

April 5, 1966

F. E. LA FLAME

3,244,105

PUMP FOR A DOMESTIC APPLIANCE

Filed March 26, 1963

6 Sheets-Sheet 1

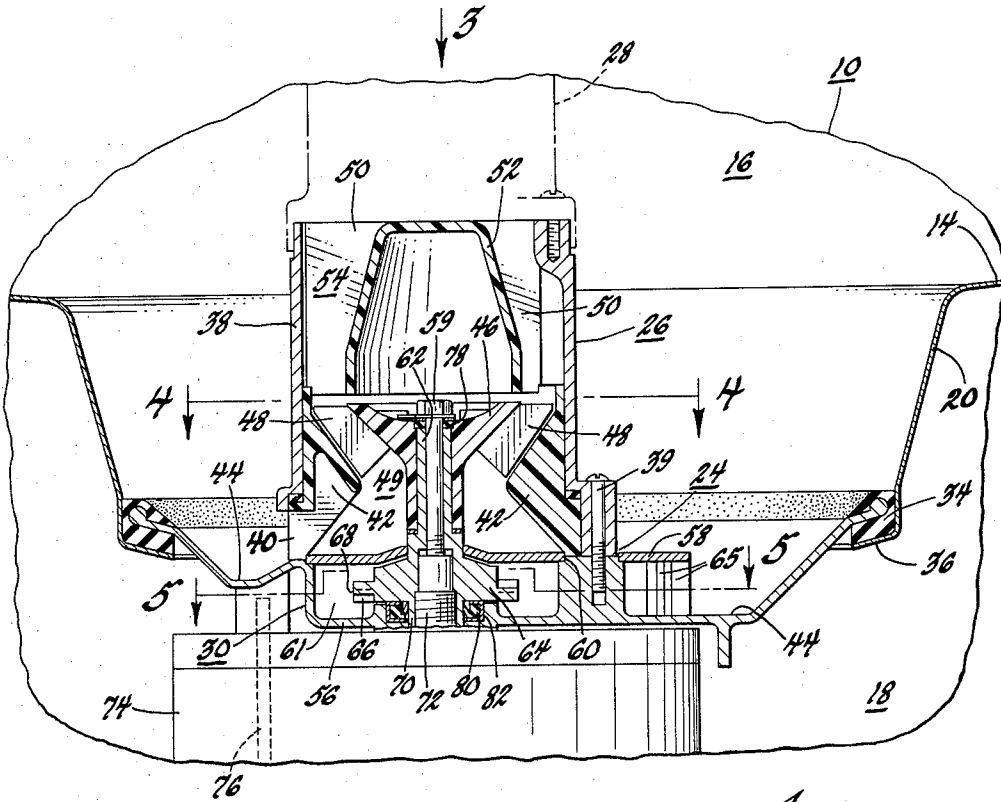


Fig. 2

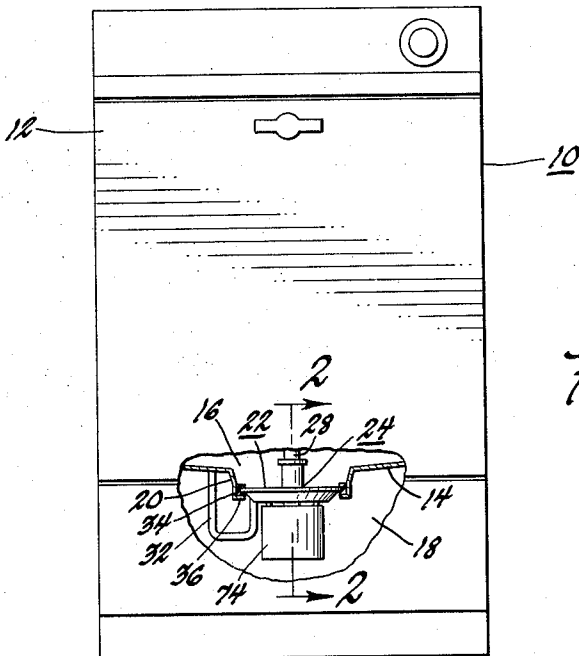


Fig. 1

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6 Sheets-Sheet 2

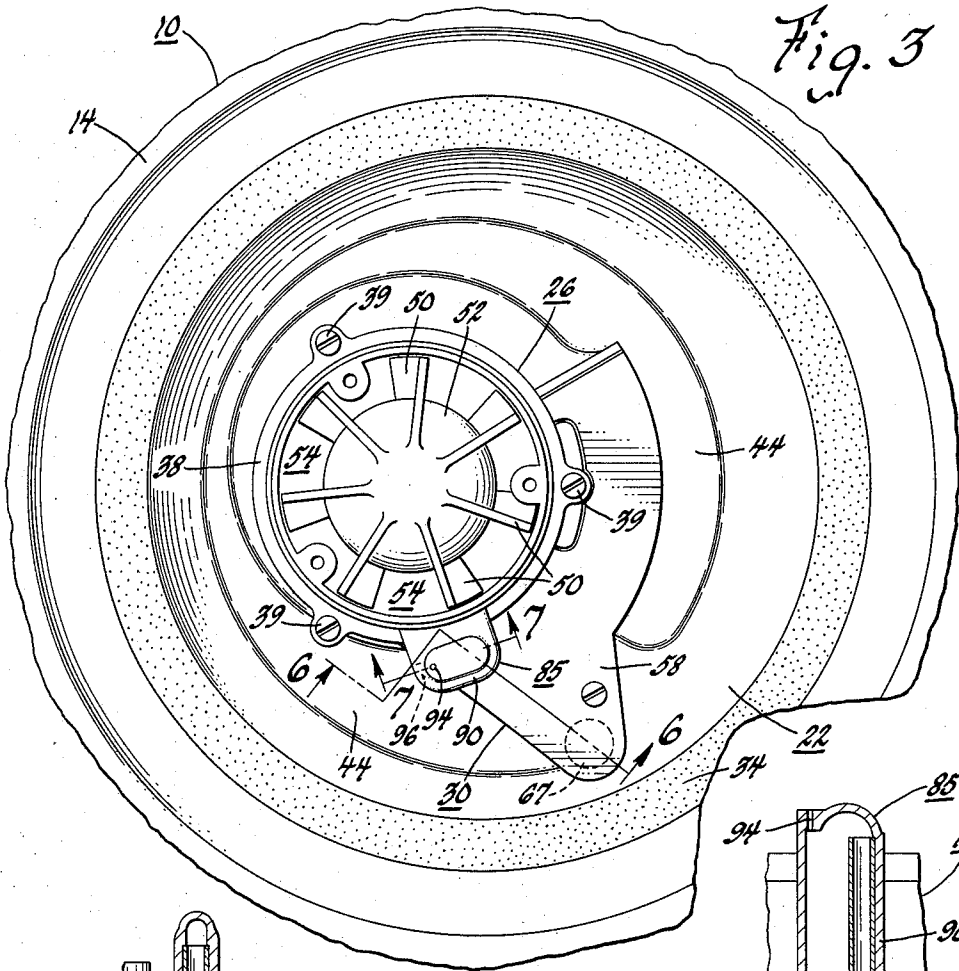
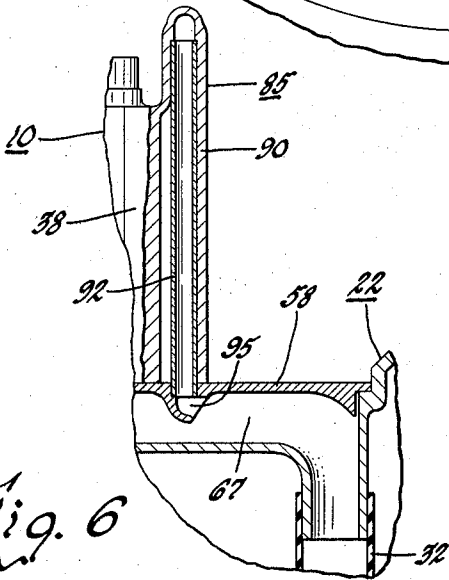
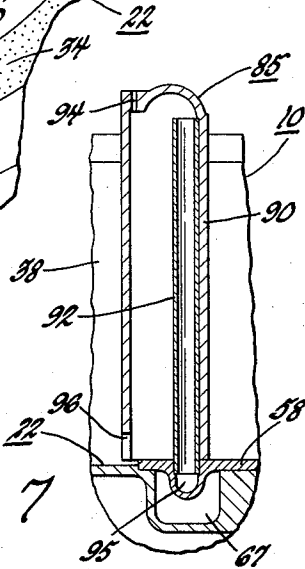


Fig. 6

Fig. 7

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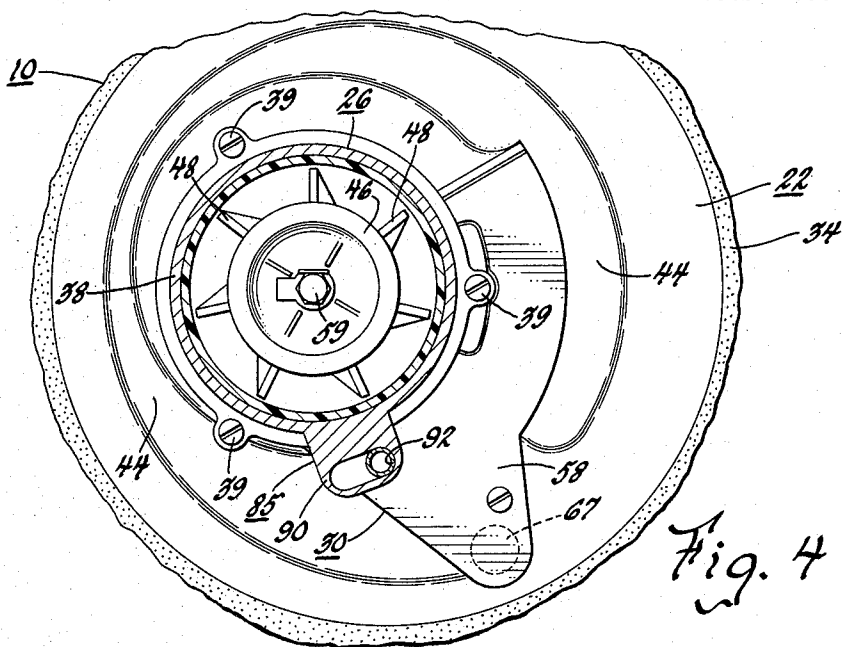
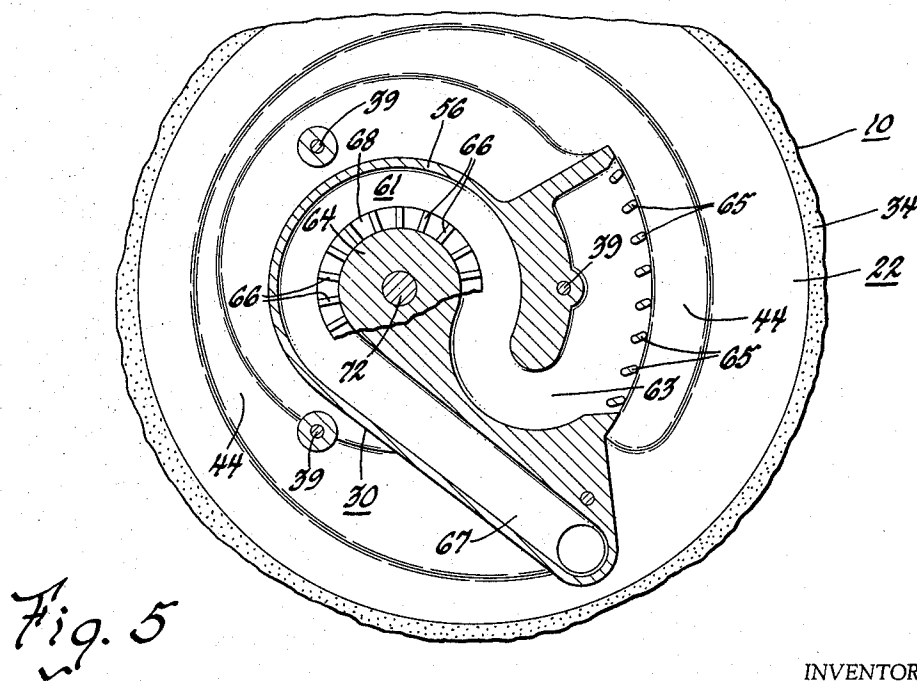
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6 Sheets-Sheet 3



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PUMP FOR A DOMESTIC APPLIANCE

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6 Sheets-Sheet 4

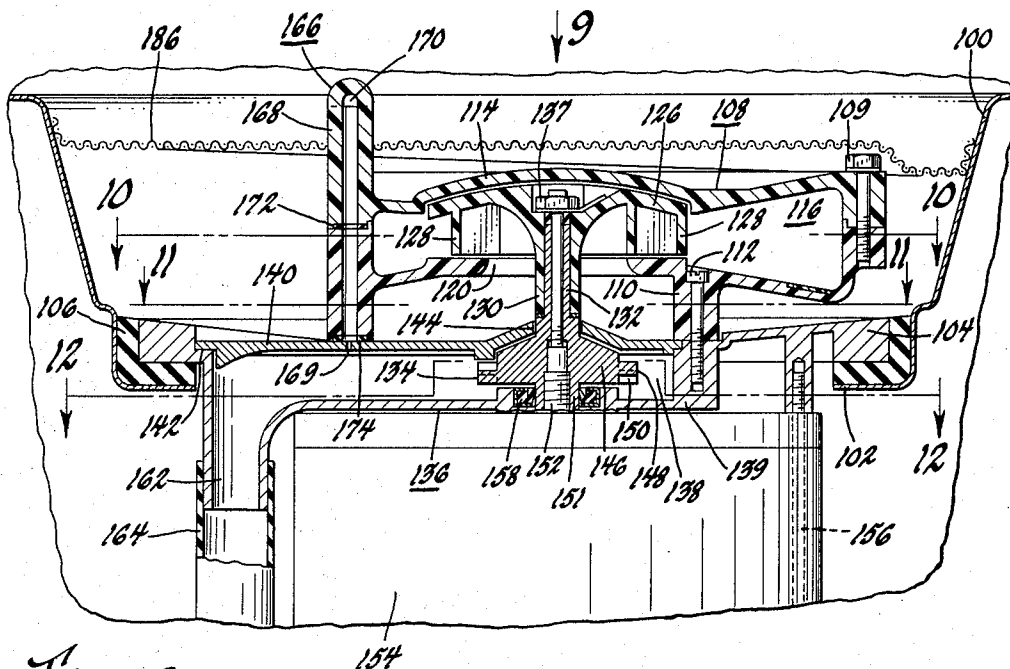


Fig. 8

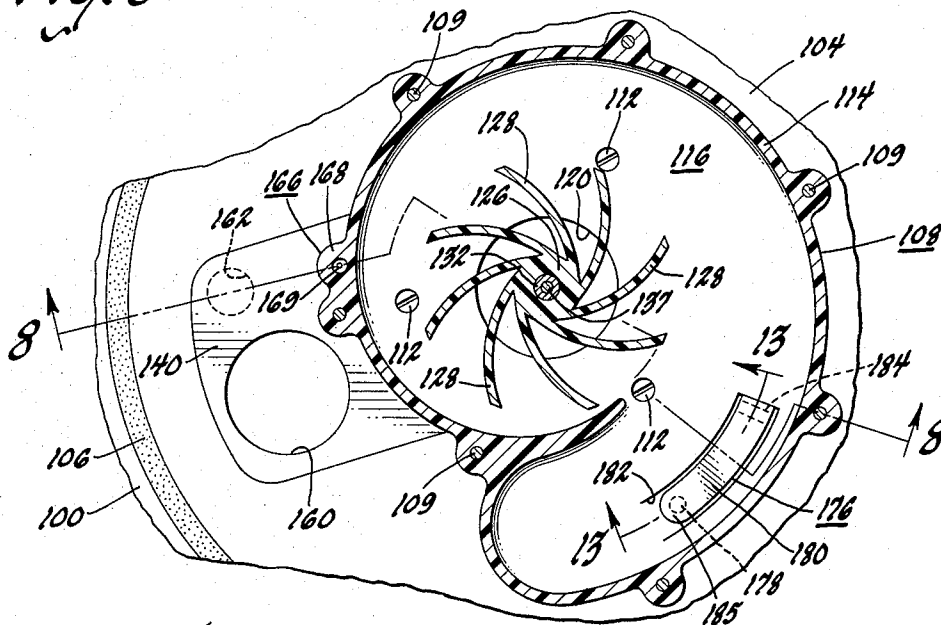


Fig. 10

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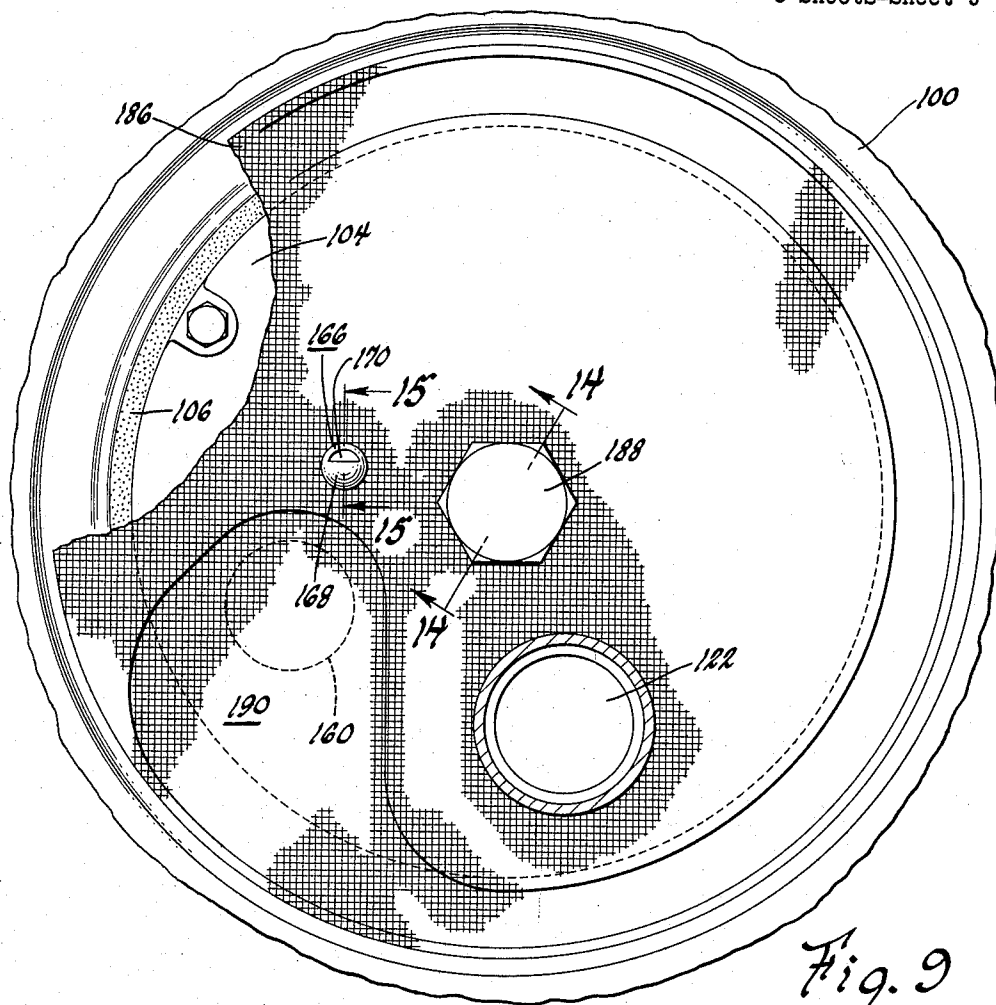


Fig. 9

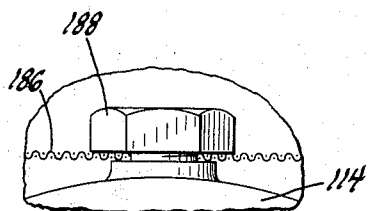


Fig. 14

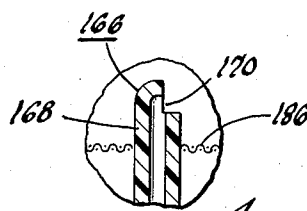


Fig. 15

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PUMP FOR A DOMESTIC APPLIANCE

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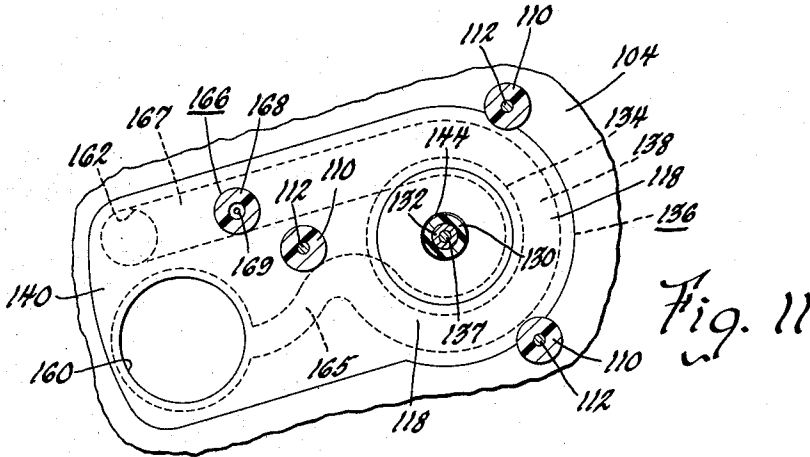


Fig. 11

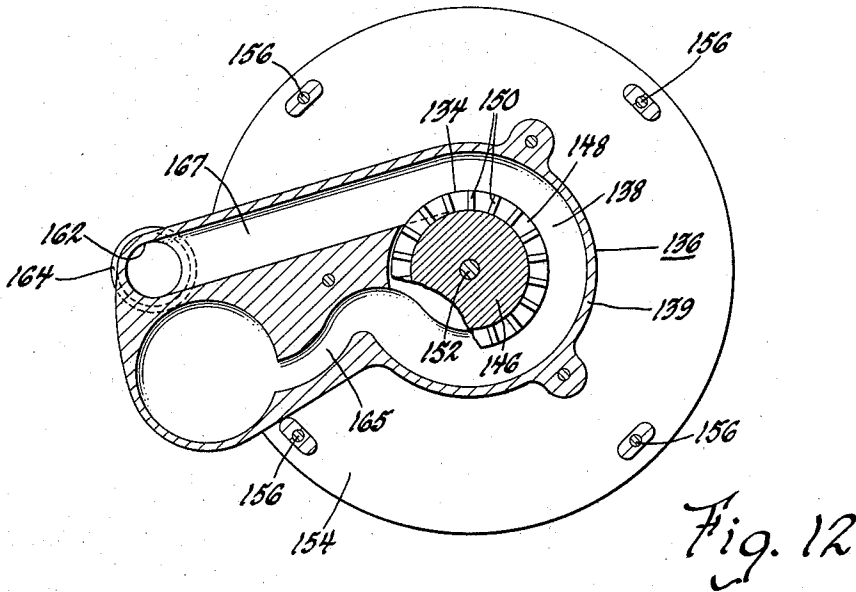


Fig. 12

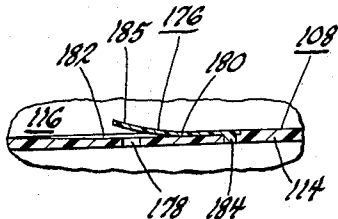


Fig. 13

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PUMP FOR A DOMESTIC APPLIANCE

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Filed Mar. 26, 1963, Ser. No. 268,053

11 Claims. (Cl. 103—3)

This invention relates to fluid circulation systems for association with a fluid containing sump and more particularly to such systems having a plurality of pumps selectively operable to circulate fluid within the sump and to drain the sump.

In many plural pump arrangements suitable for association with a fluid containing sump, fluid is selectively recirculated within the sump by one of the pumps or drained therefrom by the other of the pumps. In such systems, it is desirable that the pumps be concurrently driven by a single motor. The pumps, preferably, are arranged or have means associated therewith to prevent the sump from being drained during periods of fluid recirculation. Furthermore, in cases where the drain pump communicates with a waste drain it is desirable to have means associated with the pumping arrangement to prevent fluid from being withdrawn from the drain and pumped into the sump.

One problem with such plural pump arrangements has been that of eliminating the return of waste from the drain into the sump. Another problem is the fact that most pump assemblies are only adapted for use in a particular fluid containing sump.

A still further problem with such plural pump arrangements is that if fluid is trapped in the pumping chamber of the primary circulation pump when the sump is being drained, it will produce an undesired drag on the pump drive means and also create an undesirable noise level.

Another problem present in such plural pump arrangements is that matter will collect in the low point of the sump associated therewith. Furthermore, the location of the sump is usually relatively inaccessible and it is therefore difficult to clean waste matter therefrom. This problem is especially true in dishwashers where the sump is often hidden beneath elaborate fluid distribution systems. Thus, food particles and the like that collect in the sump can be manually cleaned therefrom only by exerting a great deal of effort.

One object of the invention, therefore, is to provide an improved plural sump arrangement that will be suitable for draining fluid from and circulating fluid within many different types of fluid containing sumps.

Another object of the invention is to improve a plurality of pumps for association with a fluid containing sump by including means in association therewith for preventing fluid in a drain connected to the sump from returning to the sump after being pumped therefrom.

A further object of the invention is to solve the problem of cleaning relatively inaccessible sumps, for example, fluid containing sumps in cleaning devices such as dishwashing apparatus, by providing means in association therewith for flushing the inner surface thereof of the sump during periods in which the sump is being drained.

Another object of the present invention is to prevent a drain pump that is operated concurrently with a pump for circulating fluid in a sump from drawing fluid from a drain and returning it to the sump by negating the pumping head of the drain pump when the circulation pump is circulating fluid within the sump by the provision of means for venting a portion of the pumping chamber of the drain pump to atmosphere to effect a vacuum breaking check between the drain and the drain pump.

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A further object of the invention is to provide an improved drain pump for association with a sump having means for filtering fluid passing thereto wherein the drain pump removes water from the sump while removing waste from the filter.

A still further object of the invention is to improve a plural pump arrangement for association with a fluid containing sump wherein one of the pumps circulates fluid from the sump and distributes it to a point remote therefrom and the other of the pumps concurrently tends to draw fluid from a drain into the sump by providing check means in association with the drain pump to prevent the drain pump from drawing fluid from the drain and passing it into the sump with the check means serving to direct fluid from the drain pump as it draws fluid from the sump so as to flush matter from the inner surface of the sump during such drainage; and

Yet another object of the invention is to improve the combination of a primary circulation pump having a convoluted casing and a drain pump for association with a sump including means in the primary circulation pump for draining the casing thereof during a first predetermined circulation of fluid within the casing to negate noisy operation of the pump and drag on its drive means during such circulation with said drain means being responsive to a second predetermined circulation of fluid within the casing to prevent drainage therefrom.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein preferred embodiments of the present invention are clearly shown.

In the drawings:

FIGURE 1 is an elevational view of the invention in a domestic dishwasher cabinet;

FIGURE 2 is an enlarged view in vertical section taken along the line 2—2 of FIGURE 1;

FIGURE 3 is a top elevational view looking in the direction of arrow 3 in FIGURE 2;

FIGURE 4 is a view in horizontal section taken along line 4—4 of FIGURE 2;

FIGURE 5 is a view in horizontal section taken along the line 5—5 in FIGURE 2;

FIGURE 6 is a view in vertical section taken along the line 6—6 of FIGURE 3;

FIGURE 7 is a view in vertical section taken along the line 7—7 of FIGURE 3;

FIGURE 8 is a view in vertical section of another embodiment of the invention taken along the line 8—8 of FIGURE 10;

FIGURE 9 is a view in top elevation looking in the direction of arrow 9 in FIGURE 8;

FIGURE 10 is a view in horizontal section taken along the line 10—10 of FIGURE 8;

FIGURE 11 is a view in horizontal section taken along the line 11—11 of FIGURE 8;

FIGURE 12 is a view in horizontal section taken along the line 12—12 of FIGURE 8;

FIGURE 13 is a view in vertical section taken along the line 13—13 of FIGURE 10;

FIGURE 14 is a view in vertical section taken along the line 14—14 of FIGURE 9; and

FIGURE 15 is a view in vertical section taken along the line 15—15 of FIGURE 9.

Referring now to the drawings, one embodiment is illustrated in FIGURES 1 through 3 as being associated with a dishwashing unit 10 having an outer casing 12 and a bulkhead 14 located within the outer casing to divide it into an upper washing compartment 16 and a lower machinery compartment 18.

The central portion of the bulkhead 14 is recessed to

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form a substantially conically shaped sump 20 for collecting fluid being circulated within the washing compartment 16. In the illustrated arrangement, the bottom of the sump 20 is formed by a slightly downwardly dished supporting plate 22 of an improved plural pump arrangement 24 for circulating fluid within the washing compartment 16 through a tubular distribution post 28 into contact with dishes or the like supported on racks (not shown) within the washing compartment, and for draining the sump following a washing operation into a looped drain 32.

Referring now more particularly to the construction of the fluid circulation system 24, FIGURES 2 through 5 show a preferred embodiment of the present invention including a primary circulation pump 26 and a drain pump 30 and wherein the supporting plate 22 has the outer peripheral edge thereof inserted into an annular seal 34 carried by a radially inwardly turned edge 36 of the conically shaped sump 20. The primary circulation pump 26 is representatively illustrated in this embodiment of the invention as comprising an outer casing 38 secured by suitable means, such as screws 39, centrally of the upper surface of the supporting plate 22 so as to be located within the sump 20. The outer casing 38 has a generally circular outer peripheral surface with a plurality of circumferentially spaced inlet ports 40 located adjacent the bottom thereof with one of such ports being illustrated in FIGURE 2. Each of the inlet openings 40 is separated from an adjacent opening 40 by a radially inwardly tapered divider or post 42 that serves as a means for directing fluid from a point exteriorly of the outer casing 38 into the interior thereof. Each of the inlet openings 40 communicates with an arcuate depression 44 formed by the slightly dished supporting plate 22 (see FIGURE 2).

The primary circulation pump 26 further includes a rotatable member 46 having a plurality of turbine blades 48 directed radially outwardly thereof to a point adjacent the inside surface of the radially inwardly tapered posts 42 with the outer surface of the rotatable member 46 and the inwardly facing surfaces of the radially inwardly tapered posts serving as a pumping chamber 49 from whence fluid is forced by the turbine blades 48 on rotation of the rotatable member 46 upwardly thereof within the outer casing 38. A plurality of circumferentially spaced curved blades 50 located above the turbine blades 48 have the radially outer bottom edges thereof carried by the upper edge of the posts 42 and their radially inner edges connected to a conoidal shaped hub 52 for locating it centrally of the casing 38 to define a plurality of flow passageways 54 therethrough for straightening the fluid pumped upwardly and outwardly of the casing 38 by the turbine blades 48. The straightened fluid flow is then passed into a suitable distribution means, such as the post 28, to a point of distribution remote from the sump where it is directed under pressure against the items to be washed.

The drain pump 30 is representatively illustrated as including a casing formed by a centrally located downwardly directed bulged portion 56 formed in the supporting plate 22 having the upper surface thereof formed by a head plate 58 supported by the supporting plate 22 at grooves 60 located therein with the head plate 58 serving to seal against fluid leakage between the primary circulation pump 26 and the drain pump 30 and to form, in conjunction with plate 22, a pumping chamber 61 within the pump 30.

In the illustrated arrangement, an inlet passageway 63 to the drain pumping chamber 61 is formed in the supporting plate 22 in communication with the low point in the arcuate depression 44 therein. A radially outer portion of the head plate 58 overlying the inlet 63 has a plurality of spaced fingers 65 extending downwardly therefrom serving to direct flow from the depression 44 into the inlet 63 and to prevent the entrance of large objects therein. The inlet passageway 63 further prevents ob-

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jects from entering the pumping chamber 61 by being formed in an S-shape, as best shown in FIGURE 5. An outlet passageway 67 from the chamber 61 is formed in the plate 22 to communicate with the drain 32, as best shown in FIGURE 6.

The primary circulation pump 26 and drain pump 30 are operatively inter-related by means of an elongated tubular shaft 62 having one end thereof directed through a central opening in the head plate 58 so as to support the rotatable member 46 in the primary circulation pump 26, with the member 46 being secured thereto by means of suitable means such as a threaded bolt 63. The opposite end of the tubular shaft 62 is located within the drain pump casing 56 and is formed as a fluid displacement member 64 having radially outwardly directed blades 66 circumferentially spaced around a radially outwardly directed edge 68 thereon at staggered points thereabove and therebelow. A hub 70 formed on the member 64 below the radial blades 66 is internally threaded to threadably engage a threaded end of a shaft 72 of a suitable reversible drive means, such as a reversible electric motor 74, suspended beneath the supporting plate 22 by suitable means such as bolts 76 directed therethrough. The shaft 72 of the motor 74 is hence directly connected to both the rotatable member 46 of the primary circulation pump 26 and the fluid displacement member 64 of the drain pump 30 so that they will rotate in the same direction. Leakage along the outer periphery of the tubular shaft 62 and drive shaft 72 is prevented by a seal 78 supported in the top of the rotatable member 46 in surrounding sealing engagement with the tubular shaft 62 and by a seal 80 supported in a central recess 82 formed in the pump casing 56 with said seal 80 being located in surrounding sealing engagement with the outer peripheral surface of the hub 70 on the fluid displacement member 64.

To effect selective circulation of fluid from the sump 20 to a distribution point remote therefrom by means of the primary circulation pump 26 and drainage of the sump by drain pump 30 the fluid displacement assemblies of the primary circulation and drain pumps are arranged to circulate fluid through the respective pumps in opposite directions between the inlets and outlets thereof depending upon the direction of rotation thereof as determined by the reversible motor 74. More particularly, each of the pumping chambers 49, 61 formed in the primary circulation and drain pumps 26, 30, respectively, are arranged about the fluid displacement assemblies 46, 64 thereof, as best illustrated in FIGURES 4 and 5, such that when the motor 74 is rotated in a clockwise direction as viewed in FIGURES 4 and 5 fluid is drawn by the primary circulation pump 26 through the inlet openings 40 thereof and forced out the outlet thereof through the tubular distribution post 28 during a predetermined washing cycle or the like. It will be appreciated that the fluid displacement member 64 of the drain pump concurrently rotates in a clockwise direction and as a result will draw fluid from the looped drain 32 and force it into the sump 20. The return of waste fluid present in the drain 32 into the sump during the primary circulation operation is obviously undesirable since such fluids will be recirculated by the primary circulation pump 26 and consequently will contaminate the whole washing compartment 16.

Upon counterclockwise rotation of the motor 74, the primary circulation pump 26 will draw fluid from the tubular distribution post 28 and discharge it through the inlet openings 40 into the sump concurrently while the drain pump 30 draws fluid from the sump through the inlet passageway 63 thereof and discharges it through the outlet passageway 67 into the looped drain 32. In other words, circulation of fluid in the washing compartment 16 by the primary circulation pump 26 and drainage of fluid from the sump by the drain pump 30 are selectively obtained by reversing the operation of the motor 74. The provision for such selective operation is needed since drainage of the sump 20 by the drain pump 30 during

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circulation of fluid within the sump by the primary circulation pump 26 would eventually drain all of the fluid from the washing compartment 16 and hence limit the washing cycle or the like in an undesirable manner.

While the above-described arrangement permits a desired retention of fluid within the sump 20 during the washing cycle or the like, it presents the problem of contaminating the washing compartment 16. One suggested solution to this problem is to provide a one-way check valve in the looped drain 32 adjacent the outlet from the drain pump 30 with the one-way check valve preventing flow therefrom back into the sump 20. Such check valves, however, tend to leak after a period of use and the problem is again present.

Therefore, in accordance with certain of the principles of the present invention, a portion of the drain pumping chamber 61 is vented to atmosphere by vacuum breaking means 85 including a hollow protuberance 90 formed in the outer casing 38 of the primary circulation pump 26 and an elongated tubular element 92 located within the protuberance 90 and held therein by portions of the inside surface thereof so that the upper end of element 92 is spaced from the top of the protuberance 90, as best illustrated in FIGURES 6 and 7. An opening 94 in the upper end of protuberance 90 communicates with the atmosphere above fluid in the sump 20 and the lower end of the tubular element 92 communicates with a passageway 95 in the head plate 58 into the outlet passageway 67 of the drain pump 30. Thus, the outlet of the drain pump 30 is maintained at atmospheric pressure during periods in which pump 30 tends to draw fluid from the looped drain 32 and force it into the sump, and thus the pumping head of the drain pump 30 is effectively negated during such periods to thereby avoid the problem of forcing waste fluids into the sump 20 and the attendant problem of contaminating the washing chamber 16.

The protuberance 90 further includes an opening 96 located adjacent the lower portion of the outer casing 38 into which fluid from the sump 20 will flow, but the vertically extending tubular element 92 has sufficient height to prevent by-passing fluid between the opening 96 and the passageway 95 and an air space is thereby maintained at the upper end of protuberance 90 to produce the above-described venting of the outlet passageway 67 of the drain pump 30 during periods in which it might tend to draw waste fluid from drain 32.

In accordance with certain other of the principles of the present invention the hollow protuberance 90 is filled with fluid from the sump 20 when the drain pump 30 draws fluid from the sump 20 since during this operation the fluid in the outlet passageway 67 of the drain pump 30 is maintained under pressure and is forced into the protuberance 90 and directed outwardly through the openings 94, 96 therein. The opening 96 is relatively larger in cross sectional area than the opening 94 from the protuberance 90, and hence the greatest portion of the flow through the protuberance 90 occurs therethrough. The opening 94 is, as best illustrated in FIGURE 3, faced substantially tangentially to the curved outer periphery of the casing 38 and furthermore is substantially tangential to the curvature of the inner surface of the sump 20 and the support plate 22. Accordingly, fluid pumped through the protuberance 90 will be directed through the arcuate depressing 44 in the supporting plate to effectively flush waste matter deposited therein toward the inlet passageway 63 of the drain pump 30 for removal from the sump 20.

Such an automatic flushing action prevents a buildup of waste materials in the sump that would tend to cause a condition therein that is unsightly or unsanitary, and therefore reduces the need for manually cleaning what is in many cases a relatively inaccessible portion of a domestic appliance or the like.

Another feature of the above-described embodiment

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of the invention is the use of the turbine or mixed flow type of pump 26 as the primary circulation pump. In the illustrated arrangement the blades 48 of the pump have an angle of attack that will cause reverse flow through the pump during drainage of the sump 20. This reverse flow feature is desirable in many dishwashing arrangements since pumping fluid into the washing compartment 16 during drainage of the sump 20 may tend to cause waste matter to be redistributed upon dishes supported therein. In other dishwasher arrangements, however, a manufacturer may provide means for filtering the water being circulated by the primary circulation pump. In this case the fluid in the sump is relatively clean and it can be used for washing the inside surface of the cleaning compartment during the draining cycle so that any waste matter will be removed therefrom and pumped by the drain pump from the unit. Accordingly, many manufacturers desire a unidirectional flow from the outlet of the primary circulation pump both during recirculation of the fluid during the washing cycle and during the drainage cycle whereby fluid is drawn from the sump by the primary circulation pump and forced through the distribution system against the dishes supported in the washing compartment and against the inner surface of the washing compartment. In the above-described embodiment such unidirectional flow can be obtained through the outlet passageways 54 and fluid distribution post 28 by changing the angle of attack of the blades 48 of the mixed flow or turbine pump 26 until there is a positive flow upwardly thereof during both directions of rotation thereof. In other words, in the above-described arrangement the primary circulation pump will have a reverse direction of fluid flow there-through or be unidirectional, depending upon the desires of a particular manufacturer, merely by changing the angle of attack of the turbine blades 48. Accordingly, the plural pump arrangement 24 will be suitable for draining fluid from and circulating fluid within many different types of dishwashers without requiring any major modifications in the primary circulation pump thereof.

Another embodiment of the invention is illustrated in FIGURES 8 through 14 wherein a generally conically shaped fluid containing sump 100 has a radially inwardly directed lower edge 102 carrying a supporting plate 104 that forms the bottom surface thereof. An annular L-shaped seal 106 of a suitable resilient material fits in sealing engagement between the outer periphery of the supporting plate 104 and the inner surface of the edge 102 to prevent fluid leakage from the sump 100. As in the first embodiment, the supporting plate 104 is slightly dished and the central portion of the upper surface thereof supports a primary circulation pump 108 having a plurality of posts 110 on the under side thereof connected to the upper surface of the supporting plate 104 by suitable means such as screws 112. The outer casing 114 of the primary circulation pump 108 is formed in two halves fastened together by screws 109, as best illustrated in FIGURE 8, with the upper and lower halves being shaped to form a convoluted pumping chamber 116 therein having an inlet thereto including openings 118, as shown in FIGURE 11, between the posts 110 and an opening or eye 120 formed in the lower half of the outer casing 114 centrally thereof. An outlet from the pumping chamber 116 is formed as an upwardly directed opening 122 formed in the upper part of the outer casing 114 radially outwardly of the inlet opening or eye 120. A rotary member 126 having a plurality of curved fluid displacement vanes 128 directed radially outwardly therefrom on a curved path is concentrically located in line within the inlet opening or eye 120 for drawing fluid therefrom to be forced thereby through the outlet opening 122. The rotary member 126 also has a tubular portion 130 integrally formed therewith extending downwardly therefrom to fit over an upper end of a tubular

member 132 forming a portion of a rotary fluid displacement member 134 in a drain pump 136 located on the under side of the supporting plate 104. The tubular members 130, 132 are interconnected by a screw 137.

The drain pump 136 has a pumping chamber 138 formed by a downwardly bulged portion 139 in the supporting plate 104 with the pumping chamber 138 being separated from the primary circulation pump 108 and the sump 100 by a cover plate 140 seated in a recess 142 formed in the upper surface of the supporting plate 104 in sealing engagement therewith. The cover plate 140 has an opening 144 therein to provide necessary relief for the tubular member 130 of the drain pump fluid displacement member 134. The rotary fluid displacement member 134 further includes a central portion 146 having a radially outwardly directed edge 148 and blades 150 thereon located at circumferentially spaced points therearound like the edge 68 and blades 66 in the drain pump 30 of the first embodiment. An internally threaded hub 151 extends downwardly from the central portion 146 to threadably engage the threaded end of a drive shaft 152 of a suitable drive means illustrated as a reversible electric motor 154 that is fastened to the underside of the support plate 104 by suitable means, such as screws 156. A suitable seal 158 is supported by the casing of the drain pump 136 at a location in sealing engagement with the outer periphery of the internally threaded hub 151 to prevent fluid leakage outwardly of the supporting plate 104 at that point.

The drain pump 136 further includes an inlet opening 160 formed in the cover plate 140, as best illustrated in FIGURE 11, and an outlet opening 162 formed in the underside of the support plate 104 adapted to be connected to a suitable drain 164, for example, a looped drain of the type illustrated in the first embodiment. The inlet opening 160 and outlet opening 162 are communicated with the drain pumping chamber 138 by inlet and outlet passageways 165, 167 respectively formed in supporting plate 104.

As was the case in the first embodiment, the above-described pumps selectively circulate fluid from the sump 100 to a suitable point of distribution remote therefrom from whence the fluid is returned to the sump to be recirculated or drain the sump following the circulation phase of operation.

More particularly, when the reversible motor 154 is driven in a clockwise direction as viewed in FIGURES 10 through 12 fluid is drawn by pump 108 from the sump 100 through the inlet openings 118 and the eye 120 thereof and discharged under pressure through the outlet opening 122 thereof to a point of distribution. Such clockwise rotation of the reversible motor concurrently causes the drain pump 136 to draw fluid from the drain 164 through opening 162 and outlet passageway 167 and discharge it under pressure through the inlet passageway 165 and opening 160 into the sump. In this arrangement, the undesirable return of waste fluid from the drain 164 is eliminated by means of a vacuum breaker arrangement 166 including a tubular element 168 integrally formed in the outer casing 114 of the primary circulation pump 108 so that one end thereof communicates with an opening 169 in the head plate 140 communicating with the passageway 167 of the drain pump. The tubular element 168 also has an opening 170 in the upper end thereof communicating with atmosphere above the fluid in the sump 100 so that the outlet passageway 167 of the drain pump is communicated with atmosphere to effectively negate the pumping head thereof during periods in which it would otherwise pump waste into the sump 100. Suitable seals 172, 174 are located and supported within the tubular element 168 at the joint formed by the halves of the pump casing 114 and the interface between element 168 and head plate 140 respectively, to prevent leakage of fluid thereacross that might otherwise block communi-

cation between the outlet passageway 167 of the drain pump and atmosphere during such operation.

Rotation of the motor 154 in a counterclockwise direction, as viewed in FIGURES 10 through 12, will reduce the output of the primary circulation pump 108 through the outlet opening 122 thereof but some fluid nevertheless is drawn through the inlet eye 120 as the drain pump 136 pumps fluid from the sump into the drain 164.

During counterclockwise rotation of primary fluid circulation pumps having the characteristics discussed above, it has been observed that the fluid in the pumping chamber 116 interacts with the fluid displacing vanes 128 to produce a disturbing noise level and also to produce an undesirable drag on the motor 154.

Thus, in accordance with other of the principles of the present invention, means are provided in association with casing 114 to drain all the fluid therefrom so as to eliminate the above-mentioned noise and drag. More particularly, this aspect of the invention includes a valve mechanism 176 for opening and closing a drain hole 178 in the low point of the pump casing 114. The valve mechanism 176 comprises a reed valve 180 disposed within a recess 182 in casing 114 leading to the drain hole 178 having one end thereof interlockingly engaged with the casing 114 at 184 and having a closure portion 185 on the opposite end thereof normally biased away from the hole 178. The reed valve 180 has a curvature along the length thereof corresponding to the curvature of the portion of the inner surface of the casing 114 located adjacent thereto and is preferably formed of a noncorrosive plastic material.

The above-described mechanism operates as follows. When the pump 108 draws fluid from the sump 100, fluid forced through the pumping chamber 116 passes from 184 in the reed valve 180 toward the closure portion 185 thereof to force the closure portion 185 downwardly into sealing engagement with the casing 114 to prevent fluid from draining through drain hole 178. When the pump 108 is reversed, the pressure in the vicinity of the reed valve 180 is reduced sufficiently to cause the closure portion 185 thereof to move into its normally biased position so that fluid will drain from casing 114 through hole 178 to negate the above-described problems.

This embodiment of the invention also includes a flushing feature in that once the outlet passageway 167 of the drain pump 136 is under pressure, fluid will flow therefrom through the tubular element 168 and out the opening 170 across the top of a screen 186 interposed between the point of distribution and the inlet openings 118 and 160 to both the primary circulation pump 108 and the drain pump 136. More particularly, screen 186 has the radially outer edge thereof biased against the inside surface of the sump 100 and has a central portion thereof fastened to the under part of the upper half of casing 114 of the primary circulation pump 108 by suitable fastening means, such as a hex headed screw 188, as best illustrated in FIGURE 14. The screen is shaped to include a depression 190 therein terminating at the inlet opening 160 to the drain pump 136. The fluid returned from the point of distribution, however, is distributed substantially evenly over the surface of the screen 186 and consequently matter deposited thereon might eventually block the screen and prevent the return of fluid to the inlets of the pump. The opening 170 in the tubular element 168, therefore, is located so that fluid directed therefrom will impinge against a substantial portion of the upper surface of the screen 176, as best shown in FIGURE 9, to dislodge matter therefrom and force it into the depression 190 from whence the matter can be quickly removed without having to remove the whole screen assembly 186 from the sump 100.

While the embodiments of the present invention as herein disclosed constitute preferred forms, it is to be understood that other forms might be adopted.

What is claimed is as follows:

1. In a dishwasher, the combination of, a water container having a sump and a drain, said sump having an inner surface, a plurality of pumps supported by said water container within said sump, one of said pumps including means to withdraw and return fluid from and to said sump, another of said pumps having means including a pumping chamber having a drain passageway to withdraw fluid from said drain and discharge it into said sump, drive means including a reversible electrical motor operatively connected to said pumps for operating said pumps concurrently, said motor being driven in a first direction during a washing cycle of operation, said motor being driven in a direction opposite to said first direction during a drain cycle of operation, vent means for venting a portion of said pumping chamber of said another of said pumps connected to said drain passageway and to atmosphere to prevent said another of said pumps from drawing fluid from said drain and discharging it into said sump during the washing cycle of operation, said vent means including means to direct fluid from the pumping chamber of said another of said pumps against the inner surface of said sump to flush matter therefrom during the drain cycle of operation.

2. In a dishwasher, the combination of, a water container having a sump and a drain, a plurality of pumps supported by said water container within said sump, drive means for concurrently operating said pumps, said drive means including a reversible electrical motor rotatable in a first direction during a washing cycle of operation and in a direction opposite to said first direction during a drain cycle of operation, one of said pumps having an inlet communicated with said sump and an outlet communicated with a point of distribution remote from said sump, said one of said pumps including an impeller connected to said motor to be driven thereby for drawing fluid and returning fluid to and from said sump through said inlet and outlet of said one of said pumps, another of said pumps having an inlet communicated with said sump and an outlet communicated with said drain, said another of said pumps including a pumping chamber having a drain passageway and fluid displacement means in said pumping chamber connected to said motor to be driven thereby for drawing fluid from said sump into said drain during the drain cycle, said fluid displacement means drawing fluid from said drain through the outlet of said another of said pumps and discharging it through the inlet of said another of said pumps into said sump during the washing cycle of operation, and vent means connected to said drain passageway and to atmosphere to prevent said another of said pumps from discharging fluid from said drain into said sump during the washing cycle of operation.

3. In a dishwasher, the combination of, a water container having a sump and a drain, said sump having an inside surface, a plurality of pumps supported by said water container within said sump, drive means for concurrently operating said pumps including a reversible electrical motor operative in a first direction during a washing cycle of operation and in a reverse direction during a drain cycle of operation, one of said pumps having an inlet communicated with said sump and an outlet communicated with a point of distribution remote from said sump, another of said pumps having an inlet communicated with said sump and an outlet communicated with said drain, said one of said pumps including an impeller connected to said motor to be driven thereby for drawing fluid from said sump and discharging it to the point of distribution during the washing cycle of operation, said another of said pumps including a pumping chamber having a drained passageway and having an impeller in said chamber connected to said motor to be driven thereby during the washing cycle of operation to draw fluid from said drain and to discharge it into said sump, vent means connected to said drain passageway and to atmosphere

phere to prevent said another of said pumps from drawing fluid from said drain during the washing cycle of operation, said impeller in said another of said pump means being operative during the drain cycle of operation to draw fluid from said sump and to discharge fluid into said drain, said vent means including means to direct fluid from said pumping chamber of said another of said pump means during the drain cycle of operation against the inside surface of said sump to flush matter therefrom.

4. In a dishwasher, the combination of, a water container having a sump and a drain, a plurality of pumps supported by said water container within said sump, drive means for concurrently operating said pumps including a reversible electrical motor, said motor being driven in a first direction during a wash cycle of operation and in a reverse direction during a drain cycle of operation, one of said pumps having an inlet communicated with said sump and an outlet communicated with a point of distribution remote from said sump, said one of said pumps including a pumping chamber having an impeller therein connected to said motor to be driven thereby during the washing cycle of operation to draw fluid from said sump and to force it to the point of distribution, another of said pumps having an inlet communicated with said sump and an outlet communicated with said drain, said another of said pumps including a pumping chamber having a drain passageway and fluid displacement means in said pumping chamber connected to said motor to be driven thereby during the drain cycle of operation to draw fluid from said sump and to discharge it into said drain, said fluid displacement means being operative during the washing cycle of operation to draw fluid from said drain and to discharge it into said sump, a screen having an upper surface located between the point of distribution and the inlet of said one of said pumps for filtering fluid passed into the inlet of said one of said pumps, and vent means connected to said drain passageway and atmosphere for preventing said another of said pumps from drawing fluid from said drain and discharging it into said sump during said washing cycle of operation, said vent means including fluid passageway means to direct fluid from said pumping chamber of said another of said pumps during the drain cycle of operation, said fluid passageway means including an outlet for directing the fluid from said another of said pumps against the upper surface of said screen to flush matter therefrom.

5. In a dishwasher, the combination of, a water container having a sump and a drain, a plurality of pumps supported by said water container within said sump, drive means connected to each of said pumps for concurrently operating said pumps, said drive means including means for reversing the pumping action of said pumps, one of said pumps including means to withdraw and return fluid from and to said sump, another of said pumps including means to drain fluid from said sump during a first predetermined operation of said drive means, said one of said pumps having a casing forming a voluted pumping chamber having a drain at the low point thereof for draining fluid therefrom, and valve means for closing said drain during a second predetermined operation of said drive means, said valve means being operable to open said drain during said first predetermined operation of said drive means for draining fluid from said casing.

6. In a dishwasher, the combination of, a water container having a sump and a drain, a supporting plate connected to and forming a portion of the bottom of said sump, a first pump casing supported on said plate forming a first pumping chamber located within said sump, said first pump casing having an inlet communicating with said sump and an outlet communicating with a point of distribution remote from said sump, a second pump casing supported on said plate forming a second pumping chamber within said sump, said second pump casing having an inlet communicated with said sump and an outlet in communication with said drain, means in-

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cluding rotatable members in each of said pump casings for causing fluid circulation therethrough, drive means including a reversible electrical motor operatively connected to each of said rotatable members for concurrently rotating said rotatable members in the same direction, said motor being driven in a first direction during a washing cycle of operation, said motor being driven in a reverse direction during a drain cycle of operation, said rotatable member in said first pump casing being operable to circulate fluid from said sump to said point of distribution during the washing cycle of operation, said rotatable member in said second pump casing being operable to draw fluid from said drain and to discharge fluid from said drain into said sump during the washing cycle of operation, said rotatable member in said second pump casing being operable during the drain cycle of operation to draw fluid from said sump and to discharge such fluid into said drain, and vent means connected to said outlet of said second pump casing and to atmosphere for preventing said rotatable member from drawing fluid from said drain for discharge into said sump during the washing cycle of operation.

7. In a dishwasher, the combination of, a water container having a sump and a drain, a supporting plate connected to and forming a portion of the bottom of said sump, said supporting plate having an upper surface, a first pump casing within said sump forming a first pumping chamber having an inlet communicating with said sump and an outlet communicating with a point of distribution remote from said sump, a second pump casing located within said sump forming a second pumping chamber having an inlet communicating with said sump and an outlet communicating with said drain, means including a rotatable member in each of said pump casings for causing fluid circulation therethrough, drive means including a reversible electric motor connected to each of said rotatable members for concurrently rotating them in the same direction, said electrical motor being driven in a first direction during a washing cycle of operation and in a reverse direction during a drain cycle of operation, said rotatable member in said first pump casing during the washing cycle of operation drawing fluid from said sump and discharging it to said distribution point, said rotatable member in said second pump casing during the washing cycle of operation being operable to draw fluid from said drain and to discharge such fluid into said sump, said rotatable member in said second pump casing during the drain cycle of operation drawing fluid from said sump and discharging fluid into said drain, and vent means connected to said outlet of said second pump casing and to atmosphere for preventing said rotatable member in said second pump casing from drawing fluid from said drain for discharge into said sump during the washing cycle of operation, said vent means including fluid passageways means for directing fluid from said second pumping chamber against the upper surface of said supporting plate to flush matter therefrom into the vicinity of the inlet to said second pumping chamber during the drain cycle of operation.

8. A fluid circulation device for association with a fluid containing sump and a drain comprising, a supporting plate adapted to be connected to and to form a portion of the bottom of the sump, a first pump casing forming a first pumping chamber having an inlet communicating with the sump and an outlet adapted to be connected to a point of distribution remote from the sump, a second pump casing forming a second pumping chamber having an inlet adapted to be communicated with the sump and an outlet adapted to be connected to a drain, means including rotatable members in each of said pump casings for causing fluid circulation therethrough, drive means including a reversible electrical motor connected to each of said rotatable members for concurrently rotating them in the same direction, said electrical motor being driven in a first direction during a washing cycle of operation and in a reverse direction during a drain cycle of operation, said rotatable member in said first pump casing being op-

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erative during the washing cycle of operation to draw fluid from said sump and to discharge it to the point of distribution, said rotatable member in said second pump casing being operative during the washing cycle to draw fluid from said drain and to discharge it into said sump, said rotatable member in said second pump casing being operative during the drain cycle of operation to draw fluid from said sump and to discharge it into said drain, and vent means connected to said outlet of said second pump casing and to atmosphere for preventing said rotatable member in said second pump casing from drawing fluid from said drain and discharging it into said sump during the washing cycle of operation.

9. In a cleaning device the combination of, a water container having a sump and a drain, a supporting plate connected to a sump and forming a bottom portion thereof, a first pump casing forming a first pumping chamber having an inlet communicated with the sump and an outlet connected to a point of distribution remote from the sump, a second pump casing forming a second pumping chamber having an inlet opening through the upper surface of said supporting plate and an outlet connected to a drain, means including a rotatable impeller in each of said pump casings to cause fluid circulation therethrough, drive means operatively connected to each of said impellers for concurrently rotating them in a first predetermined direction, said drive means including means for reversing the direction of rotation of said impellers during a drain cycle of operation, said first pump casing having a curved outer peripheral surface cooperating with the inside surface of said supporting plate to define a flow channel communicating with the inlet to said second pump casing, said rotatable impeller in said first pump casing being operative to draw fluid from said sump and to discharge such fluid to the point of distribution remote from said sump, said impeller in said second pump casing being operative during the washing cycle of operation to draw fluid from said drain and to force it under pressure into said sump, said impeller in said second pump casing being operative during the drain cycle to draw fluid from said sump and to discharge it into said drain, vent means connected to said outlet of said second pump casing and to atmosphere for preventing said impeller in said second pump casing from drawing fluid from said drain into said sump during the washing cycle of operation, said vent means including means to direct fluid from said second pump casing during the drain cycle of operation with the directed fluid passing substantially tangentially to the outer peripheral surface of said first pump casing to cause a circular flushing of the fluid channel defined by the outer peripheral surface in cooperation with the inside surface of said supporting plate so as to carry matter therein into the vicinity of the inlet to said second pump casing.

10. In a cleaning device the combination of, a water container having a sump and a drain, a supporting plate connected to a sump and forming a bottom portion thereof, said supporting plate having an upper surface, a first pump casing forming a first pumping chamber having an inlet communicated with the sump and an outlet connected to a point of distribution remote from the sump, a second pump casing forming a second pumping chamber having an inlet opening through the upper surface of said supporting plate and an outlet being connected to a drain, means including impellers in each of said pump casings to cause fluid circulation therethrough, drive means including a reversible electrical motor connected to each of said impellers for concurrently rotating said impellers in the same direction, said electrical motor being driven in a first direction during a washing cycle of operation and in a reverse direction of rotation during a drain cycle of operation, said first pump casing having a curved outer peripheral surface cooperating with the inside surface of said supporting plate to define a flow channel communicating with the inlet to said second

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pump casing, said impeller in said first pump casing being operative during the washing cycle of operation to circulate fluid from said sump to said point of distribution, said impeller in said second pump casing being operative to draw fluid from said drain and discharge it into said sump, said impeller in said second pump casing being operative during the drain cycle to draw fluid from said sump and to discharge it into said drain, vent means connected to said outlet of said second pump casing and to atmosphere for preventing said impeller in said second pump casing from drawing fluid from said drain into said sump during the washing cycle of operation, said vent means including means forming a fluid passageway between said second pump casing and a point adjacent the base of said first pump casing for directing fluid from said second pump substantially tangentially to the outer peripheral surface of said first pump casing adjacent the upper surface of said supporting plate to cause a generally circular flushing of said upper surface during the drain cycle of operation.

11. In a cleaning device the combination of, a water container having a sump and a drain, a supporting plate forming a bottom portion of said sump, said support plate having an upper surface, a first pump casing forming a first pumping chamber having an inlet communicating with the sump and an outlet connected to a point of distribution remote from the sump, a second pump casing forming a second pumping chamber having an inlet opening through the upper surface of said supporting plate and an outlet connected to a drain, means including a rotatable impeller located within each pump casing to cause fluid circulation therethrough, drive means including a reversible electrical motor connected to each of said impellers for concurrently rotating said impellers in the same direction, said electrical motor being driven in a first direction during a washing cycle of operation and in a reverse direction during a drain cycle of operation, said impeller in said first pump casing being opera-

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tive during the washing cycle of operation to circulate fluid from said sump to the point of distribution, said impeller in said second pump casing being operative during the wash cycle of operation to draw fluid from said drain and to discharge it into said sump, said impeller in said second pump casing being operative during the drain cycle to draw fluid from said sump and to discharge it into said drain, and first pump casing having a curved outer peripheral surface cooperating with the upper surface of said supporting plate to form a flow channel, vent means defining a passageway adjacent the outer peripheral surface of said first pump casing having one end thereof communicating with atmosphere and an opposite end thereof communicating with said outlet of said second pump casing for preventing said impeller in said second pump casing from draining from said drain and discharging it into said sump, said vent means further including an opening therein directed substantially tangentially to the outer peripheral surface of said first pump casing adjacent the upper surface of said supporting plate for directing fluid from said passageway tangentially of said supporting plate during the drain cycle of operation, and means within said passageway for preventing fluid from passing from the sump through said passageway into said second pumping chamber during rotation of said second pump impeller during the washing cycle of operation.

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