United States Patent

Baker

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[54] PERIMETER SKIMMING GUTTER FOR SWIMMING POOLS

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[52] **U.S. Cl.** **4/172.17,** 210/169

[51] **Int. Cl.** **E04h 3/16,** E04h 3/18

[58] **Field of Search** 4/172, 172.17, 172.15, 172.18, 4/172.19, 172.21; 210/169

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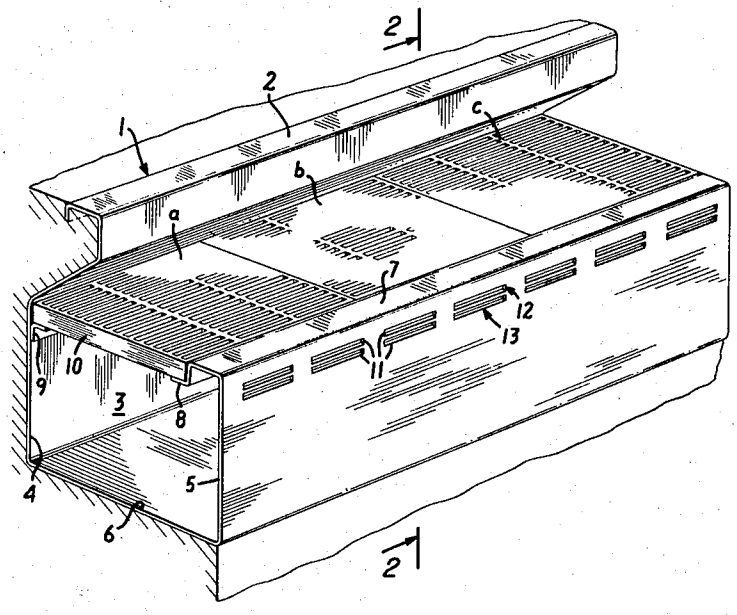
Primary Examiner—Henry K. Artis

Attorney—Janes & Chapman

[57] **ABSTRACT**

A perimeter skimming gutter for swimming pools is provided including a gutter conduit for disposition about the perimeter of a swimming pool and adapted to carry water at a level below a predetermined level of water in the swimming pool, a retaining wall on the pool-side of the conduit, over the top of which wall water may flow from the pool into the gutter conduit, and a plurality of narrow elongated substantially horizontally disposed openings through the wall at a height to maintain a predetermined water flow, the top of the wall being spaced above the openings at a height to retain the pool water within the pool perimeter at water flows, wave actions and surges up to a predetermined maximum, while allowing excessive water flows, wave actions and surges beyond such maximum to flow over the top of the wall into the gutter conduit.

22 Claims, 6 Drawing Figures



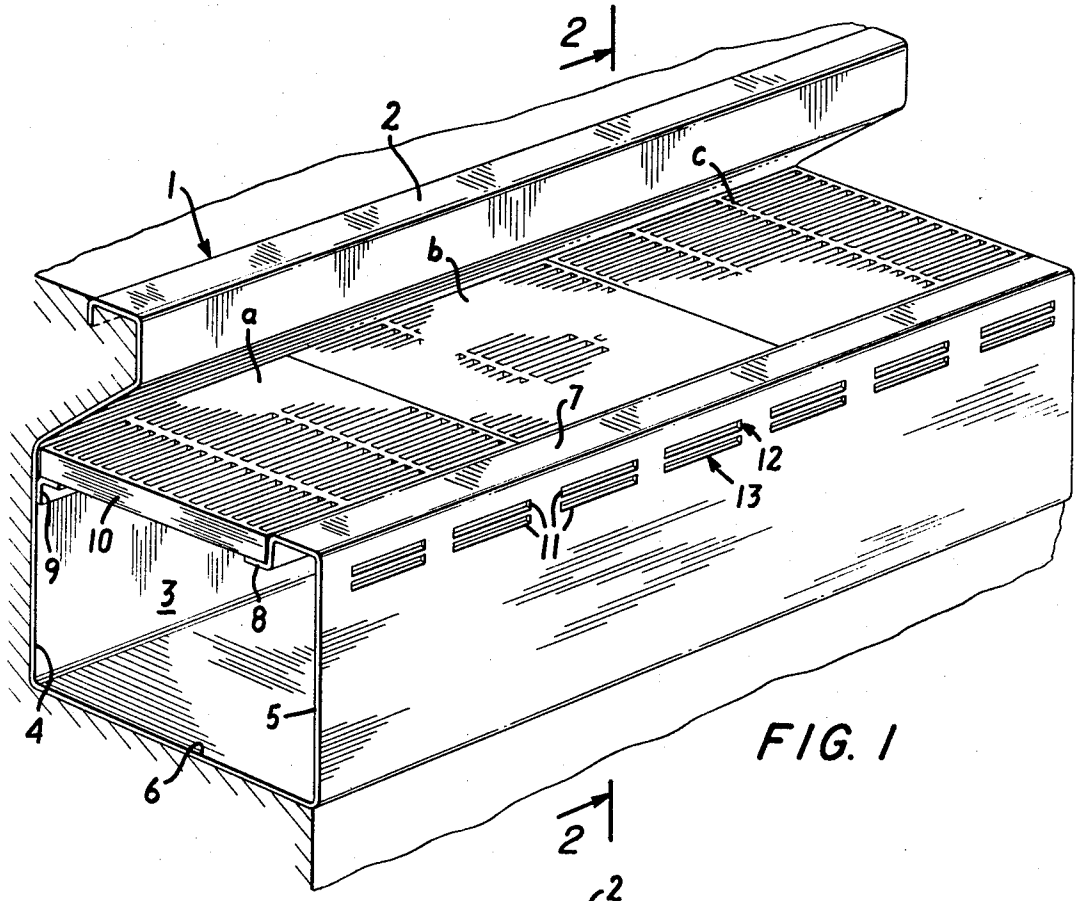


FIG. 1

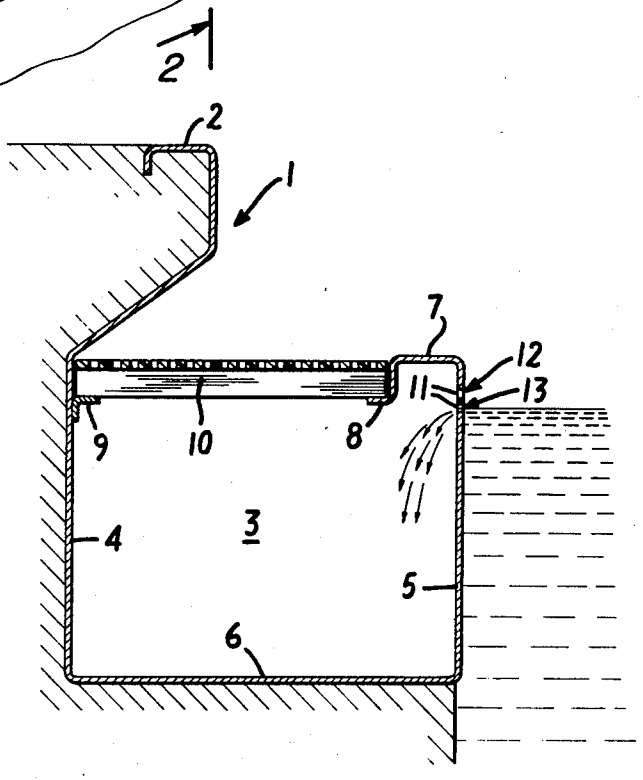


FIG. 2

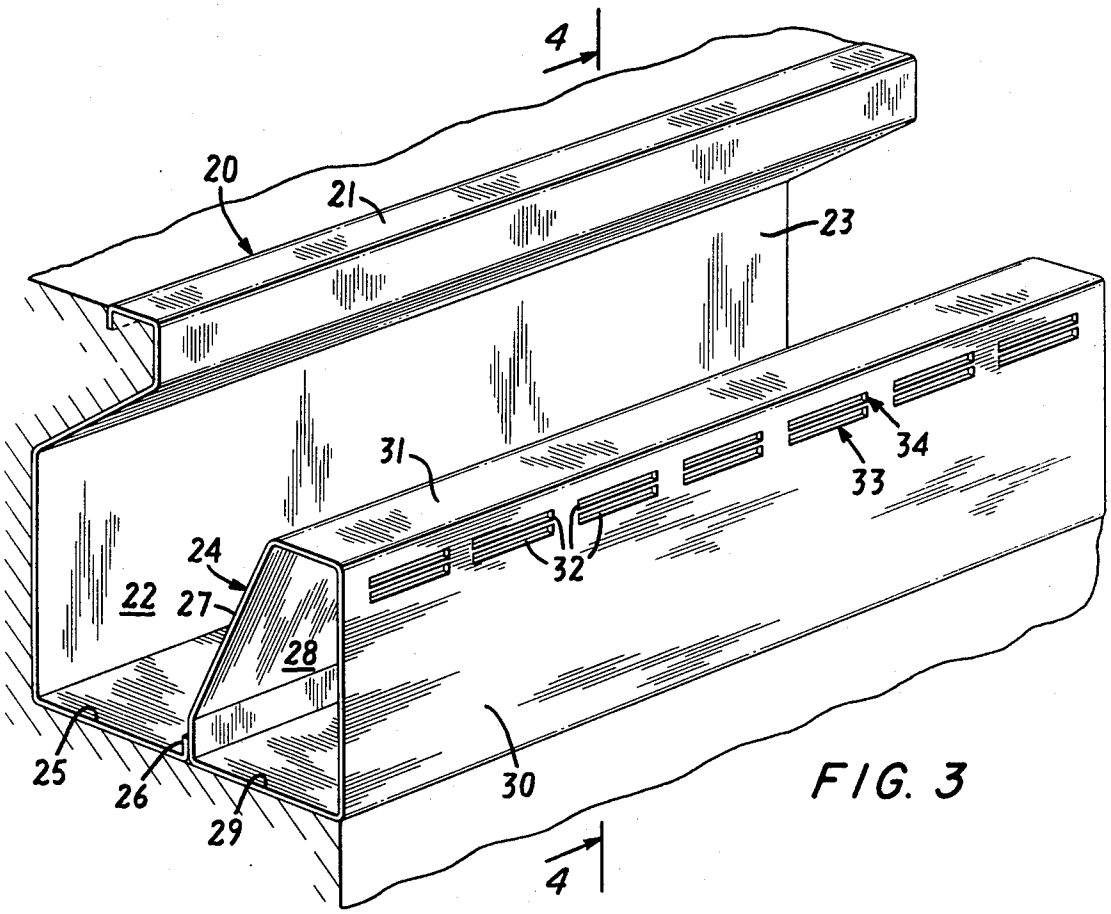

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FIG. 3

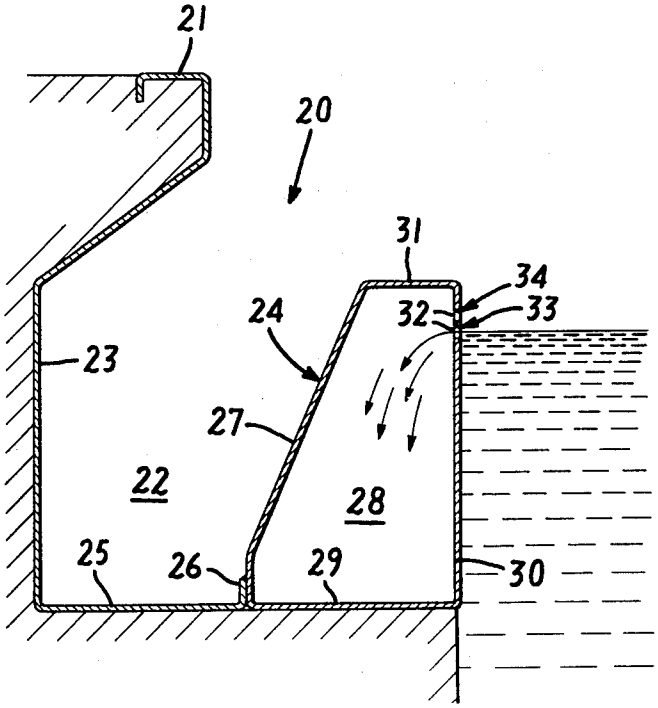

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FIG. 4

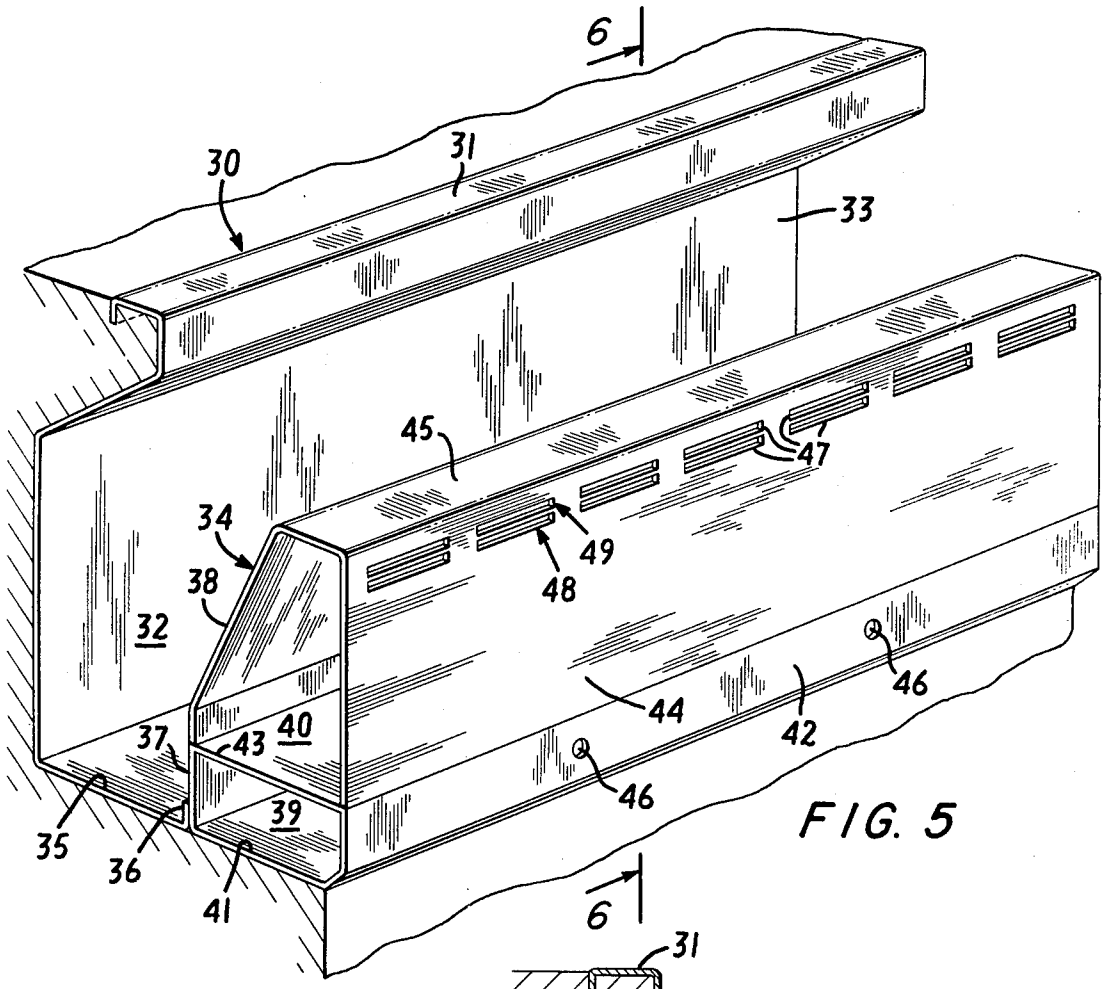

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FIG. 5

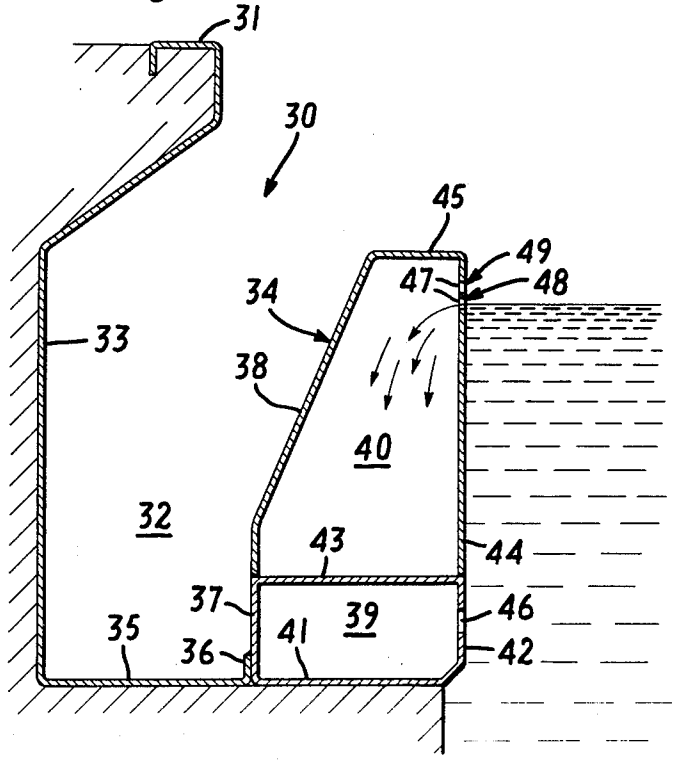

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FIG. 6

PERIMETER SKIMMING GUTTER FOR SWIMMING POOLS

The gutter system of a swimming pool is one of its most important components, and its design is determinative of many of the characteristics of the pool. However, what constitutes good gutter design has long been a perplexing problem, in much dispute. What is recognized is that a swimming pool gutter system must provide an adequate surge flow capacity, especially when the pool is filled with swimmers, and it should not flood when a large group of swimmers enters the pool all at once. It should also provide a good surge- and wave-quelling capacity. Its ability to cope with surges and waves produced by swimmers is quite important to the competitive qualities of the swimming pool.

A problem related to gutter design is the removal of surface dirt. Some types of gutters are designed to provide a skimming action, but it has generally been conceded that the most efficient type of skimming action is provided by the scum gutter type of pool, and on all pools over 1,600 square feet in area, scum gutters are provided as a matter of course. In fact, in some states, surface skimmers are not permitted.

One type of swimming pool with a perimeter gutter provides for flow of water over the top of the gutter wall into the gutter trough at all times. Such a gutter system is described in U.S. Pat. No. 2,932,397 to Ogden dated Apr. 12, 1960. Another and older design appears in U.S. Pat. No. 1,797,397 to Booraem dated Mar. 24, 1931. Such a gutter provides a most efficient skimming action under normal flow conditions, but as soon as swimmers enter the pool, or a heavy surge or wave action is encountered, the additional flow of water over the top of the gutter tends to flood the gutter, after which skimming action is lost, until the water can be drained away, and in fact some of the dirt already in the gutter may be washed back.

In an attempt to alleviate such a condition, a modification of the Ogden gutter has been proposed in U.S. Pat. No. 3,363,767 to Ellis dated Jan. 16, 1968, incorporating a plurality of skimmer openings spaced around the gutter at a lower level than the top of the gutter. In this system, when the pool is not in use, the skimmer weir is opened and skimming is obtained via the openings into the gutter (column 2, lines 19 to 24). When the pool is in use, the skimmer weirs are closed (column 2, lines 12 to 13), but the water level is held down below the lip of the gutter, providing a certain in-pool surge capacity, and avoiding a flooded gutter condition at the time of flow surges. However, when the pool is in heavy use and there is considerable wave or surge action over the top of the gutter, surface contaminants washed into the gutter may still be washed back into the pool.

In accordance with the invention, a perimeter skimming gutter for swimming pools is provided which permits an adequate skimming action at all times, and also provides for an adequate surge capacity when the pool is in use, without the possibility of the gutter's flooding or dirt in the gutter's being washed back into the pool. This is accomplished by combining a plurality of narrow, elongated, substantially horizontally disposed openings which are open at all times in a retaining wall disposed about the perimeter of the swimming pool, with the peripheral gutter conduit arranged to receive water spilling over the top of the retaining wall when the flow capacity of the elongated openings is exceeded. The elongated openings can be arranged to feed water into the main gutter conduit, or into a separate second gutter conduit, so as to keep these two water flows completely separate, and retain the dirt skimmed off the top of the pool in a separate place, to avoid the hazard of this dirt's being washed back into the pool, in the unlikely event of the first gutter conduit's being flooded during wave actions or surges. In this gutter system, the water level in the pool is normally maintained at the level of the skimmer openings in the gutter.

Accordingly, the perimeter skimming gutter for swimming pools provided in accordance with the invention comprises, in combination, a gutter conduit for disposition about the perimeter of a swimming pool and adapted to carry water at a level below a predetermined level of water in the swimming pool; a retaining wall on the pool-side of the gutter conduit, over the top of which wall water may flow from the pool into the gutter conduit; and a plurality of narrow, elongated, substantially horizontally disposed openings through the wall below the top thereof at a height to maintain a predetermined water level in the pool, and providing a skimming flow of water through the skimmer openings at such predetermined water flow, the top of the wall being spaced above the openings at a height to retain the pool water within the pool perimeter at water flows, wave actions and surges up to a predetermined maximum, while allowing excessive water flows, wave actions and surges beyond such maximum to flow over the top of the wall into the gutter conduit.

The term "conduit" as used herein is inclusive of open conduits or troughs as well as partially or wholly enclosed conduits.

In a preferred embodiment of the invention, a second gutter conduit is provided, into which the skimmer openings lead, while the top of the retaining wall leads the water into the first gutter conduit.

In a still more preferred embodiment of the invention, a water feed conduit is provided about the perimeter of the swimming pool, for feed of fresh water into the pool. This conduit is preferably an integral part of the perimeter skimming gutter, and in the case where a second gutter conduit is provided, fed by the skimmer openings, the water feed conduit is disposed beneath the second gutter conduit.

It is important that the openings be elongated, narrow, and substantially horizontal. They should provide an opening area within the range from about 50 percent to about 75 percent of the perimeter at the water level of the pool, and hence are elongated and substantially horizontal. They also should limit flow to prevent surges and waves from entering, and hence are narrow. They should not exceed about one inch in height, and should have a length to height ratio of from 1:1 to 100:1, although the latter limit is not critical. The limit is actually imposed only by the feasible length of gutter section and the strength of the material used for the retaining wall.

Preferred embodiments of the invention are illustrated in the drawings, in which:

FIG. 1 represents a view in elevation of one embodiment of perimeter gutter in accordance with the invention;

FIG. 2 represents a view in cross-section taken along the line 2—2 of FIG. 1;

FIG. 3 represents a view in elevation of a second embodiment of perimeter gutter in accordance with the invention;

FIG. 4 represents a view in cross-section taken along the line 4—4 of FIG. 3;

FIG. 5 represents a view in elevation of a third embodiment of perimeter gutter in accordance with the invention, incorporating a water-feed conduit; and

FIG. 6 represents a view in cross-section taken along the line 6—6 of FIG. 5.

The perimeter gutter of FIGS. 1 and 2 is made of a number of modular units, which are assembled on site and bonded together by welding, soldering or brazing, to form a gutter extending around substantially the entire circumference of the swimming pool. Each unit 1 is made of stainless steel sheet, formed with a top coping 2, and a gutter trough 3 with upstanding sides 4, 5 and a bottom 6. The side 5 is designed to serve as the top pool retaining wall on the pool-side of the gutter, and terminates in a flat top portion 7 and a flange 8. A mating flange 9 is attached to the side wall 4 at the same height above the gutter bottom 6. The flanges 8 and 9 support a grate 10 made of a number of short abutting grate sections *a*, *b*, *c*, each of which is individually removable, and merely rests on the flanges 8, 9. The grates are made of Cycolac plastic material (acrylonitrile-butadiene-styrene polymer) and have approximately 50 percent open area. These protect the trough 3 against the entry of large debris and also prevent injury to the bathers, who might otherwise be able to step into the trough by accident.

Formed in the retaining wall **5** is a plurality of elongated narrow, substantially horizontal slots **11**, which are disposed in two parallel rows **12, 13** at a level substantially above the bottom **6** of the trough, but only a short distance from the top **7** of the retaining wall **5**. The open area presented by these slots constitutes 75 percent of the perimeter at the water level.

FIG. **2** shows the normal water level of a pool in which this perimeter gutter is installed. This level is defined by the slots **11** in the lower row **13** of the retaining wall **5**. The provision of two rows of such slots provides the skimming action over a wide range of water circulating flow, since at high flows the water level may rise to the upper row **12**, and water then may flow through slots in both rows, the skimming action then being provided by the upper row **12** instead of the lower row **13**.

As shown in FIG. **2**, water enters the gutter trough **3** via the slots **11**, runs to the water recirculating system by gravity, and passes through the pool water recirculating system to the filter and and pump (not shown, but of conventional design), whence the water is returned to the pool by way of a suitable water feed system. Dirt of a size that can enter the slots is thereby carried into the gutter trough, and removed from the surface of the pool.

The spacing of the slots below the top **7** of the retaining wall **5** provides a reserve pool water surge capacity, to accommodate the surge created when swimmers enter the pool. Even though in the event of such a surge the pool may initially rise to a level above both rows of slots **12, 13**, it will be apparent that if the inlet flow is less than the capacity of the slot system, the water level will gradually be reduced to the level shown in FIG. **2**. When, however, the pool is rather full, or when it is in competition use, with a considerable amount of wave action, more than can be contained by wall **5**, the waves and surges can lap over the top **7** of the retaining wall **5** into the gutter **3**.

The skimming slots can be arranged in size and in number so as to provide from 50 to 75 percent of the pool perimeter at the water level for constant skimming, equivalent to a gutter-type pool when the pool is not in use. In addition, there is an in-pool surge capacity sufficient to accommodate the surge caused by swimmers without flooding the gutter trough, while at the same time providing an excellent wave-quelling effect (faster calming and faster wave subsidence) because of access to the gutter trough over the top **7** of the retaining wall **5** of the gutter.

The perimeter gutter shown in FIGS. **3** and **4** provides two gutters so as to keep the gutter carrying the dirty flow from the skimmer openings separate from the flow created by surges and wave action. This perimeter gutter is also made up of a number of modular units **20**, which are fitted together about the perimeter of the pool in the course of the construction of the pool, being bonded together at their abutting ends by welding, brazing or soldering. This gutter is formed of a sheet of stainless steel which is shaped with a top **21** serving as the coping about the perimeter of the pool, and an open trough portion **22** formed with upstanding sides **23, 24** and a bottom **25**. The side **24** is in fact made up of two sections bonded together by welding; a lower flange **26**, extending upwardly from the bottom **25** of the gutter trough **22**, and the side **27** of a closed-top gutter conduit **28**.

The conduit **28** has a bottom **29**, two upstanding sides **27,30** and a top **31**. This conduit is designed to receive the skimming flow. The side wall **30** serves as a retaining wall for the pool water, as is best seen in FIG. **4**. The wall **30** contains a plurality of narrow, substantially horizontal skimmer slots **32**, disposed in two parallel rows **33, 34**. These have a sufficient open area in the aggregate to provide 75 percent of the pool perimeter at the water level for skimming action. Water flowing through the skimmer slots **32** flows into the gutter conduit **28**, while water flowing over the top **31** of the closed-top gutter conduit **28** enters the gutter trough **22**.

The action of this perimeter gutter is much the same as that of FIGS. **1** and **2**, except that the skimmer water flow is kept separate from the gutter flow. Consequently, there is no way for the dirt washed out of the pool by the skimming action through the slots **32** and entering the closed-top gutter **28** ever to be washed back into the pool, in the unlikely event of the trough **22** flooding, due to excessive wave action or surges, or an excessive number of swimmers in the pool. Thus, full gutter dirt protection is provided.

During normal flow, the skimmer action is provided by the lower row **33** of slots **32**, such water entering the conduit **28** and being lead back through the pool recirculation system by way of the filter and pump to the water feed intake for the pool. When swimmers enter the pool, the water level may rise, in which event skimming action can be taken over by the upper row of slots **34**. An adequate in-surge flow capacity is provided by the additional height of the wall **30** between the top row **34** of slots **32** and the top **31** of the retaining wall. Wave action or surges beyond the predetermined maximum flow over the top **31** into the gutter **22**, whence the water is again carried by way of the pool recirculation system back to the pool.

The gutter system of FIGS. **5** and **6** is similar to that of FIGS. **3** and **4**, with the provision of a clean water feed conduit below the gutter conduit **40**. This perimeter gutter is also made up of a number of modular gutter units **30**, which are fitted together about the perimeter of the pool during construction of the pool, the abutting ends being bonded together by welding, brazing or soldering. The gutter trough is made of a sheet of stainless steel, formed in the configuration shown in FIG. **6**, with a top coping **31**, and a gutter trough **32** formed with upstanding sides **33, 34**, and a bottom **35**. The side **34** of the trough is actually made up of three parts: the upstanding flange **36**, extending up from the bottom **35**, the portion **37**, which serves as the side wall of the clean water inlet feed conduit **39**, and the side **38** of the gutter conduit **40**. The inlet feed conduit **39** is formed of stainless steel box beam tubing, and the gutter conduit **40** is formed of a sheet of stainless steel folded around and butt-welded at its ends to the top sides of the feed conduit. The feed conduit has a bottom **41** and a side **42**, with a top **43** serving also as the bottom of the gutter conduit **40** directly above. The gutter conduit **40** has a side **38**, a bottom **43**, and an upstanding side **44**, and top **45**. The sides **42, 44** together constitute a retaining wall about the perimeter of the pool, as is best seen in FIG. **6**.

The water feed conduit **39** includes a plurality of openings **46**, regularly spaced about the pool and serving as pool feed inlets for clean water from the feed conduit into the pool, below the surface of the water level in the pool, as is seen in FIG. **6**. The side **44** of the gutter conduit **40** is provided with a plurality of narrow, horizontal slots **47** arranged in two parallel rows **48, 49**. These provide, at the water level shown in FIG. **6** capacity for flow equal to about 75 percent of the perimeter of the pool.

The skimming action of this gutter system is exactly the same as that in FIGS. **3** and **4**, and reference is made to this description. The water inlet feed by way of the feed conduit **39** and openings **46** through wall **42** provides a uniform distribution of fresh water throughout the perimeter of the pool, matching a skimming flow which is equally inform about the perimeter of the pool by way of the openings or slots **47**. The skimming flow is kept separate from the flow in the gutter trough **32** arising from wave action or surges, as well as from the clean water feed conduit **39**. Water flowing in the gutter trough **32** and in gutter conduit **40** is fed back to the water filter and pump, where it is cleaned, and then recirculated to the pool by way of the feed conduit **39**.

The perimeter gutters shown in the drawings are made of stainless steel, but it will, of course, be understood that other metals can be used, such as galvanized iron and steel, and aluminum, as well as anodized aluminum. Whatever the metallic material, its surface should be treated so as to render it corrosion-resistant, as by plating, galvanizing, anodizing, porcelain-enamel coating, or painting. It is also possible to form the perimeter gutter of plastic material, either in whole or in part. There are plastics now available which are sufficiently strong

to withstand the wear and tear of a perimeter gutter system, including, for example, acrylonitrile-butadiene-styrene resin, polycarbonate resin, polytetrafluoroethylene, polyvinyl chloride, polyvinylidene chloride, polyesters, polypropylene, polyamides, and synthetic rubbers such as polyisoprene, polybutadiene, butadiene-styrene copolymers, and butadiene-isoprene copolymers.

The preferred construction is from a sheet or several sheets of metallic or plastic material, which are formed into the desired configuration, as is seen in the cross-sectional drawings. It is usually preferred that the coping portion at the top rear of the perimeter gutter extend at least partially, and preferably wholly, across an open gutter trough, so as to prevent people from stepping or falling into the gutter. Such can also be prevented by covering the gutter with a grating or grid of metal or plastic, the same or different material from the gutter, as shown in the embodiments of FIGS. **1** and **2**.

The use of modular units, such as are shown in the drawings, is preferred, because this permits mass production of the gutter system at a point remote from the swimming pool, with easy and inexpensive transportation from that point to swimming pool construction sites anywhere in the world. The modular units can then be assembled on site to form any type or configuration of swimming pool. The modular units can be made in straight sections for rectangular or other straight-sided pool shapes, while curved sections can be made for pear-shaped, elliptical, circular, or other round-sided pool configurations.

The modular units can be fitted together by welding, soldering or brazing, in the case of metal units; by bonding, using various types of adhesives, in the case of metal or plastic units; or by heat-sealing, ultrasonic welding, or heat-bonding, in the case of thermoplastic plastic units. Plastic units which are not fully heat-cured can be bonded and then cured in situ to form a permanent bond on site, in the course of construction of the pool.

The perimeter gutter system of the invention can be used completely around the perimeter of a pool, or only partially around the pool perimeter, as desired. The most uniform skimming action and gutter action is, of course, obtained when the entire perimeter of the pool is provided with such a gutter.

While construction of the gutter in the form of modular units has been described, it will also be appreciated that the gutter system can be formed on site in the configurations shown using concrete or plastic material, and can form an integral part of the pool wall, by casting or pouring into suitable frames, so that the material can harden and set in the desired pool shape. The construction of the gutter system is sufficiently simple so that this type of technique can be employed with good results. Since this requires more hand-work, however, and is therefore a more costly method of construction, it would not usually be preferred, particularly in the case of large pools, where construction costs may be too high to permit the luxury of a handmade gutter system on the pool site.

The gutter system can also be made from bricks or tiles, which are built up in the desired configuration. These can be the usual types of materials, preferably with a ceramic facing, so that it is leak-proof, with the tiles being bonded together with water-resistant adhesive or cement.

The fresh water feed conduit can be fitted below or to one side of the gutter conduit, as shown in the embodiment of FIGS. **5** and **6**, or it can be positioned within, or on top of, the gutter feed conduit. Thus, an equally effective system is obtained if the feed conduit **39** is placed on the top of the gutter conduit **40**, abutting the top **45** of the gutter conduit, so that the top **43** of the feed conduit serves as the top of the retaining wall at the side of the pool. This type of system is less preferred, since the intake feed has to be injected into the pool at a considerable velocity, in order to clear the skimming slots **47**, and obtain the desired skimming action. In this case, the feed water is projected in the form of a spray from each inlet opening **46**; this effect may be desired in some cases, for decorative or other reasons.

A fresh water feed conduit can also be fitted within the open gutter trough **3** of FIGS. **1** and **2**, at the pool-side retaining wall **5**, so as to nestle in the corner of the gutter between wall **5** and bottom **6** of the gutter.

A fresh water feed conduit can also be fitted within the closed gutter conduit **28** of FIGS. **3** and **4** or **40** of FIGS. **5** and **6**, preferably abutting the pool-side walls **30**, **44**, respectively. In this event, the inlet openings must extend not only through the feed conduit wall but also through the retaining wall of the gutter. This system is as effective as that shown in FIGS. **5** and **6**, but it is somewhat more difficult to manufacture, because of the fitting of the conduit within the gutter, and a consequent bonding problem.

The level of the skimmer openings with respect to the bottom of the gutter conduit can be adjustable, so as to provide adjustment of the water level permitted in the pool before skimming flow via the openings into the gutter conduit commences. This adjustment can be provided for by forming the openings in the pool-side retaining wall as vertical slots or with an extended vertical height, and disposing a movable barrier member over the openings, with the opening or openings of the desired size and shape in the barrier member. Vertical movement of the barrier member over the wall openings adjusts the height of the opening or openings in the barrier member, and these openings are always in register with the openings in the wall. There has to be a fluid-tight seal between the barrier member and the retaining wall, which can be provided for by a gasket or O-ring seal therebetween. The barrier member can move along slots with set screws fixing it at the desired skimmer opening and thus pool level.

The swimming pool can be equipped with water filtration and cleaning recirculation systems. The gutters usually feed water therein to such systems by gravity. Pumps can be provided, and the gutters can also be provided with jet water inlets to direct a driving flow of water along the gutters, to flush out the gutters, and to drive water along the gutter towards the water recirculation system. Such jet water inlets are described in U.S. Pat. No. 2,932,397 to Ogden, dated Apr. 12, 1960.

Other variations and modifications in the invention will be apparent to those skilled in the art.

Having regard to the forwgoing disclosures, the following is claimed as the inventive and patentable embodiments thereof:

1. A perimeter skimming gutter for swimming pools comprising, in combination, a gutter conduit for disposition about the perimeter of a swimming pool, and adapted to carry water at a level below a predetermined level of water in the swimming pool; a retaining wall on the pool-side of the conduit, over the top of which wall water may flow from the pool into the gutter conduit; and a plurality of narrow, elongated, substantially horizontally disposed openings through the retaining wall below the top thereof, at a height to maintain a predetermined water level in the pool, and to provide a skimming flow of water through the openings at such predetermined water flow through the pool, the top of the wall being spaced above the openings at a height to retain the pool water within the pool perimeter at water flows, wave actions, and surges up to a predetermined maximum, while allowing excessive flows, wave actions, and surges beyond such maximum to flow over the top of the wall into the gutter conduit.

2. A perimeter skimming gutter for swimming pools in accordance with claim **1**, comprising a second gutter conduit. the elongated narrow openings leading into one gutter conduit and the top of the retaining wall leading over to the other gutter conduit.

3. A perimeter skimming gutter in accordance with claim **2**, in which one of the gutter conduits is closed at the top, and one is open.

4. A perimeter skimming gutter in accordance with claim **3**, in which the elongated narrow openings open into the closed conduit, and the top of the retaining wall leads water thereover and into the open conduit.

5. A perimeter skimming gutter in accordance with claim **2**, in which a water feed conduit for feeding fresh water into the pool at a point below the top of the retaining wall is disposed within the second gutter conduit.

6. A perimeter skimming gutter in accordance with claim 1, comprising a water feed conduit for feeding fresh water into the pool at a point below the top of the retaining wall.

7. A perimeter skimming gutter in accordance with claim 6, in which the water feed conduit is disposed within the gutter conduit.

8. A perimeter skimming gutter in accordance with claim 5, in which a second gutter conduit is provided, with the elongated narrow openings leading into one gutter conduit and the top of the retaining wall leading water thereover and into the other gutter conduit, with the feed conduit disposed below one of the two gutter conduits.

9. A perimeter skimming gutter in accordance with claim 1, in which the gutter conduit is an open trough, having an open grid extending thereover.

10. A perimeter skimming gutter in accordance with claim 1, having two rows of elongated narrow openings, one above the other, through the retaining wall.

11. A perimeter skimming gutter in accordance with claim 1, in which the openings provide an opening area within the range from about 50 to about 75 percent of the perimeter at the water level.

12. A perimeter skimming gutter in accordance with claim 1, in the form of a modular unit adapted to be assembled end-to-end with other such units to form the perimeter gutter of a swimming pool.

13. A swimming pool comprising side walls and a bottom adapted to retain water therewithin, and, extending about the upper perimeter of at least a portion of one side wall thereof, a perimeter skimming gutter in accordance with claim 1.

14. A swimming pool in accordance with claim 10, including a water cleaning and recirculating system for collecting water flowing into and along the gutter conduit, cleaning it, and returning it to the pool.

15. A swimming pool in accordance with claim 11, in which the water cleaning and recirculating system includes a water filter for cleaning the water and a water pump for returning the clean water to the pool.

16. A swimming pool comprising side walls and a bottom adapted to retain water therewithin, and, extending about the upper perimeter of at least a portion of one side wall thereof, a perimeter skimming gutter in accordance with claim 2.

17. A swimming pool comprising side walls and a bottom adapted to retain water therewithin, and, extending about the upper perimeter of at least a portion of one side wall thereof, a perimeter skimming gutter in accordance with claim 3.

18. A swimming pool comprising side walls and a bottom adapted to retain water therewithin, and, extending about the upper perimeter of at least a portion of one side wall thereof, a perimeter skimming gutter in accordance with claim 5.

19. A swimming pool comprising side walls and a bottom adapted to retain water therewithin, and extending about the upper perimeter of at least a portion of one side wall thereof, a perimeter skimming gutter in accordance with claim 11.

20. A swimming pool comprising side walls and a bottom adapted to retain water therewithin, and extending about the upper perimeter of at least a portion of one side wall thereof, a perimeter skimming gutter in accordance with claim 12.

21. A perimeter skimming gutter in accordance with claim 1 in which the skimmer openings are disposed in a movable member arranged to move along the retaining wall and to be fixed thereto at a selected adjustable level below the top of the retaining wall, to adjust the predetermined water level in the pool for skimming flow.

22. A perimeter skimming gutter in accordance with claim 21 in which large openings are disposed through the retaining wall, and the narrow openings for skimming flow are disposed in the movable member, and are in register with the large openings in any of the adjustable positions of the movable member.

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