Jan. 31, 1967 R. G. FOOTE 3,300,790

TUB WITH REMOVABLE LINER

Filed Feb. 24, 1964 3 Sheets-Sheet 1

Fig. 1.

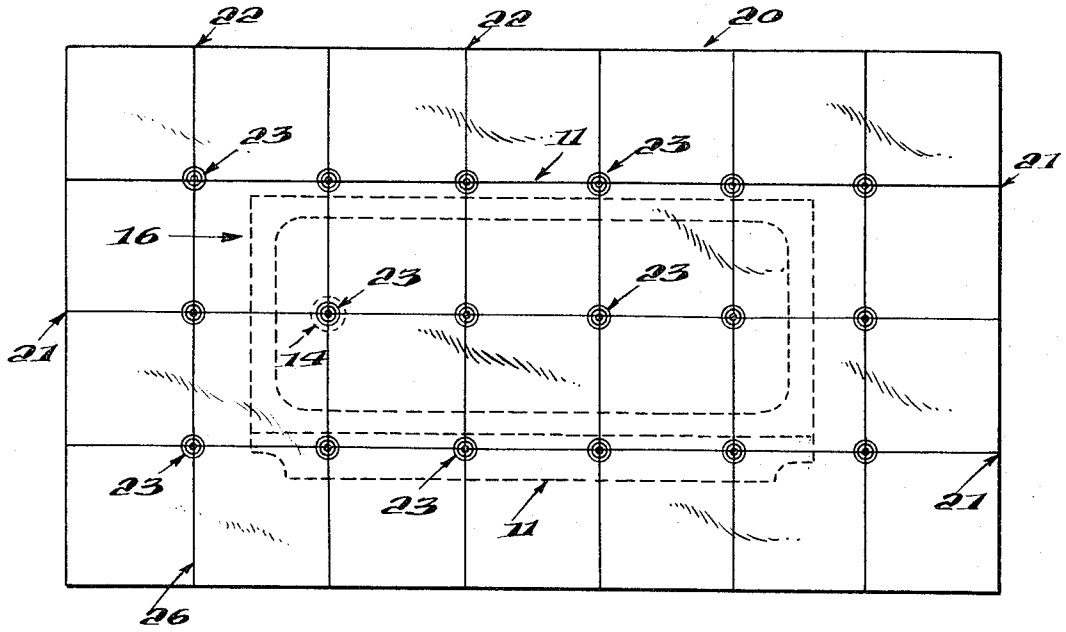
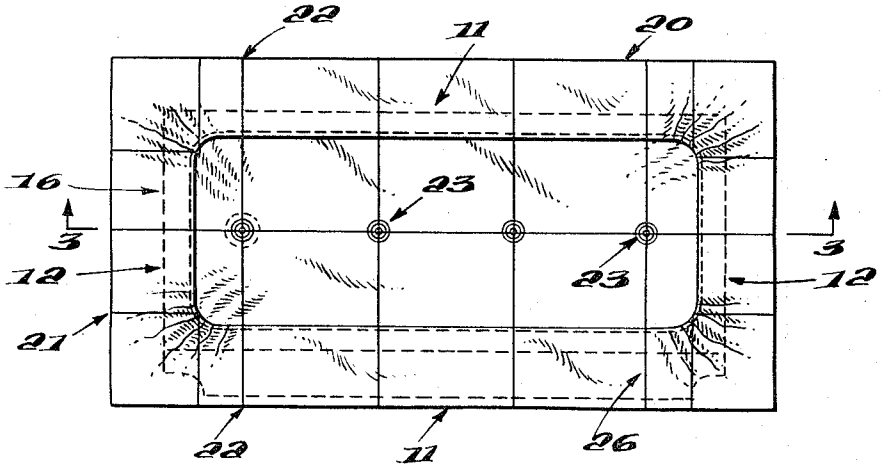


Fig. 2.



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TUB WITH REMOVABLE LINER

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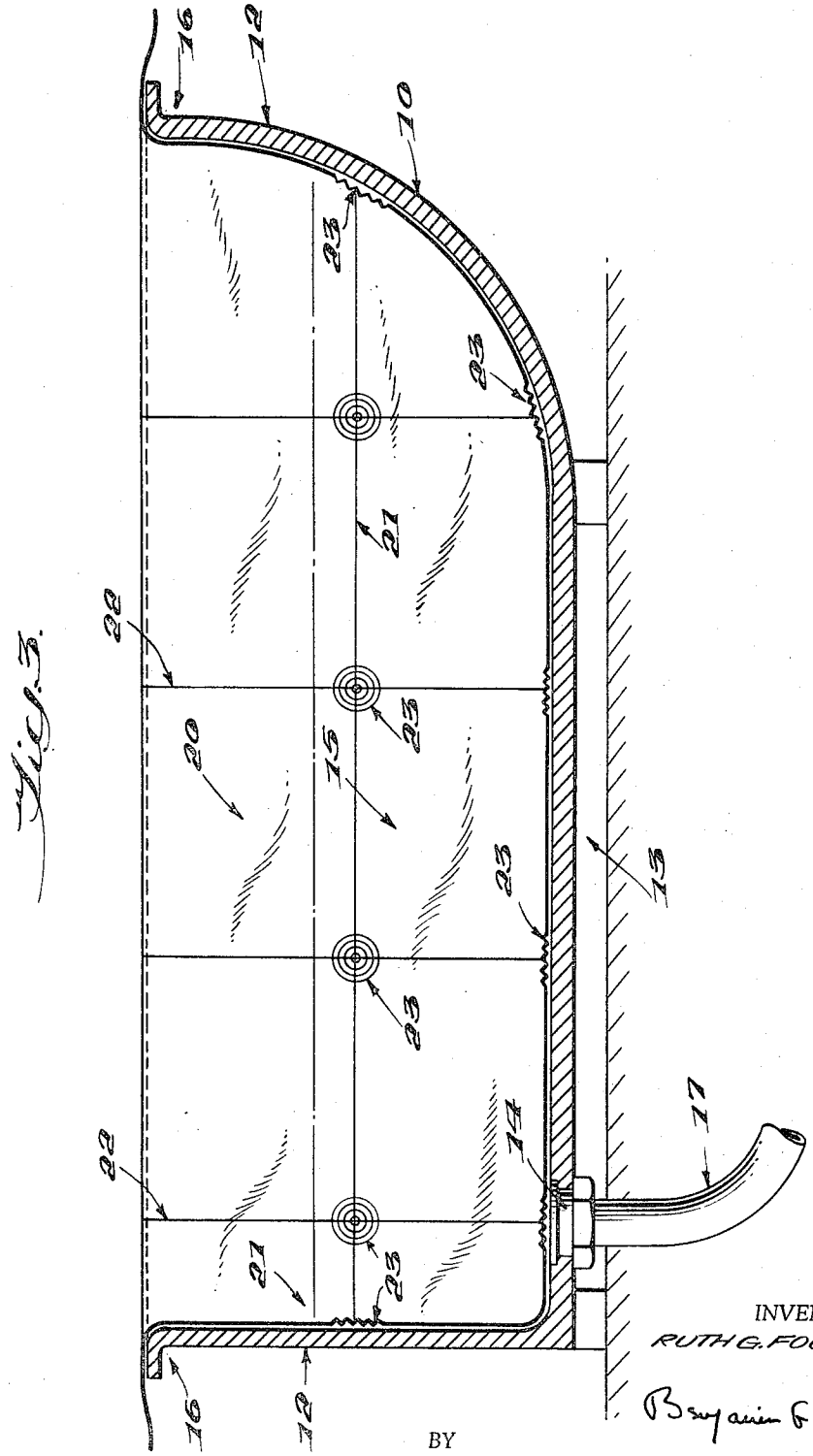


Fig. 2.

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Jan. 31, 1967 R. G. FOOTE 3,300,790

TUB WITH REMOVABLE LINER

Filed Feb. 24, 1964 3 Sheets-Sheet 3

Fig. 4.

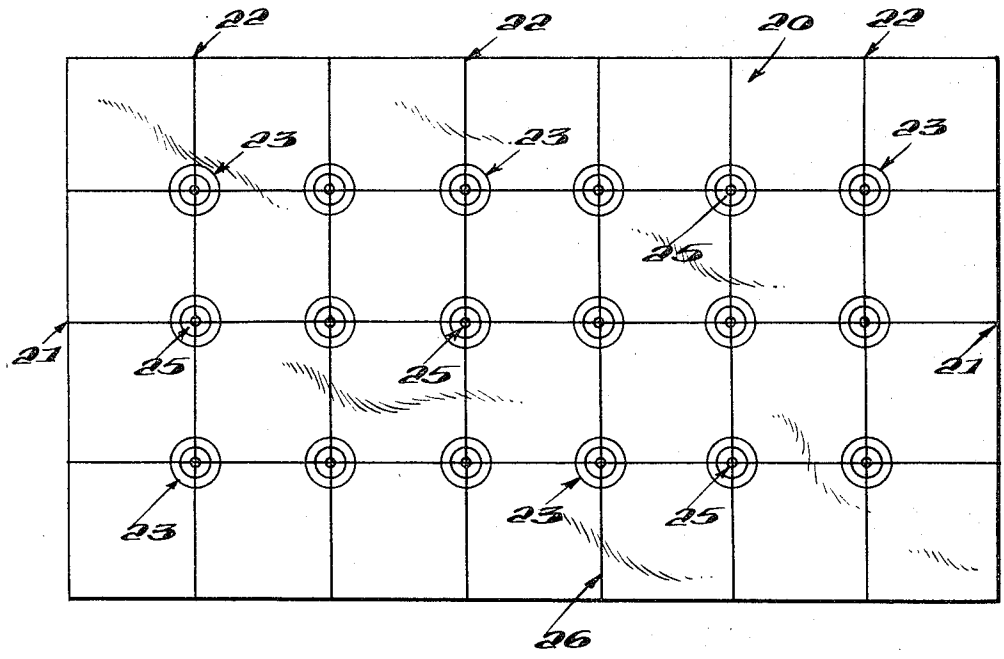


Fig. 5.

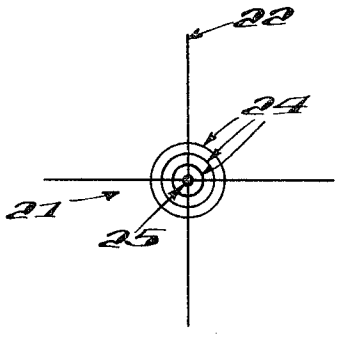
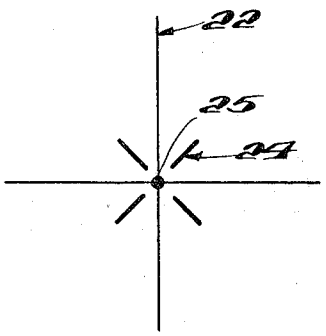


Fig. 6.



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3,300,790

Patented Jan. 31, 1967

3,300,790

TUB WITH REMOVABLE LINER

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5 Claims. (Cl. 4—185)

The present invention relates generally to a liquid containing device using a removale flexible thin sheet or film as a liner therefor and more particularly to a tub or basin having a removable non-reusable releasably adherent film liner uniquely constructed to prevent either contamination of, or damage to, the interior of the tub or basin by the fluid contained therein and to facilitate the draining of the fluid contents contained within the basin or tube.

Over the years, demand has been created for a cheap labor saving device for containing liquids within a container such as a tub, basin or tank in such a way as to avoid the time consuming, and therefore costly, labor of cleaning the container to eliminate the presence of any residue remaining after the draining of the container. This can be a most difficult task involving detergents, solvents, abrasives and high temperature cleaning agents such as steam, some of which methods may do permanent damage to the interior finish of the container. Demand was also created for a device that would prevent contamination of subsequently added fluid by any residue remaining after draining the prior contents. It was important that such device be removable, readily disposable and light in weight for ease in handling and capable of being compacted into a small volume for ease of disposal. It was likewise important that the construction of the container be adaptable to retain without leakage a variety of fluids of varying chemical and physical characteristics. It was also important that such a device be non-reusable to avoid accidental contamination of subsequently added contents and to ensure that labor not be used in a cleaning or decontaminating operation. It was further important that such device not be dependent on the geometry of particular containers, but would be adaptable to a range of containers of varying geometry. It was again important to provide a device that was readily drainable without the use of valves or integrally connected liquid discharge conduits, and which could be readily drained even when the liquid contained therein was opaque. Containers embodying such features are of great interest to housewives who presently spend much time in cleaning or attempting to clean, tubs, basins and other containers in which various bathing, cleaning, degreasing, dyeing and culinary operations have been performed. They are also of interest to portions of the food dispensing industry such as restaurants, hotels, trains, and steamships, as well as to the food processing industry. They would also be of interest to agricultural users in connection with watering and painting operations as well as in connection with the containment of liquid fertilizers and insecticides. They are further of interest to the many users of industrial processes involving countless types of solutions and baths, including as examples dyeing, plating, finishing, photographic, cleansing and other well known processes. The invention is designed to satisfy

all these desirable conditions sought by a multitude of users and at the same time to provide a highly improved means for the containing of liquid.

From the description given below, it will be seen that I have designed a unique container of unique construction which will yield a highly improved performance.

Although the broad idea of employing a removable liner in a container for fluid is not new, they have had disadvantages and have not proven to be satisfactory. Such liners have been constructed of a relatively heavy gauge material in order to provide the durability necessary for continued reuse. This resulted in the need for expenditure of time and effort to clean the liner and merely succeeded in substituting an alternate disagreeable cleaning job for the task of cleaning the tank itself. An unsatisfactory result of the use of such heavy gauge materials was that the material was of such a weight as to overcome the forces of mutual attraction between the adjoining surfaces of the liner and the container, thereby requiring the use of mechanical hanger devices to secure the liner from collapsing into its containing structure. Employment of such hangers required cooperating structural provisions affixed to the container, thus necessitating a close relationship between the container and the geometry and dimensions of the liner and its supporting structures. This limited the utility of such liners to containing structures of specific types and did not permit the employment of such liners with a broad range of supporting structures of various sizes and shapes. Moreover, the use of such liners of relatively heavy gauge resulted in the provision of a liner of limited flexibility that would not conform completely to the contours of its containing structure leaving unsupported areas, thereby necessitating the use of a liner of sufficient strength to withstand the pressure load of the therein contained fluid in areas unsupported by its retaining structure. In order to avoid substantially unsupported structure, retaining structures specially designed to mate with the geometry and dimensions of their liners were required. Such liners were likewise structurally related to their containing structure due to the employment of valving means and attached conduits for draining the fluid contents of the liner which of necessity must cooperate with the location of a complementary drain hole in the retaining structure. This also required a close design relationship between the construction of the liner and the construction of its retaining structure. Likewise, liners were either formed from a series of panels joined together or from blanks with lapped margins, which panels or blanks were adapted to conform to the shape and size of the tub or like. Such liners so devised to conform to the shape and size of their retaining and supporting structures are severely limited in their range of adaptability to structures of varying sizes and shapes. Such conforming type liners have the further disadvantage of requiring careful positioning of the liner with respect to its supporting structure. This is particularly so in the case of a liner composed of more than one part, which parts are not bonded or joined together by seams but merely overlie each other, thus requiring their cooperating parts to be precisely positioned with respect to each other and to their supporting and retaining structure to provide the proper overlap. The requirement for such a

special design relationship between the basin, tub or tank and its liner resulted in an expensive apparatus, which expense in its turn resulted in the economic need for a liner capable of being used a substantial number of times. Consequently, the inexpensive, but destructive, method of draining through rupturing the liner in the vicinity of a drain hole was not contemplated. Since a rupturable structure for draining its contents was not contemplated, no means for locating the point of location of the drain hole in the retaining structure within which the liner was positioned was provided. Lastly, liners did not provide a surface adapted to reduce the slipping of objects positioned thereon to a minimum, thereby neglecting to provide desirable safety and protective features.

Therefore, it is the general object of the invention to provide a novel and improved container for fluids of simple and inexpensive construction and improved efficiency.

A primary object of the invention is to provide a device for the containment of fluids so constructed as to eliminate the tedious labor of cleaning the inner surfaces of the container after the fluid content thereof has been drained.

Another primary object is to provide a container so constructed as to prevent contamination of subsequently added fluid by any residue of the prior contents remaining after draining the container.

Thus, an object of the present invention is to provide the container with lining means that is made of a thin material that is inexpensive, light in weight and of small mass in order that it be readily and economically disposable.

Also, it is an object of the invention to provide a liquid container having a removable flexible liner impervious to the fluid therein contained.

Furthermore, it is an object of the invention to provide the liquid container with a lining construction simple and economical to manufacture, being made out of single unitary sheet without seams or joints and without valves or conduits for the draining thereof.

It is a further objective of the invention to provide a liquid container having a removable flexible lining not requiring mechanical means for the suspension thereof in its retaining structure, but which releasably adheres to the interior surfaces of its retaining structure through the mutual attraction of their respective adjoining surfaces.

It is another object of the invention to provide a liquid container having a removable flexible liner that is of a construction adaptable to a variety of containers of varying sizes and shapes and not dependent on the geometry and proportions of a particular container for utility.

It is still another object of the invention to provide a liquid container with a removable non-reusable liner constructed to be readily drained through the destruction of a selected area thereof and of such a low cost material as to render such destruction attractive from an economic standpoint.

It is yet another object of the invention to provide a liquid container with a removable liner with positive means to permit the location of the drain area of the container to permit rupturing the liner at that point to enable the contents of the container to be drained.

It is again another object of the invention to provide a liner with a non-skid surface.

According to the invention, the above objects are attained by providing a fluid container having a retaining structure having a drain hole therein supporting a thin seamless single sheet film serving as a removable liner therefor, which, being releasably adherent to the inner surfaces of the retaining structure through the mutual attraction of their adjoining surfaces and therefore being suspended within this structure without the

use of mechanical hangers, is formed with a plurality of weakened areas which are easily rupturable and is permanently marked with a regular geometric design that provides coordinate reference points, these coordinate points being coincident with the geometric center of the geometric design so that the center of these weakened areas may be readily located with reference to this design. The liner is so positioned within the structure that at least one of these weakened areas is over the drain hole in the supporting structure so that, when the weakened area is ruptured, the fluid content will drain from its container. The location of the exact point at which the liner is ruptured is the center of the weakened area located above the drain hole, which location can be quickly and easily obtained by reference to the geometric design, at least part of which is visible above the level of the retained fluid.

In a preferred form of the invention, the liner is comprised of a readily tearable transparent polymeric plastic film which is readily tearable and which is releasably adherent through the action of static electricity. In this form, a geometric design in the form of a grid is printed on the liner with permanent ink and the geometric centers of a plurality of weakened areas are located at the intersections of the lines forming this grid. At least one of these weakened areas is positioned over a drain hole in the bottom of the supporting structure and then the film is spread out over the inner surfaces of this structure to intimately conform to the inner contours thereof so that the hydrostatic load of the contained fluid is transmitted to the structure. The exact location of the drain hole is then determined by reference to the coordinates provided by the printed geometric design and noted. The container is then filled with fluid to a level below the upper portion of the liner which bears thereon a visible portion of the printed grid. When it is desired to drain the container, the liner is ruptured over the drain hole, the location of the rupture point being precisely determined by reference to the visible portions of the printed grid. After draining, the liner is removed from its retaining structure and its disposition is effected. No cleaning of the retaining and supporting structure is required before relining it with a fresh liner and thereafter refilling it with fluid.

The above and other objects and advantages of the invention will become apparent upon full consideration of the following detailed description and accompanying drawing in which:

FIGURE 1 is a plan view of the device with the parts thereof arranged for final assembly.

FIGURE 2 is a plan view of the assembled device;

FIGURE 3 is a sectional view of FIGURE 2 taken along the lines 3—3 thereof;

FIGURE 4 is a plan view of a segment of a plastic film liner constructed in accordance with the invention;

FIGURE 5 is an enlarged fragmentary plan view of a weakened area formed in the film illustrated in FIGURE 4, but on a larger scale, showing the relationship of position of the weakened areas to the geometric design marked on the film; and

FIGURE 6 is another enlarged fragmentary plan view of a weakened area of a different geometrical configuration formed in the film illustrated in FIGURE 4, but on a larger scale, showing the relationship of the position of the weakened areas to the geometric design marked on the film.

With particular reference now to the several figures wherein like parts are identified by like reference numbers, a basic embodiment of the features of the present invention is shown in which a rigid retaining and supporting structure of this invention is shown to comprise a tub **10**, which can be constructed or formed of many materials and in many ways that are well known, a very well known example of which is a thin-walled iron casting. Tub **10**, depending on choice of material, may have its interior coated with an oxidization resistant coating

such as a porcelain finish of fused vitreous enamel. Tub 10 is preferably constructed to have two substantially identical sides each designated 11, and two identical ends each designated 12 and a bottom 13. An aperture 14 is formed in the bottom 13 of the tub 10 to serve as a drain hole and a drain pipe 17 is fitted to drain hole 14 to carry away fluid from the tub. Tub 10 is provided with a rim 16 extending continuously around its upper portion.

A liner 20 is positioned within the tub 10. Liner 20 is formed from a thin highly flexible readily tearable film impervious to the fluid contained. It is constructed from a single sheet of film without seams, as will hereinafter be described.

Liner 20 may be made in a number of ways from numerous materials. It may be made of a single layer of a single material, it may be a lamination of layers of different materials or it may be made of a coated material, all of which types of products are commercially available in quantity. Example of a coated material would be paper with a water-proof coating or a reconstituted cellulose film sold under the name of cellophane coated with a nitrocellulose lacquer containing wax and resins, thereby rendering it waterproof. An exampe of a laminate is a laminated structure readily available commercially comprising an outer layer of paper with an inner of a synthetic resin or plastic bonded thereto.

Preferably, liner 20 is made from a film of a polymeric plastic material selected from the multitude of commercially available plastics. It is estimated that there are hundreds of synthetic polymeric plastic materials that possess the necessary characteristics of flexibility, ease in tearing, liquid resistance, low permeability, and low cost. Among them are ethylene resins (polyethylene), polyesters, cellulose acetate, fluro carbons, flurohalo carbon resins, vinylidene chloride, polypropylene, and some vinyls. Particular examples of these films are "Saran-Wrap" which is a vinylidene chloride copolymer film sold by Dow Chemical Company; "Teflon" film which is a fluorocarbon and is sold by the Dupont Company, "Scotchpak" which is a polyester film sold by the Minnesota Mining & Milling Company and "Alclar" film which is a fluorohalo carbon sold by the Allied Chemical Company.

The word "film" as used in describing this invention is defined as a species of sheet which has a thickness of .010 inch or less. Preferably, in the practice of this invention, a film of a thickness between .001 inch and .003 inch is employed.

Liner 20 is marked with a regular geometric design 26 preferably in the form of a quadrille grid defined by the intersection of a plurality of parallel lines 21 parallel to the X axis of the plastic film and a plurality of intersecting parallel lines 22 parallel to the Y axis of the plastic film 20. This design 26 is applied to the surface of the plastic film 20 in such a manner as to be clearly visible when the film is positioned within the tub 10 and to extend preferably to the outer edges of the film 20. This design 26 may be applied to the film by standard printing and decorating techniques, including printing, embossing or marking by hot stamping. Lines 21 and lines 22 may be spaced at any convenient distance permitting their intersection points 25 to serve as geometric centers of a plurality of weakened areas 23 formed in the plastic film liner 20.

A plurality of weakened areas 23 are formed in liner 20 arranged in such a way with respect to the geometric design 26 that the geometric center of each weakened area 23 can be located with reference to the design.

In the embodiment of the invention described and illustrated, this is done by forming the weakened areas 23 so that their geometric centers are coincident with the intersections 25 of one of lines 21 and one of lines 22.

Weakened areas 23 are preferably formed by scoring the liner 20 with a series of score marks 24 which can be arranged in numerous patterns. Liner 20 can be scored by many well known methods and in the case of the preferred plastic film, liner 20 may be scored by well known methods in the plastic's art involving either thermo-forming or cold work as may be appropriate. These score marks 24 reduce the strength of liner 20 in the scored areas, thereby resulting in a readily rupturable structure at their location. Suitable arrangements of score marks 24 are shown in FIGURES 4 and 5. In FIGURE 4, a series of concentric score marks 24 are formed, the centers of which are all located at the intersection of one of lines 21 and one of lines 22. The exterior circle is formed with a diameter not greater, and preferably somewhat smaller, than the diameter of drain hole 14. Such smaller size is desirable so that when liner 20 is ruptured by tearing along score marks 24, the intact portion of liner 20 surrounding area 23 will move into contact with the lip of drain hole 14 and protrude therein in a funnel-like manner due to the pressure exerted by the fluid and the mutual attraction of the adjoining surfaces, thereby serving to seal liner 20 to the lip of drain hole 14. In FIGURE 5, score marks 24 are arranged in a radial spoked arrangement radiating from an axis coincident with the intersection of one of lines 21 and one of lines 22 to form a weakened area which can be either shaped to define an area of circular or non-circular geometry as may be desired by varying the length of the individual spokes 24 in order to conform to the cross-section of drain holes of varying geometry. This weakened area 23 is formed to be an area not greater, and preferably smaller, than the cross-sectional area of the drain hole 14, for the reasons previously described.

In addition to providing a weakened area 23 for draining fluid 15 as herein described, score marks 24 located in areas of liner 20 not above drain hole 14 that are fully supported by tub 10 form a roughened non-skid surface on liner 20, serving to minimize sliding and slipping of objects positioned within the liner 20.

The container is completed by positioning a lining of plastic film 20 marked and weakened as heretofore described within the tub 10 so that at least one of the weakened areas 23 is above drain hole 14, and preferably with the geometric center of the weakened area 23 coincident with the geometric center of the cross-section of drain hole 14. Liner 20 should be of sufficient size to extend above the level of the volume of fluid that is to be introduced into the container in order that the design 26 borne thereon be clearly visible above the level of the fluid 15, and, preferably, of such a size as to completely cover the bottom 13, sides 11, and ends 12 of tub 10 when spread out over these surfaces and hang over upper rim 16 of tank 10. Plastic film liner 20 is then carefully spread out while maintaining a weakened area 23 precisely in the location described so as to be in intimate contact with and cover sides 11, ends 12 and bottom 13, thereby achieving a skin-like conformity to the inner contour of tub 10. This intimate contact must be achieved as it is an important feature of the invention that the thin film liner 20 remain unstressed by the fluid 15 and that the film liner 20 be in such close contact with the tub 10 so that the hydrostatic load of the fluid 15 is transmitted to tub 10, its supporting and retaining structure. The thinness and flexibilty of the liner 20 will enable such conformity to be achieved. There will, of course, be wrinkles and folds, particularly in the corners of the tub 10 when the liner 20 is pressed into contact with it and arranged to conform to its inner contour, but these folds and wrinkles are of no consequence and easily formed due to the thinness and flexibility of the film liner 20. Liner 20 will cling to and be releasably adherent to the surfaces of tub 10, thereby remaining positioned in place on the vertical surfaces of tub 10, namely sides 11 and ends 12, without mechanical aids such as hangers, hooks or fasteners, as a result of the mutual attraction of their adjoining surfaces. This mutual attraction is primarily a result of the effect of static electricity. A static charge is placed on the liner

by unrolling the film **20** from the roll on which such films are customarily packaged and stored; or liner **20** may be otherwise charged by friction or by other methods that are well known. This static electricity effect is aided by the action of the inter-molecular forces causing the molecules of the surfaces of liner **20** and tub **10** to adhere to each other.

The geometric coordinates of the position of the weakened area **23**, which should preferably coincide with drain hole **14**, is noted in reference to the design marked on liner **20**, thereby providing when the tub **10** is filled the information and capability to precisely locate the weakened area **23** and its complementary drain hole. Then the fluid **15** is introduced into the container.

When it is desired to drain the container **10**, reference is made to the visible portion of the geometric design **26** marked on liner **20** above the surface of fluid **15** and a location directly above the weakened area **23** which is over drain hole **14** is established through the use of coordinates. In the example illustrated, the coordinates of the location are determined by reference to lines **21** and **22** which form a quadrille pattern. A probe of sufficient length to reach this weakened area **23** is plunged directly downward from that point to rupture the liner **20** at the weakened area **23** over drain **14**. Once the structural integrity of film **20** is broken at a point within the weakened area **23**, the film will fail structurally in the general weakened area **23** to open out a ruptured area of sufficient size to permit the fluid **15** to drain freely out through drain hole **14** and drain pipe. After draining, liner **20** may be removed and disposed of. A fresh liner **20** can then be disposed within tub **10** as heretofore described and the container will be ready for further use without any cleaning or other preparations.

It should be noted that the above description refers to location of the weakened area **23** over the drain hole **14**. It is preferred to employ a transparent plastic liner film **20**, so that the weakened area **23** may be visually located with respect to drain hole **14** which will be readily seen through such a transparent film. However, an opaque film, such as a coated paper, can be easily used as the location of the drain hole **14** under liner **20** and can be readily established through the sense of touch.

It should also be noted that the weakened area **23** may be unsupported over drain hole **14**. The small area involved is minimal and liner **20** is substantially continuously supported. No structural problem is presented for the further reason that the structural capability of film liner **20** is not effectively impaired by score marks **24** as the area of reduced cross-section formed by those score marks **24** is so small.

While the embodiment of the invention illustrated and described shows a film liner **20** that is releasably adherent through the action of natural forces, this releasably adherent quality can also be produced by employing a film **20** coated on its inner surface with a releasable contact adhesive. Such products are readily available commercially. An example of such a film **20** would be a sheet of contact coated plastic film sold by the Minnesota Mining and Milling Company under the name of Scotch Tape.

It will thus be apparent that the apparatus of the present invention will provide important labor saving advantages through the elimination of tedious labor involved in cleaning the conventional fluid container after use thereof.

The apparatus of the present invention is also highly advantageous when the fluid contained therein is or becomes opaque as the container may be readily drained in such cases. It should be noted that such opacity will be very frequently experienced. For example, some solutions embodying dyes or other chemicals will never be transparent and other fluids will become opaque in use through the suspension or dissolution therein of matter removed from objects being cleaned, from foaming detergents, or the formation of soap suds. The combination of the labor saving feature of the removable liner and the provisions described herein for draining the liner provide substantial advantages not heretofore available.

A more specific advantage of the apparatus is that it is so simple and inexpensive.

A further advantage lies in the adaptability of the improved liner to tubs, basins and tanks of varying geometry.

Another advantage lies in the provision of a liner with a non-skid roughened surface reducing the danger of injury to objects positioned in the apparatus, thereby providing unique safety features.

It should be understood, however, that the specific apparatus herein illustrated and described is intended to be representative only, as many changes may be made therein without departing from the clear teachings of the invention. Accordingly, reference should be made to the following claims in determining the full scope of the invention.

I claim:

1. In a device for the containment of fluids, the combination comprising a supporting and retaining structure having side walls, a bottom and a drain hole in the bottom part of said structure, an adjustable unitary removable seamless inner liner made of a readily tearable polymeric plastic film impervious to the contained fluid and releasably adherent to the inner surfaces of said structure, the dimensions of said liner being proportioned with respect to the inner dimensions of said structure so that the hydrostatic load of said contained fluid is transmitted to said structure, said liner being provided with a plurality of locally weakened areas and at least one of said weakened areas being located over said drain hole to enable said fluid to drain from said container when said liner is ruptured at said weakened area.

2. The structure claimed in claim **1** in which the said liner is deformable and the peripheral dimensions of the said locally weakened areas are less than the peripheral dimensions of the said drain hole to enable the ruptured film within said weakened areas to overlap the edge of said liner and seal the lip of said drain hole through hydrostatic pressure on said ruptured film and the mutual attraction of the adjoining surfaces of said structure and said liner.

3. In a device for the containment of fluids, the combination comprising a supporting and retaining structure having side walls, a bottom and a drain hole in the bottom part of said structure, an adjustable removable unitary seamless inner liner therefor made of a readily tearable polymeric plastic film impervious to the contained fluid and releasably adherent to the inner surfaces of said structure, the dimensions of said liner being proportioned with respect to the inner dimensions of said structure so that the hydrostatic load of said contained liquid is transmitted to said liner, said liner bearing visibly and permanently marked thereon a regular geometric design so arranged as to establish a plurality of coordinate points and being formed with a plurality of locally weakened areas the geometrical centers of which weakened areas coincide with said coordinate points, said lines being positioned within said structure so that at least one of said weakened areas and its said geometrically coincident coordinate point are located over said drain hole, said weakened area enabling said fluid to drain from said container when said liner is ruptured at said weakened area and said geometric design providing a reference location for said weakened area over said drain when said container is filled with fluid so that said liner may be ruptured over said drain hole to permit said fluid to drain therefrom.

4. The structure claimed in claim **3** in which the said liner is deformable and the peripheral dimensions of said locally weakened areas are less than the peripheral dimensions of the said drain hole to enable the ruptured

film within said weakened areas to overlap the edge of said liner and seal the lip of said drain hole through hydrostatic pressure on said ruptured film and the mutual attraction of said structure and said liner.

5. The structure claimed in claim 4 in which the dimension of said plastic film liner is such as to line an area within said supporting structure of greater volumetric capacity than the volume of fluid to be contained, the portions of said liner above said fluid level being supported by the action of the mutual attraction of the adjoining surfaces of said structure and said liner.

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