United States Patent [19]

Whitaker

[11] **3,792,499**

[45] **Feb. 19, 1974**

[54] **SWIMMING POOL SURFACE SKIMMING WEIRS**

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[22] Filed: **Jan. 30, 1970**

[21] Appl. No.: **7,000**

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 801,029, Feb. 20, 1969, abandoned.

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

[51] **Int. Cl.** **E03d 3/16,** E03d 3/18

[58] **Field of Search** 210/169; 61/27; 4/172.17, 4/172.18, 4/172

[56] **References Cited**

UNITED STATES PATENTS

2,826,307	3/1958	Paca	210/169
3,316,934	5/1967	Sowers	210/169 X
1,084,454	1/1914	Liljegran	61/27

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[57] **ABSTRACT**

A weir for use in swimming pool skimmers which may be biased to maintain a water level differential between the swimming pool and the interior of the skimmer is disclosed. Particularly advantageous results are obtained when the weir is so designed that the upper surface of the weir is flat or midly convex and a lower surface which is either flat or midly concave intersects with the upper surface to form an edge which is proximate the surface of the water in the swimming pool and a distance above the water in the skimmer.

17 Claims, 7 Drawing Figures

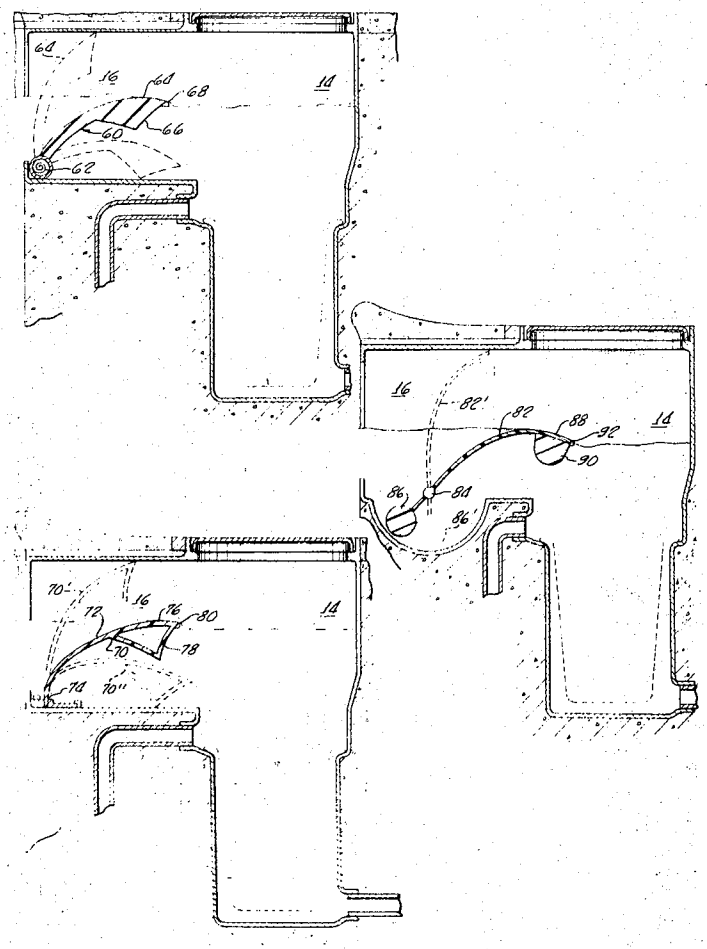


FIG. 1.

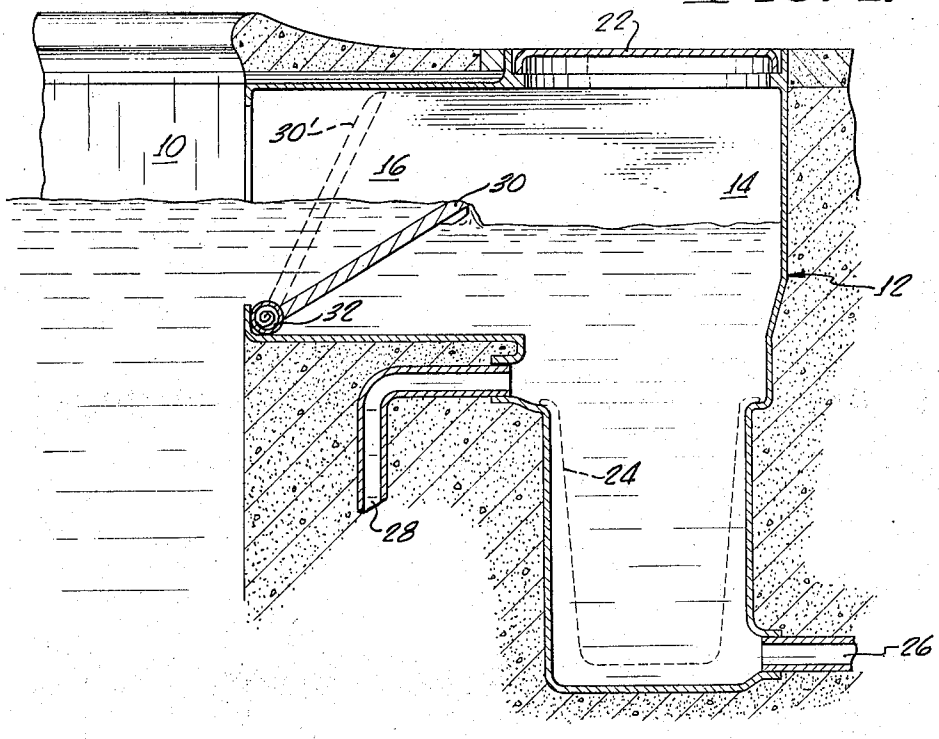


FIG. 2.

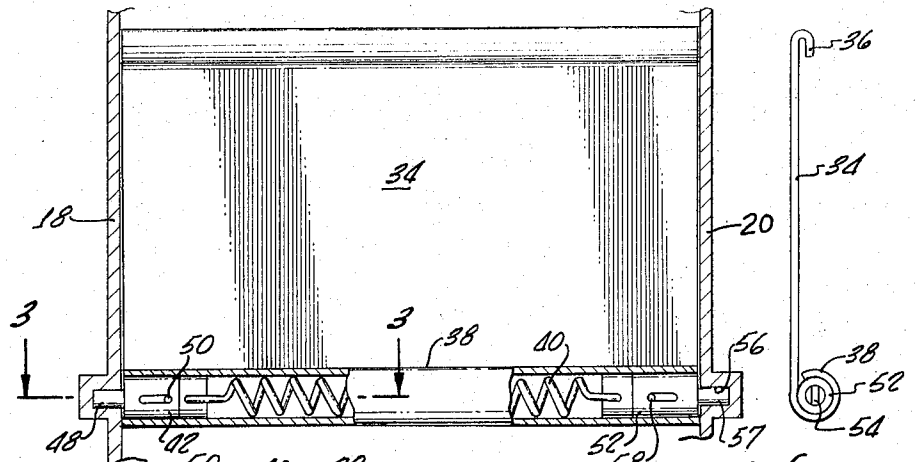


FIG. 4.

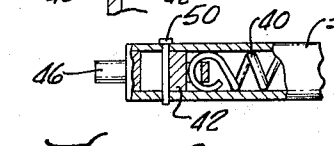


FIG. 3.

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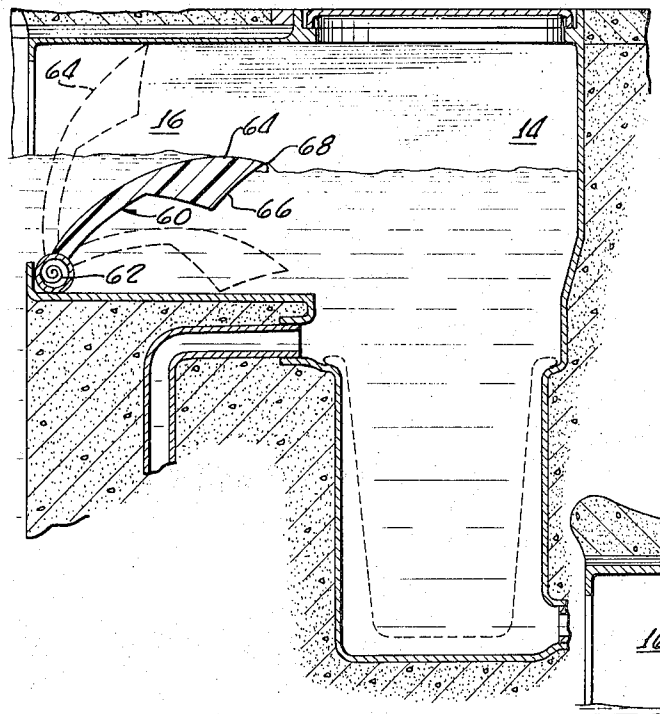
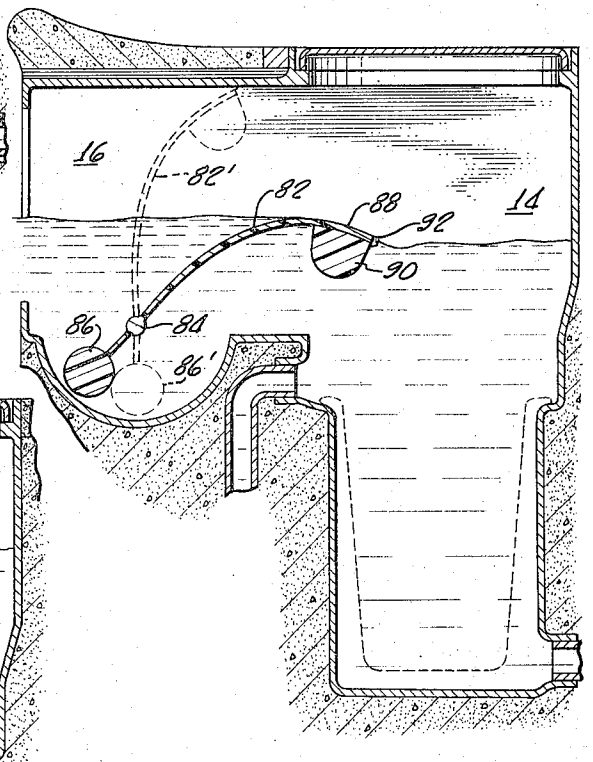


FIG. 5.

FIG. 7.



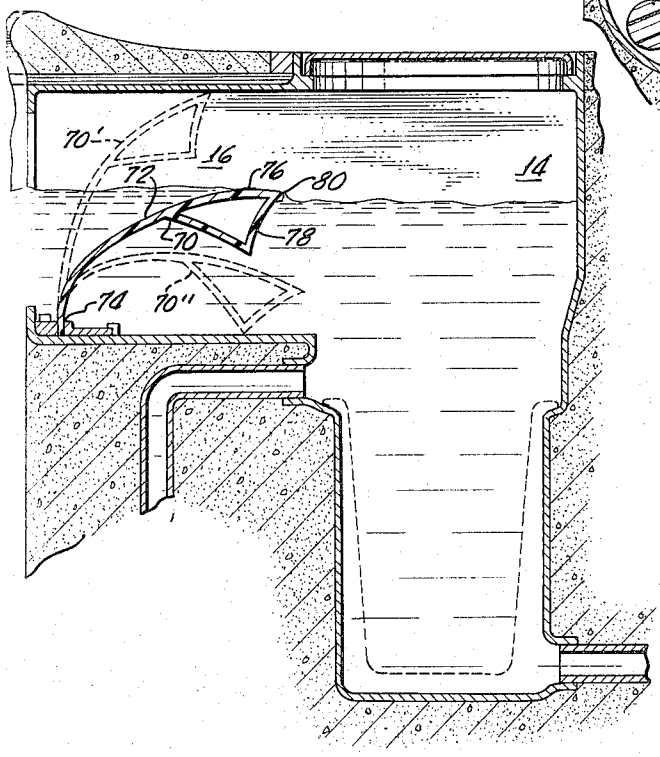


FIG. 6.

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SWIMMING POOL SURFACE SKIMMING WEIRS

CROSS REFERENCE TO RELATED APPLICATION

This is a continuation-in-part of my copending application Ser. No. 801,029 filed Feb. 20, 1969, now abandoned, entitled SWIMMING POOL SURFACE SKIMMING WEIRS.

This invention relates to skimming systems for swimming pools and, more specifically, this invention relates to swimming pool skimming weirs which are mounted to rise and fall as the level of the water in the swimming pool rises and falls.

Swimming pools, both residential and commercial, are customarily equipped with one or more devices to remove the film and floating objects which inevitably collect on the surface of a swimming pool. Skimming units of this type are connected to a recirculating system which includes a pump for removing water through the skimmer and forcing the water through a filter before it is returned to the swimming pool. The recirculation system may include water heaters, treating equipment, etc.

Skimming devices usually comprise open housings built into the wall of the swimming pool with a throat which opens to the swimming pool. Surface water from the swimming pool flows through the throat and into the housing and is removed from the housing by a pump, usually through a strainer basket to catch large solid objects which could damage the pump impeller or clog the system. The principal purpose of the weir is to limit the withdrawal of the water from the swimming pool into the skimmer to the surface water, since maximum surface flow velocity to the skimmer will result in most efficient removal of the surface film which forms on the pool from dust, particles, oils, etc, which are deposited on the surface of the water.

Since the level of water in the swimming pool is variable, depending upon evaporation, filtering, and displacement during use, it is known to provide weirs which are movably mounted in the throat so as roughly to follow the level of the pool. Weirs which are buoyant and which depend upon that buoyancy to follow the level of water are known. For example, a buoyant weir which is pivotally mounted in the throat for free floating motion has been used. According to another proposal, a buoyant weir is mounted on the lip of the throat by means of a flexible flange.

Floating weirs of this type perform the basic intended function but are not entirely satisfactory in all respects. Among other disadvantages, the level differential between the swimming pool and the water in the housing is to a large extent a function of the buoyancy of the weir and changes as the water level in the pool changes, because of differing positions of the weir relative to its mounting point. Moreover, since motion of the weir is a function of its buoyancy, the weir tends to flutter or bounce in the throat when the swimming pool is in use because of waves generated by bathers.

Furthermore, the shape or configuration of the weir has been given little consideration. The present invention solves certain of these difficulties and provides advantages unattainable with the devices of the prior art.

The swimming pool skimmer of this invention comprises a housing with a throat which communicates with the swimming pool surface according to conventional design and a weir assembly which includes a weir movably mounted in the throat, the weir preferably being biased toward the swimming pool to maintain a generally constant level differential between the water in the swimming pool and the water in the skimmer housing. The level differential is sufficient to prevent the backflow of surface film and solid material from the skimmer housing to the pool, either as a result of violent splashing or lack of circulation.

The weir assembly advantageously comprises a resilient sheet, which constitutes mounting and biasing means, secured at one end in the throat and at the other end to a weight, which is the weir member.

According to one particularly advantageous feature of the invention, the upper portion of the weir is so constructed and arranged as to have a substantially flat or mildly convex upper surface and a lower surface portion which is either substantially flat or concave, the upper and lower surfaces intersecting in an acute angle to form the upper edge of the weir. The biasing means maintains the edge of the weir a generally constant distance relative to the water level. The edge is usually maintained at approximately the level of the water in the swimming pool. The lower surface of the weir is preferably designed so as to be concave immediately below the edge such that wave action in the housing causes the water to flow upwardly along the concave surface and to sweep past the edge of the weir carrying with it surface film and solid objects on the upper surface proximate the edge of the weir. In addition, the water flowing over the weir creates a low pressure area beneath the edge of the weir which coacts with the upflowing water to produce a synergistic-like effect on the skimming effectiveness of the weir.

The weir may be biased by means of a spring, such as a compression spring, resilient leaf, etc., or by means of a counter balance on the opposite side of the weir edge. The weir may be the same density as water or slightly less dense and may be more dense than water, the water differential being maintained by reason of the biasing means.

The biasing means can be constructed and arranged so as to provide a variety of level differentials, the bias provided being resistive to the water head established by the differential of water between the swimming pool and the skimmer housing.

Other features and advantages of the invention will be apparent from the specification and from the drawings to which reference is made.

FIG. 1 is a vertical section of the skimmer of this invention illustrating a basic resiliently biased weir assembly.

FIG. 2 is an elevation, shown partially in vertical section, of a modified weir.

FIG. 3 is a horizontal section taken substantially along lines 3—3 of FIG. 2 showing one end of the mounting means for the weir of FIG. 2, and FIG. 4 is an end view of the weir of FIG. 2 showing the mounting means on the other end thereof.

FIG. 5 is a vertical section of a swimming pool skimmer showing a modified resiliently biased weir.

FIG. 6 is a vertical section of a swimming pool skimmer showing a weir resiliently biased by a leaf spring.

FIG. 7 is a vertical section illustrating a modified swimming pool weir in which a counter weight is used to bias the weir to provide the level differential.

Referring first to FIG. 1, the present invention is intended for use in connection with a swimming pool and is mounted adjacent the wall thereof, shown generally at 10. The swimming pool skimmer, shown generally at 12, may comprise, according to conventional design, a open housing 14 and a throat 16 which communicates with the swimming pool at the normal water surface level. The throat 16 is defined by side walls 18 and 20. Access to the housing is through a cover 22 to permit removal of a screen 24 which is conventionally provided to prevent the entry of large solid objects into the pump through a conduit 26. A conduit 28 is usually provided in communication with the pool at a lower point to permit continued circulation of water even though the swimming pool water level may fall below the level of the throat in the skimmer. These elements and combinations are, of course, conventional design and a great many variations may be made depending upon the particular requirements.

The skimmer is provided with a weir 30 which is mounted and resiliently biased by means indicated generally at 32. The biasing and mounting means may be of the type described in connection with FIGS. 2, 3 and 4 hereinafter. The weir 30 is substantially the width of the throat and preferably has a specific gravity of 1 or slightly less than 1.

It is not necessary that the weir have a density equal to or less than water. For example, FIG. 2 illustrates a weir 34 which may be made of sheet metal terminating at the top edge by a portion 36 bent upon itself and turned inwardly. The bottom edge is arcuately folded to form a cylindrical housing 38 for a bias means such as a spring 40.

The spring 40 is connected to a bearing 42 which is provided with a pin 46 for being rotatably received in a blind aperture 48 in wall 18. The bearing 42 is secured to the housing to prevent relative rotation by means of a pin 50.

At the other end, the spring 40 is connected to bearing 52 which is provided a pin having a rectangular shoulder 54 which engages a stud 56 in a recess 57 in the wall 20. This prevents relative rotation of the bearing 52 in the recess. For installation purposes, a temporary pin 58 extends through the housing 38 and the bearing 52. The spring is slightly compressed upon installation to maintain tension on the end bearings 42 and 52. The spring is rotated in the housing to obtain the desired torque, the pin 58 inserted, and the bearings compressed while the weir is mounted in the throat. The spring biases the pins into the recesses and the pin 58 is removed. This permits relative rotation of the bearing 52 and the housing 38 but since the pin 50 is retained in position, and the bearing 52 is not free to rotate with respect to the recess 57 in wall 20, the weir is biased in the counter clockwise direction as shown in FIG. 4.

A similar housing and throat arrangement are illustrated in FIG. 5, but a significantly improved weir configuration is incorporated in this embodiment of the swimming pool skimmer. According to this embodiment of the invention, the weir 60 is in the form of a substantially solid body which may be more or slightly less dense than water. In either event, the weir 60 is preferably resiliently biased and mounted for movement as indicated at 62, according to the construction discussed with respect to FIG. 2.

The weir 60 is so constructed and arranged to have a mildly convex upper surface 64 and a lower surface portion 66 which is flat or slightly concave. The upper surface 64 and the lower 66 intersect in an acute angle to form an edge 68. The biasing means maintains the edge 68 a distance above the water level in the housing and at approximately the level of water in the swimming pool. The mildly arcuate upper surface 64, proximate the surface of water in the swimming pool, results in very substantial improvement in skimming efficiency.

While I do not wish to be bound by any particular explanation, I believe that the water and the film thereon, by reason of its surface tension, tends to flow along the surface 64, this being a substantially lateral surface, rather than a substantially vertical surface usually encountered in the devices of the prior art. The surface film thereby tends to flow smoothly and continuously over the lateral surface of the weir and into the skimmer housing. The level differential and sharp edge aids in this flow and prevents back flow of the surface film and particulate matter.

FIG. 6 illustrates a modified form of a weir 70 utilizing the principles discussed in reference to the weir 60. Weir 70 includes a resilient leaf spring 72 mounted in the throat as shown at 74 and a weir body in the form of a weight which has an upper slightly convex surface 76. Like weir 60, weir 70 has a lower surface portion which is either flat or slightly concave as shown at 78, the surfaces intersecting to form an edge 80.

Weir 70 performs much in the same manner as weir 60; however, the use of the leaf type spring 72 is advantageous in that the construction is simpler and more reliable and since the flexing occurs over a longer area. Rather than biased pivotal movement, the weir tends to maintain a more efficient position with respect to the surface of the water in the swimming pool. That is, the upper convex surface proximate the edge of the weir tends better to conform with the surface of the swimming pool permitting surface tension to effect more efficient and more rapid flow of the surface film over the edge.

FIG. 7 illustrates an alternative bias means for the weir assemblies of this invention. The weir assembly 82 includes a pivotal mount 84, which may be of any conventional design. On the bottom side of the weir assembly a weight 86 is provided to counterbalance the weight of the weir body which is configured to define an upper surface 88 and a body having a lower surface 90 which intersect to form an edge 92. The counterbalance 86 biases the weir so as to maintain a water level differential.

As previously stated, I do not wish to be bound by any particular explanation for the observed increase in efficiency of operation of the weir; however, the following explanation is offered as an aid in understanding the nature of the skimming action using the preferred form of the weir, which is inherent in the configuration of the weir body.

Several phenomena appear to coact to bring about the highly efficient skimming action achieved with the weir of this invention in which the weir body has a generally flat to convex top surface which intersects with a generally flat to concave lower surface in an edge which is maintained a distance above the water level in the skimmer housing.

First, when the pool is relatively quiet, the forces developed by the surface tension of the water and the film on the water cause the film to flow across the surface toward and over the edge. Flow over the edge is aided and accelerated by the flow resulting from the water level differential between the pool and the housing and any wave action in the pool. In addition, wave action in the housing causes water to flow up the lower surface and outwardly from the edge back into the housing carrying water and film from within the pool into the housing. These flow phenomena are aided and increased by the low pressure area created under the edge of the weir by water flowing over the edge into the housing.

When the pool level is relatively turbulent, then the relative effect of surface tension is reduced while the other flow effects are significantly increased, with a net increase in skimming efficiency.

The weir is moveably mounted in the throat to permit it to move up and down as the water level in the swimming pool increases and decreases. The spring or counterweight biases the top edge of the weir toward the swimming pool side of the throat thereby maintaining a generally constant water level differential between the housing and the swimming pool. This improves the skimming action and prevents the return of surface film and solid matter from the housing to the swimming pool.

In the preferred embodiments, as previously pointed out, the upper portion of the weir is so constructed and arranged as to have a substantially flat to mildly convex upper surface and a lower surface portion which is substantially flat to concave which intersects with the upper surface in an acute angle to form an edge. The edge preferably is relatively sharp as shown in FIG. 5 although it may be round as illustrated in FIG. 7, for example.

Preferably, the lower surface of the weir is concave immediately below the edge such that wave action in the housing causes the water to flow along the concave surface and to sweep past the edge of the weir.

With reference to FIG. 6, it is to be noted that the weir body constitutes a weight secured to the free end of a leaf spring, the combination comprising the weir of the invention. In this embodiment of the invention, the weir body serves as a weight, rather than a buoyant member, even though the weir body may actually be slightly less dense than water. The upper surface and edge of the weir body lies proximate the surface of the water in the swimming pool but a significant portion of the weir body is above the water level in the housing. Consequently, if the density of the weir body is more dense than water or even if it is slightly less dense than water, the weir body still constitutes a weight exerting a downward force against the resilient biasing force of the leaf spring 72.

This relationship of weir body and bias means, wherein the weir body has a large inertia relative to the leaf spring, avoids one of the problems of certain of the prior art devices. Where the weir body buoyancy causes the weir to move up and down with the water level, heavy or rapid wave motion, resulting for example from the activity of one or more bathers in the pool, the weir body tends to bounce. Sometimes, as the weir bounces, the upper edge extends far above the water surface in the swimming pool and sometimes the edge may be 1 or 2 inches, or more, below the water surface. Effective skimming action is significantly reduced as a result of this bouncing action. In the embodiment of the invention illustrated, for example, in FIG. 6, the weir body constitutes a relatively high inertia weight on a long flexible leaf spring of low inertia and the bouncing action, due to high buoyancy, is eliminated or significantly damped. The weir edge more nearly coincides with the swimming pool surface and skimming effectivness is improved.

As will be apparent to those skilled in the art, the several advantageous features of the invention may be combined in several arrangements, according to the principles and teachings of this invention without departing from the spirit thereof or from the scope of the claims which follow.

What is claimed is:

1. In a swimming pool surface skimmer of the type which includes an open housing, a skimmer throat for fluid communication between the housing interior and the swimming pool, and a skimmer weir assembly in said throat for moving as the water level in the swimming pool changes, the improvement wherein the weir assembly comprises: a weir, means moveably mounting the weir in the throat to permit the weir to move up and down as the water level in the swimming pool increases and decreases, and springs means connected to said weir and resiliently biasing the top edge of the weir toward the swimming pool side of the throat to thereby maintain a generally constant level differential between the water in the housing and the water in the swimming pool for improving the skimming action and preventing return of surface film and solid matter from the housing to the swimming pool.

2. The swimming pool skimmer as defined in claim 1 wherein the biasing means is a leaf spring and the weir comprises a relatively high inertia weir body mounted on the free edge of the leaf spring.

3. The swimming pool skimmer as defined in claim 1 wherein the upper portion of the weir is so constructed and arranged as to have a substantially flat to mildly convex upper surface, and a lower surface portion which is substantially flat to concave, the upper and lower surfaces intersecting in an acute angle to form an edge, which points away from the swimming pool side of the throat, the biasing means maintaining the edge of the weir a distance above the water level in the housing and proximate the water level in the swimming pool.

4. The swimming pool skimmer as defined in claim 3 wherein the lower surface of the weir is concave immediately below the edge such that water flows along said concave surface and sweeps past the edge of the weir thereby increasing the skimming effectiveness of the weir.

5. The swimming pool skimmer as defined in claim 4 wherein the spring comprises a resilient leaf connected to a weir body to permit resiliently biased movement of the weir body in the throat.

6. The swimming pool skimmer as defined in claim 5 wherein the weir body is a weight, the weight of the weir body cooperating with the resiliency of the biasing means to maintain the level differential.

7. In a swimming pool surface skimmer of the type which includes an open housing, a skimmer throat for fluid communication between the housing interior and the swimming pool, and a skimmer weir assembly in said throat for moving as the water level in the swim-

ming pool changes, the improvement wherein the weir assembly comprises: a weir, means moveably mounting the weir in the throat to permit the air to move up and down as the water level in the swimming pool increases and decreases, and means biasing the top edge of the weir toward the swimming pool side of the throat to thereby maintain a generally constant level differential between the water in the housing and the water in the swimming pool for improving the skimming action and preventing return of surface film and solid matter from the housing to the swimming pool, wherein the lower surface of the weir is concave immediately below an edge of the weir which points away from the swimming pool side of the throat such that water flows along said concave surface and sweeps past the edge of the weir thereby increasing the skimming effectiveness of the weir, and wherein the mounting means comprises a pivot and the biasing means comprises a counter balance secured to the weir assembly on the opposite side of the pivot from the weir edge.

8. The swimming pool skimmer as defined in claim **7** wherein the weir is a weight, the weight of the weir cooperating to maintain the level differential.

9. The swimming pool skimmer as defined in claim **1** wherein the spring comprises a resilient leaf connected to a weir body to permit resiliently biased movement of the weir body in the throat.

10. In a swimming pool surface skimmer of the type which includes an open housing, a skimmer throat for fluid communication between the housing interior and the swimming pool, and a skimmer weir assembly in said throat for moving as the water level in the swimming pool changes, the improvement wherein the weir assembly comprises: a weir, means pivotably mounting the weir in the throat to permit the upper edge of the weir to move up and down as the water level in the swimming pool increases and decreases, and means biasing the top edge of the weir toward the swimming pool side of the throat to thereby maintain a generally constant level differential between the water in the housing and the water in the swimming pool for improving the skimming action and preventing return of surface film and solid matter from the housing to the swimming pool, wherein the mounting means comprises a pivot and the biasing means comprises a counter balance secured to the weir assembly on the opposite side of the pivot from the weir edge.

11. In a swimming pool surface skimmer of the type which includes an open housing, a skimmer throat for fluid communication between the housing interior and the swimming pool, and a skimmer weir assembly in the throat for moving as the water level in the swimming pool changes, the improvement wherein the weir assembly includes a weir body which has an upper surface which is normally maintained proximate the level of the water in the swimming pool and above the level of the water in the housing, which is substantially flat to mildly convex and which intersects with a lower surface which is substantially flat to concave to form an edge which points away from the swimming side of the throat and which is normally a distance above the level of the water in the housing, whereby water flow over the edge from the swimming pool to the housing coact to increase the efficiency of the skimming action of the weir.

12. The improvement as defined in claim **11** wherein the upper surface is mildly convex and the lower surface is concave, the convex and concave surfaces intersecting to form the edge.

13. A spring loaded weir for attachment at the throat of a skim tank of a pool comprising a sheet of leaf spring material adapted to be secured to the bottom of the throat so that the sheet extends substantially from one side to the other of the throat and a lip member attached to the free upper edge of the sheet, the lip member having a density such that when there is no flow of liquid through the tank, at least the upper part of the lip member is above the level of liquid in the pool and when there is liquid flow through the tank the force of the flow flexes the leaf spring, lowering the lip so that the liquid flow passes over it.

14. A spring loaded weir according to claim **13** in which the lip member is of a density approximately equal to that of the liquid which it displaces.

15. A flexible weir according to claim **13** in combination with attaching means at the bottom of the throat for attaching the bottom edge of the sheet to the throat.

16. A combination according to claim **15** in which the attaching means comprises a wedge for wedging the edge of the sheet between the wedge and a wedge surface at the bottom of the float.

17. A combination according to claim **15** in which the leaf spring is stiff enough to cause the lip member to rise above the water level of the pool liquid when there is no liquid flow from the pool to the tank, thus preventing debris in the tank from re-entering the pool.

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