Dec. 10, 1957 V. PRIBIL 2,815,919

SUCTION CUPS

Filed Oct. 20, 1954

Fig. 1.

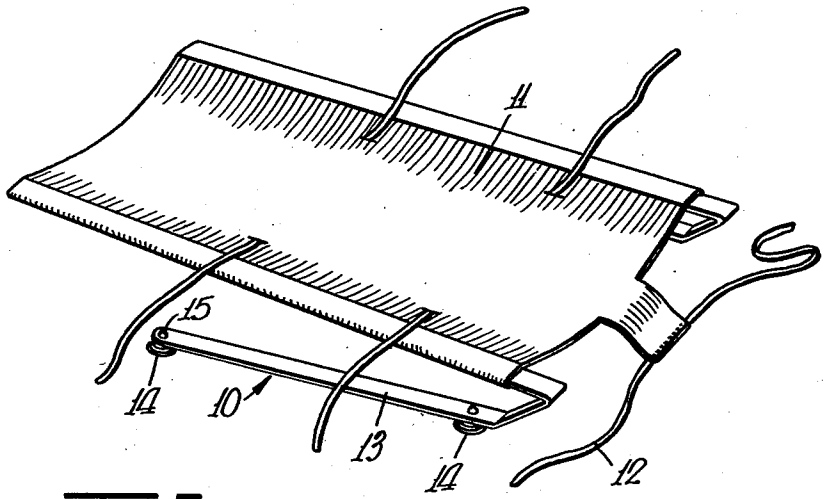


Fig. 2.

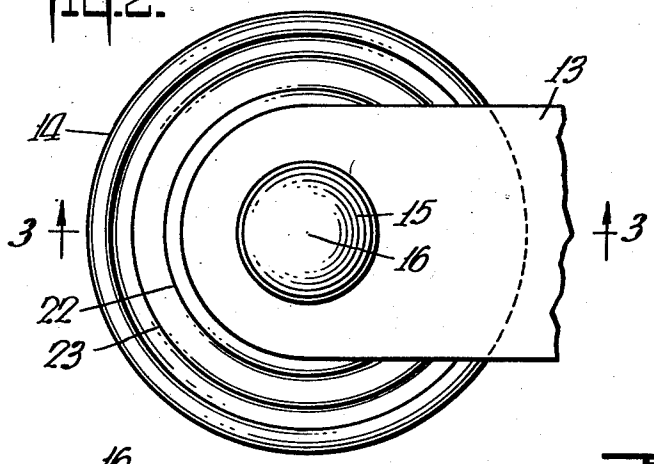


Fig. 3.

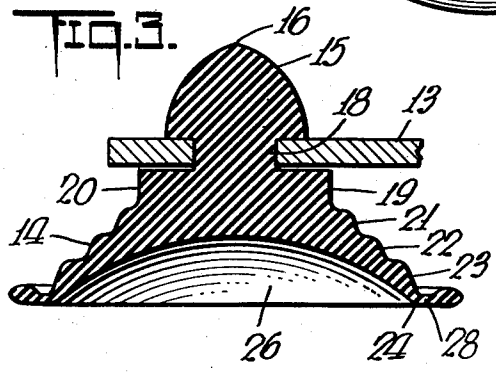
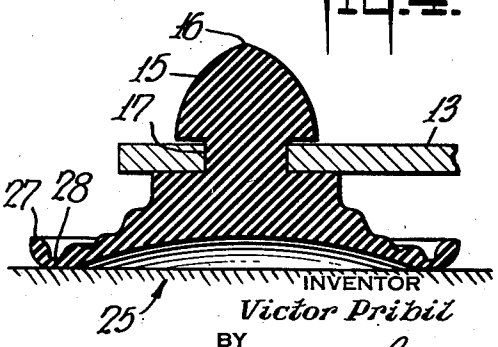


Fig. 4.



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SUCTION CUPS

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3 Claims. (Cl. 248—363)

This invention relates to suction cups.

Vacuum or suction cups of rubber or other flexible material are well known. In one type of suction cup commonly used, it is frequently necessary to use a blade or other object to pry up a portion of the cup to break the vacuum and permit ready removal of the cup. This results in marring of the surface on which the cup is placed and the cutting or scuffing of the cup itself which is objectionable for obvious reasons. In order to eliminate such objections to suction cups, it has been proposed to provide the exterior thereof with a lug or ear which can be grasped and pulled to lift a portion of the cup to permit access of air and break the vacuum. Such lugs or ears have the objections that they require positioning of the cups in use for convenient access to the lug or ear. Furthermore, they add to the cost of the cup since in the production of molded cups the mold must be designed to produce the lug or ear on the exterior of the cup which results in a more complicated and hence more costly mold construction. Moreover, the ear or projection on the exterior of the cup interferes with the smooth, more or less streamlined appearance of the cup which is desired at times.

It is among the objects of the present invention to provide a suction cup so designed that the suction or vacuum can readily be broken when it is desired to remove the cup from the surface on which it is mounted, which cup is free of ears or other protuberances, which cup does not require the use of a blade or other tool for the purpose of facilitating its removal from the surface on which it may be mounted, which cup is so designed that the portion thereof facilitating its removal is always readily accessible irrespective of the position of the cup, and which cup for a given size and of the same flexible material invariably results in a firmer hold onto a surface on which it may be mounted than the vacuum or suction cups heretofore known.

Other advantages and objects of the present invention will be apparent from the following detailed description thereof.

The suction cup of this invention has a peripheral rim connected by a thin flexible member to the edge of the cup defining the limits of the vacuum space when the cup is positioned on a surface and held thereon by the vacuum in this space. This thin flexible member, when pressure is applied to the cup to secure it on a surface, causes the rim to turn up thus providing about the entire periphery of the cup an upstanding edge which can be readily engaged to lift a portion of the cup and thus break the vacuum whenever it is desired to remove the cup from the surface on which it is mounted. The thin flexible connecting member cooperates with the edge of the cup defining the vacuum space to provide an improved gas-tight seal relative to the surface on which the cup is mounted with consequent improvement in the "hold" of the cup on this surface.

In the accompanying drawing forming a part of this

specification and showing, for purposes of exemplification, a preferred form of this invention, without limiting the claimed invention to such illustrative instance:

Figure 1 is a perspective view of a device for supporting infants while bathing, which is disclosed and claimed in my Patent No. 2,460,308 granted February 1, 1949 and shows one of the many forms of devices in connection with which the suction cups of this invention may be used;

Figure 2 is a top plan view of the suction cup of this invention secured to one of the legs of the device of Figure 1;

Figure 3 is a vertical section taken in a plane indicated by the line 3—3 of Figure 2 and showing the vacuum cup on a surface in position before pressure is applied to create the vacuum holding the cup onto the surface; and

Figure 4 is a vertical section similar to Figure 3 but showing the cup after pressure has been applied so that the vacuum has been created, maintaining the cup on the surface.

In the case of the embodiment shown in the drawing involving the use of the suction cups on infants' bathing devices, the cups are used to secure the device, say to the base of a sink or bathtub, so that the device will not move when it is partially or completely under water. The feature of this invention which enables breaking the vacuum to permit removal of the infants' bathing device is particularly useful in this application because when the device is immersed in soapy water the vacuum cups cannot be easeily seen. With the present invention, as more fully explained hereinafter, by placing a hand in the water the upstanding rim of each cup can easily be located by feel and a gentle pull on the rim will break the vacuum releasing the hold. It will be understood that the invention is not limited to this application, nor is it limited to the particular shape of cup disclosed.

In the drawing **10** indicates the frame of a device for receiving an infant, as disclosed, e. g., in my aforementioned Patent No. 2,460,308, which frame supports an apron **11** provided with tie ribbons **12** for securing the infant in an inclined position to facilitate bathing of the infant. Frame **10** desirably is provided with legs **13** having suction cups **14** thereon to maintain the frame **10** in the desired fixed position while the infant is being bathed.

In the embodiment of the invention shown in the drawing suction cups **14** are provided with a top button **15** tapering so that they come to a point, as at **16**, facilitating the entry of the button in an opening **17** provided in the leg **13**. The base of button **15** is connected by a neck **18**, of reduced diameter as compared with the diameter of the base of button **15**, with the body portion **19** of the cup. In this way, since the cup is made of flexible material, such as rubber including synthetic rubber, or flexible plastic, it can readily be connected with the legs **13** by forcing the button **15** through the opening **17**, the natural tendency of the rubber to expand resulting in the cup being firmly mounted on the leg **13**. It will be understood, however, that, as noted above, the shape of the cup may be varied as desired, and, instead of using the button **15** as a securing means, the cup may be secured to the member with which it is intended to be used by means of an adhesive, by riveting it thereto, by the use of other securing means, such as pins, bolts, nuts, etc., or in any other suitable way.

In the embodiment of the invention shown in Figures 3 and 4 the cup is of general conical shape and comprises a body portion **19** consisting of a top cylindrical member **20** and three succeeding annular rings **21**, **22** and **23** of gradually increasing diameter. Ring **23**, the lowermost ring, has its peripheral edge **24**, which edge in the embodiment shown is circular in contour, in contact with the

surface 25 on which the cup may rest. The underside of the cup is of concave shape, as best shown in Figure 3, this concavity being indicated by the reference character 26.

A rim 27 is connected with the edge 24 by a thin flexible member 28. The thickness of member 28 will depend on the size of the cup, the particular flexible material employed in fabricating the cup, i. e., whether natural rubber, synthetic rubber, or other flexible plastic material, the grade of the flexible plastic material used, etc. It should be sufficiently thin so that, when pressure is applied to the peripheral edge 24 against a surface on which the cup may be positioned, it will cause the rim to turn upwardly, as shown in Figure 4. One embodiment of the invention made of rubber reclaim and which gave an unusually firm hold or grip when applied to a smooth surface with the rim 27 turning up to provide an accessible member for releasing the cup, had a diameter at the base of the concave portion defined by the peripheral edge 24 of 1¾ inches, a height of approximately 1½ inches, a height of the concave portion 26 of approximately ¼ inch, a thickness of flexible member 28 of approximately $\frac{1}{32}$ inch, and a width of the member 28 of approximately $\frac{1}{16}$ inch. It will be understood the invention is not limited to these dimensions and the dimensions and appearance of the cup may be varied to suit any application or desire. Furthermore, while in the interests of mass production economy, it is preferred to produce the vacuum cups by molding them, they can of course be made in any other manner.

In use the cup is applied to a surface by exerting pressure in a downward direction, i. e., towards the surface. This causes deformation of the lowermost annular ring 23, i. e., a flattening thereof from the shape shown in Figure 3 to that shown in Figure 4. It also causes the thin flexible member 28 to be extended in a direction away from the cup, the integral rim 27 to be curled upwardly, as shown in Figure 4, and the expulsion of air from concavity 26. Upon removal of this pressure a holding vacuum is created, as will be understood, this holding vacuum being of improved strength due to the above described coaction of ring 23 and thin flexible member 24 producing a better seal between the base of the vacuum cup and the surface on which it is positioned.

It will be noted that the vacuum cup of this invention is designed so that the suction or vacuum can be readily broken when it is desired to do so by exerting a slight pull on the raised rim 27. It is free of ears or projections, does not require the use of a blade or other tool to effect its removal, and the upstanding rim 27 which facilitates removal completely encircles the cup so that it is always readily accessible irrespective of the position of the cup. The flexible member 28 adds holding power to the cup. This may be explained on the theory that the pressure applied to the cup causes flattening and extending deformation of lowermost ring 23 and thin member 28 resulting in a better seal or gas-tight joint between the portion of the cup in contact with the supporting surface and the supporting surface with consequent improvement in the suction or vacuum maintaining the cup in position. Moreover, this action is further augmented by the fact that, in view of the greater flexibility of the member 28 chiefly because of its thinness, better adherence results to surfaces to which the cup may be applied. Thus, for example, it has been found that this cup adheres firmly to a curved surface, such as the roll edge of a sink.

Since certain changes may be made in the vacuum cup embodying this invention without departing from the scope of this invention, it is intended that all matters contained in the above description or shown in the accompanying drawing shall be interpreted as illustrative and not in a limiting sense.

What is claimed is:

1. A vacuum cup comprising a body portion the base of which is shaped to provide a concave surface on its underside and a rim connected to the peripheral edge of said base by a flexible, annular portion having a width approximately double its thickness, said flexible annular connecting portion being of uniform thickness throughout its width and of a thickness of about $\frac{1}{32}$ of an inch, said rim being of appreciably greater thickness than said annular connecting portion whereby pressure exerted on said cup to secure it to a surface causes said rim to turn upwardly providing a projecting rim which can be engaged and lifted to break the vacuum and thus release the cup.

2. A vacuum cup of flexible material which is compressible and expandable comprising a body portion having a concave underside the outer periphery of which is adapted to rest on a surface, an integral annular rim secured to said outer periphery by a flexible annular connecting portion, which portion is so constructed that when pressure is applied to said cup it causes the rim to turn upwardly, a portion of the connecting portion remaining in engagement with the said surface on which the cup is mounted providing an upstanding portion completely encircling the cup which can be engaged and when pulled breaks the vacuum, said flexible annular connecting portion having a width approximately double its thickness, said flexible annular connecting portion being of uniform thickness throughout its width and having a thickness of about $\frac{1}{32}$ of an inch, said rim being of appreciably greater thickness than said flexible annular connecting portion.

3. A rubber vacuum cup of general conical shape having a concave vacuum maintaining portion in its base, a rim connected to the peripheral edge of said base by a thin rubber annular connecting portion so constructed and arranged that when pressure is applied to said cup to cause it to grip a surface said rim turns upwardly providing an upstanding portion completely encircling the cup which portion can be engaged and when pulled breaks the vacuum, said thin rubber annular connecting portion being of uniform thickness throughout its width, having a width approximately double its thickness and a thickness of about $\frac{1}{32}$ of an inch, and said rim being of appreciably greater thickness than said flexible annular portion and being of generally convex shape.

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