

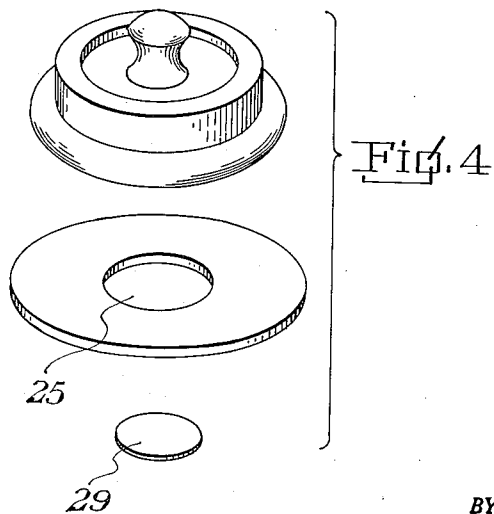
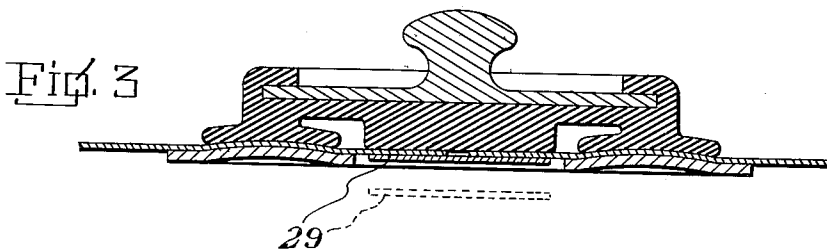
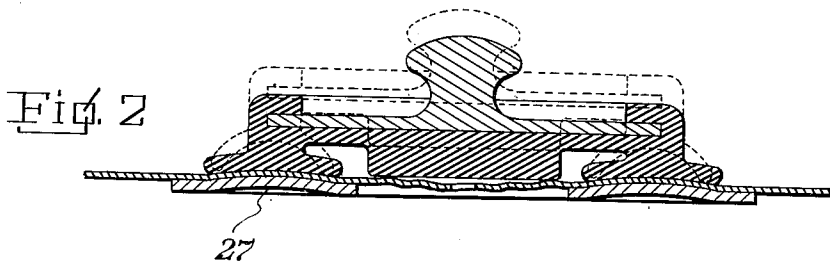
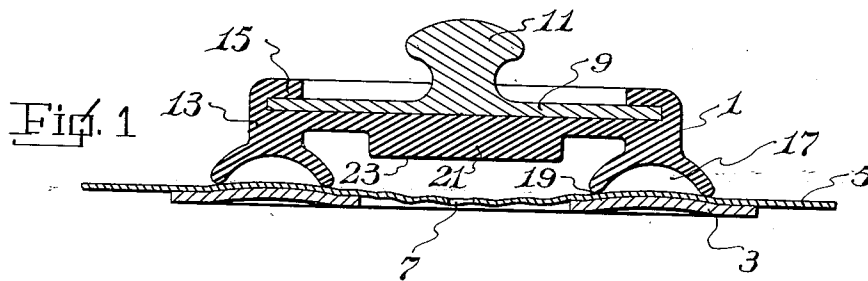
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REPAIR DEVICE

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REPAIR DEVICE

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The present invention relates to repair devices, and more particularly to devices for patching holes in fluid-impervious flexible sheet material such as the side walls of above-ground swimming pools.

In the past, when it has been desired to repair a hole in a large flexible container such as a plastic swimming pool, it has been necessary to drain the water from the pool at least below the level of the hole, dry the material of the pool and then patch it. Naturally, this has been an annoying and time-consuming procedure; and with the recent popularization of backyard swimming pools, the need for a device that can quickly and easily repair holes in the pool without the necessity of draining the pool has become increasingly great.

Accordingly, it is an object of the present invention to provide a device for repairing fluid-impervious flexible sheet material, in which at least one side of the sheet material can be immersed in water during repair.

Another object of the present invention is the provision of a device for repairing fluid-impervious flexible sheet material, which is fully supported by the sheet material itself during the repair operation.

Still another object of the present invention is the provision of a device for repairing fluid-impervious flexible sheet material, in which no element need be extended through the hole in the material, and in which nothing need be permanently secured to the material itself other than the patch which closes the hole.

Finally, it is an object of the present invention to provide a device for repairing fluid-impervious flexible sheet material, which will be easy and inexpensive to manufacture, quick and foolproof to operate, and rugged and durable in use.

Other objects and advantages of the present invention will become apparent from a consideration of the following description, taken in connection with the accompanying drawing, in which:

FIGURE 1 is a cross-sectional view of the present invention about to be secured to flexible sheet material for the repair of a hole therein;

FIGURE 2 is a view similar to FIGURE 1 showing the next step in securing the device to the sheet material;

FIGURE 3 is a view similar to FIGURE 1 showing the device fully attached and showing the patch being applied; and

FIGURE 4 is an exploded assembly perspective view of the device of the present invention and an associated patch.

Referring now to the drawing in greater detail, the principal elements of the repair device according to the present invention are a vacuum member 1 and a stiff back-up plate 3, adapted to be placed on and secured to opposite sides of a portion of fluid-impervious flexible sheet material 5, which may for example be a flexible plastic sheet such as heavy polyethylene film. The device of the present invention is needed when a rip, tear or hole 7 develops in the sheet material.

Vacuum member 1 comprises a flat, rigid circular plastic disc 9 having an integral handle 11 centrally thereof. Disc 9 provides a support and firm backing for an attachment 13 of rubber or other elastic deformable material, which fits over and is retained on the edges of disc 9 by means of a flange 15. On the other side of disc 9, attachment 13 is provided entirely about its periphery with an annular vacuum cup 17 of which the portions

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farthest from disc 9 are two concentric circular edges 19 disposed in a plane parallel to the plane of disc 9.

Also provided on the underside of attachment 13 is an integral circular central boss or projection 21 which is circular and of a height less than the distance between disc 9 and the plane of edges 19 and a diameter less than the diameter of the inner edge 19 and which terminates on its underside in a flat surface 23. In the unstressed position of vacuum member 1, as shown in FIGURE 1, the plane of flat surface 23 is parallel to and spaced from the plane of edges 19.

Backup plate 3, the other component of the invention, is rigid and may for example be of metal and is provided with a circular central opening 25 of an area less than the area of the central opening of the vacuum cup, that is, within the smaller circle defined by the inner edge 19 in the position of the device shown in FIGURES 2 and 3. Back-up plate 3 is also provided with a small annular convexity as at 27, which conforms the plate to a limited extent to the curvature of annular vacuum cup 17 and thereby makes it easier to cause the vacuum cup to assume the position of FIGURES 2 and 3. It is to be expressly understood, however, that plate 3 may be flat and uniplanar.

In use, for example in connection with a leaking swimming pool having a hole 7 therein, backup plate 3 is placed on the outside of the plastic sheet material of the pool with hole 7 exposed through opening 25 and backup plate 3 enclosing hole 7. Backup plate 3 is held in this position with the fingers of one hand while vacuum member 1 is placed in the position shown in FIGURE 1, that is, with annular vacuum cup 17 directly opposed to backup plate 3 on the other side of sheet material 5.

The two members are then forced together until they assume the position shown in FIGURE 2. With vacuum cup 17 thus fully engaged on sheet material 5, flat surface 23 now lies in the plane of edges 19, so that sheet material 5 is fairly flat against flat surface 23, as shown in FIGURE 3.

When the hands are removed from vacuum member 1 and backup plate 3, a most remarkable phenomenon is noted: members 1 and 3 remain firmly in place on sheet material 5 with no other support. This is because vacuum cup 17 draws a vacuum on fluid-impervious flexible sheet material 5, which in turn draws a vacuum on backup plate 3. Naturally, if sheet material 5 were not fluid-impervious or were inflexible, this phenomenon would not be observed. Thus, a vacuum cup and a relatively rigid member are held together by the vacuum cup, on opposite sides of the sheet material, even though the rigid backup member touches nothing but the sheet material.

In this assembled position, projection 21 provides a firm backing for the sheet material adjacent hole 7; and it is now possible to apply a patch 29 in the usual way in the free space afforded by central opening 25 in backup plate 3, the patch being applied as shown in FIGURE 3 and cemented or otherwise fixed in place in a known manner.

After the cement has dried or the patch has otherwise become permanently emplaced, the vacuum of vacuum cup 17 may be broken by lifting an edge thereof in the usual manner and member 1 and plate 3 may then be removed. Of course, the gripping effect of vacuum cup 17 is unimpaired by water, so that vacuum member 1 may be applied under water with no need to drain the pool. In assembled position, member 1 and plate 3 provide a rigid frame entirely about the hole in the sheet material, as well as a backing member in the form of projection 21.

From the foregoing description, it will be understood that although vacuum cup 17 is referred to for conven-

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ience as "annular," its shape can depart from circular without departing from the invention. Similarly, the shape of projection 21 is immaterial so long as its flat surface 23 is of an area less than the opening of member 1 within the smaller circle of the inner edge 19 in the position of FIGURES 2 and 3, so that the projection does not interfere with vacuum cup 17. Also, central opening 25 need not be circular, but need only provide access to hole 7. Also, although back-up plate 3 is shown as annular in FIGURE 4, it is so shown only for convenience, the shape of its outer edge being completely immaterial so long as plate 3 remains of sufficient area to provide backing for cup 17 in the fully assembled position. Thus, it may in certain circumstances be desirable to make plate 3 and cup 17 and projection 21 and opening 25 rather greater in length than in width, to accommodate holes 7 in the form of elongated rips; but all these immaterial variations are within the scope of the present invention as defined by the appended claims.

It is obvious, therefore, that all of the initially recited objects of the present invention have been achieved; and hence, it is to be understood that the appended claims are to be accorded a range of equivalents commensurate in scope with the advance made over the prior art.

What is claimed is:

1. A device for repairing fluid-impervious flexible sheet material, comprising, the combination of an annular vacuum cup of elastic deformable material enclosing a central opening, and a stiff plate having an opening therethrough no larger than the central opening of the vacuum cup, so that when the vacuum cup and stiff plate are pressed together with flexible sheet material therebetween, the vacuum cup will secure the plate firmly against the sheet material and with the plate will provide a rigid frame for a region of sheet material exposed on the plate side of the assembly.

2. A device as claimed in claim 1, and a central projection on the underside of the vacuum cup extending toward but terminating short of the plane of the edges of the vacuum cup when the vacuum cup is in unstressed

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condition, the projection terminating in a flat surface parallel to said plane.

3. A device as claimed in claim 2, said flat surface lying in said plane when the vacuum cup is fully engaged.

4. A device for repairing fluid-impervious flexible sheet material, comprising a rigid back-up member, and an annular vacuum cup of elastic deformable material secured to the back-up member, so that when pressure is applied to the back-up member in the direction of a fluid-impervious surface, the cup will be forced into clinging relationship with said surface entirely about a central region of sheet material which is free from clinging engagement with the vacuum cup, and a central projection on the underside of the vacuum cup extending toward but terminating short of the plane of the edges of the vacuum cup when the vacuum cup is in unstressed condition, the projection terminating in a flat surface parallel to said plane.

5. A device as claimed in claim 4, said flat surface lying in said plane when the vacuum cup is fully engaged.

6. A device for repairing fluid-impervious flexible sheet material, comprising the combination of an annular vacuum cup of elastic deformable material enclosing a central opening, a stiff plate having an opening there-through no larger than the central opening of the vacuum cup, and fluid-impervious flexible sheet material between the vacuum cup and the stiff plate with the vacuum cup and the stiff plate pressed together and the vacuum cup holding the stiff plate to the side of the sheet material opposite the vacuum cup.

7. A device as claimed in claim 6, and a central projection on the underside of the vacuum cup terminating in a flat surface lying substantially in the plane of the edges of the vacuum cup.

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