Fig. 1 is a fragmentary view illustrating the device mounted upon the handle of a golf club to serve as a golf ball retriever.

Fig. 2 is an axial sectional view of one embodiment of the device.

Fig. 3 is a sectional view of the device taken on line 3—3 of Fig. 2 and illustrating the manner in which the device conforms to and adheres to the surface of a ball having a pebbled or irregular surface contour.

Fig. 4 is an enlarged side view illustrating the manner in which the device fits upon a ball of irregular contour.

Fig. 5 is an enlarged fragmentary detail axial sectional view of one embodiment of the device.

Fig. 6 is an enlarged axial detail sectional view of another embodiment of the invention.

Fig. 7 is a side view illustrating the application of a modified embodiment of the invention to a curved surface.

Fig. 8 is a top view of the embodiment illustrated in Fig. 7 in its applied position.

Fig. 9 is a sectional view illustrating the deformed condition of the device while subjected to pressure incident to application of the device to a surface, and which illustrates in dotted lines the normal adhered position of the device.

Referring to the drawing, and particularly to Figs. 1 to 5, which illustrate one embodiment of the invention intended for use as a golf ball retriever, the numeral **10** designates a golf club having the usual head **12**, shaft **14** and handle **16**. My improved golf ball retriever **18** is mounted upon the free or upper end of the handle **16**.

The retriever **18** has a socket portion **20** at one end thereof adapted to fit around the free end portion of the handle **16** of the club shaft and a suction cup end portion **22** formed integrally with the socket **20** and separated therefrom by a transverse web **24**. The retriever **18** is formed integrally in one piece, preferably by molding, and is formed from rubber, synthetic rubber, or other material possessing resilience and flexibility.

When formed of rubber or synthetic rubber, a so-called "soft rubber" is required. The rubber will preferably be of such character that its durometer measurement will be in the range from 15 to 70 and preferably will be less than 50.

The cup portion **22** of the retainer has a concave surface **26** whose curvature, if part-spherical, has a radius less than the radius of a golf ball **28**, and which, if not truly part-spherical, has a concave surface so curved that the socket defined thereby will be the equivalent of that provided by a part-spherical surface of lesser radius than a golf ball. The concave surface **26** terminates spaced from the end surface **30** of the cup portion **22** which is preferably flat or planar. The parts are so proportioned that the wall at **32**, at the margin of the concave surface is thin and, therefore, readily yieldable. A marginal flange **34** is carried by and projects inwardly from the marginal portion **32** of the cup. The flange **34** tapers radially inwardly and is defined in part by the flat outer surface **30**, and in part by a frusto conical or beveled inner surface **36**. Said inner beveled surface extends at an acute angle to the surface **30**. The angle may vary but preferably should be in the range between 15 deg. and 35 deg.

For purposes of illustration solely and to indicate the substantial proportion of the parts with relation to a golf ball which is customarily of a dimension slightly greater than 1⅝ in. in diameter, the retainer will preferably be of an outer diameter of approximately 1 1/16 in., and the width of the flange at each surface **30** will be approximately 3/32 in., the thickness of the flange at **32** being approximately one-half the width of the flange in the plane **30**. The depth of the socket of the cup at its center, as compared to the plane of the surface **30**, will preferably be about 5/32 in.

The socket **20** will be of a size to fit snugly upon the handle **16** of a golf club and will have a thin wall thickness so as to avoid excessive bulk and circumferential dimension thereof where it fits upon the handle. The bore or socket **20** will preferably be of a diameter slightly less than the diameter of the handle so as to fit snugly upon the handle preferably with a constrictive fit. The general shape of the unit **18** will preferably be somewhat tapered, as illustrated in Fig. 2, but when the socket **20** is applied upon the handle, the extension or stretching of the socket will enlarge it to a diameter substantially equal to the major or maximum diameter of the cup portion of the device. Consequently, no lateral projection occurs, as best illustrated in Fig. 1, and, therefore, the device does not interfere with the grip of the user upon the golf club, particularly upon a putter, the same being the club upon which it is most logical to mount the retriever. The device is light in weight and, therefore, its use does not substantially alter the balance or "feel" of the club or otherwise tend to create any condition which would hamper the player in the normal use of the club.

Since the maximum outer diameter of the retainer at the mouth of the suction cup portion thereof is substantially less than the diameter of a golf ball, the device will apply only to and receive a limited part of that ball, as illustrated in the drawing in Figs. 1, 3 and 4.

The flexibility of the cup, due to its softness coupled with the fact that the concave surface **26** is of substantial depth, provides a free space at **38** between the ball **28** and the concave cup surface **26**. Therefore, when pressure is applied axially of the suction cup, the margin of the cup is deformed in a manner spreading and tending to enlarge the diameter of the marginal wall portion **32**. At the same time the application of pressure effects an intimate face contact of the flange **34** with the surface of the ball. The surface of the ball is commonly char-

acterized by indentations 40 which give it a pebbled surface, and the application of pressure causes those portions of the flange 34 which are adjacent to the depressions 40 to be pushed into those depressions. The pressure applied must be sufficient to partly evacuate air from the space 38, and, consequently, upon release of pressure, a firm suctional adherence will exist between the suction cup and the golf ball at the flange 34 thereof. It will be apparent that since this flange is tapered, the tapering, coupled with the softness of the rubber of which it is formed, permits the flange to follow the surface contour it engages and to maintain an intimate adhesion or frictional contact therewith.

While the shape and character of the flange 34 as described above and as illustrated in Fig. 5 is preferred, it is not critical and alternative constructions may be applied, especially in instances where the device is intended for use as a golf ball retriever. One modified embodiment or alternative form is illustrated in Fig. 6 wherein the flange 34' is defined by a frusto conical outer surface 30' and a frusto conical inner surface 36'. The angle between these surfaces should preferably be in the range between 15 deg. and 30 deg. as specified above, and, preferably, the width or radial dimension of the flange portion 34' should be substantially equal to the thickness of the marginal portion 32 of the cup at the maximum inner diameter thereof, that is, at the junction of the flange 34' with the body of the cup. Substantially the same advantages and functioning of the device occurs with respect to the Fig. 6 embodiment as occurs with respect to the Fig. 5 construction.

The suction cup may be used for other purposes than a golf ball retriever, and, in fact, may be used in any place where a conventional rubber suction cup now can be effectively used. The basic form of such a cup is illustrated in Fig. 7 where the cup is provided with a transverse wall 50 and a skirt portion 52 from which the marginal inwardly projecting flange 54 extends, the cup having the usual concave inner surface 56 comparable to the surface 26 above described. It will be understood that the concavity of the surface 56 for a standard suction cup need not be as great; that is, the depth of the socket need not be as great as that shown in the golf ball retriever in instances where the device is to be applied to flat surfaces in ordinary usage. In such constructions, instead of using a socket, there may be provided an axial stud or projection 58 of the character well understood in the art.

The use of such a suction cup is not limited to application to flat surfaces, but, instead, may be applied successfully to curved surfaces, either convex or concave in form. The application of the cup to a convex surface is illustrated in Fig. 7. One characteristic of the suction cup when applied to such curved surfaces is that the flange 54 will deflect axially, as illustrated in cross-section in Fig. 7, to accommodate an effective suction grip of the suction cup upon the curved surface. The softness of the rubber employed permits the body of the cup to be deformed substantially, as illustrated in Fig. 8, with its margin assuming a somewhat oval shape at 60, as illustrated. This will entail some curvature of the body at the shoulder 62 thereof, as illustrated in Fig. 7, but the curvature at 62, at least in cases where the surface 64 being contacted is of comparatively short radius, need not conform to the surface 64 and, instead, may have a lesser curvature, as seen in Fig. 7. The difference in curvature between 62 and 64 is accommodated by the axial projection of the flange 54, as illustrated in Fig. 7. As an indication of the capacity of a suction cup, made according to this disclosure, tests have been made in which a cup having a maximum diameter at its mouth in the order of $1\frac{1}{16}$ in. has been successfully adhered for long periods of time to a convex surface having a radius curvature as small as $1\frac{1}{4}$ in. While the application of the device to a curved surface has been illustrated only with respect to a convex surface, it will apply equally to a concave surface, the action in that instance being substantially the same and entailing the same deforming of the outer contour of the suction cup and the axial deflection of the lip or flange 54, as illustrated in Fig. 7.

Fig. 9 is a view which illustrates the manner in which the suction cup is deformed to apply it to a surface. In this figure the same numerals applied to Fig. 7 are employed, and the cup is illustrated as being applied to a flat surface. It will be observed that the inward or downward deflection of the central web 50 of the cup is accompanied by an outward flexing of the skirt portion 52 of the cup to a substantially frusto conical outline as illustrated. This tends to circumferentially stretch the flange 54 to draw the same into intimate surface adhesion with the surface it engages. The distortion of the cup is illustrated by a comparison with the dotted lines which illustrate the substantially normal or unstressed shape of the same cup.

While the preferred embodiments of the invention have been illustrated and described herein, it will be understood that changes may be made within the scope of the appended claims without departing from the spirit of the invention.

I claim:

1. A ball retriever for gripping a ball having a pebbled surface characterized by shallow spaced indentations, comprising a cup-shaped imperforate body of a diameter less than the diameter of said ball, said body being formed of resilient material having a durometer measurement in the range from 20 to 70, said body having a skirt portion and a substantially uniform, narrow, continuous, marginal ball-engaging flange formed integrally with and projecting inwardly from the mouth of said skirt portion, said skirt portion being of a depth to receive a portion of said ball within said cup-shaped body with clearance in an axial direction, said flange having inner and outer faces and tapering radially inwardly of said body at an angle in the range between 15° and 35° with respect to each other and being of a width between the outer periphery of the body and the inner edge of the flange not substantially greater than twice the thickness of the skirt portion from which it projects, whereby said flange terminates in a sharp inner edge and is thin and flexible to conform to the pebbled surface contour of a ball when pressed thereagainst substantially concentrically in a direction axially of said body and with sufficient pressure to circumferentially stretch said flange and partially expel air from the interior of said cup-shaped body.

2. A ball retriever as defined in claim 1, and means at the end of said body opposite the end from which said flange projects for mounting said body on a supporting member.

3. A ball retriever as defined in claim 2, in which the means for mounting the body is an integral cup-shaped socket forming portion substantially axially aligned with and opposite said cup-shaped part adapted to fit frictionally on the end of the handle of a golf club.

4. A ball retriever as defined in claim 2, in which the means for mounting said body is a stem projecting centrally from the cup-shaped body opposite the end from which said flange projects and providing means to mount said body on a support.

5. A ball retriever as defined in claim 1, wherein both the inner and outer faces of said flange are beveled to space the edge of the flange inwardly from the plane of the mouth of said body.

References Cited in the file of this patent

UNITED STATES PATENTS

993,989	Hazelrigg	May 30, 1911
1,152,981	Schacht	Sept. 7, 1915
1,178,147	Gardner	Apr. 4, 1916
1,655,979	Watkins	Jan. 10, 1928
1,830,520	Moyses	Nov. 3, 1931
2,126,689	Povliot	Aug. 9, 1938