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R. S. GAUGLER ET AL

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DOMESTIC CLOTHES WASHER WITH FLUID FLOW AGITATION

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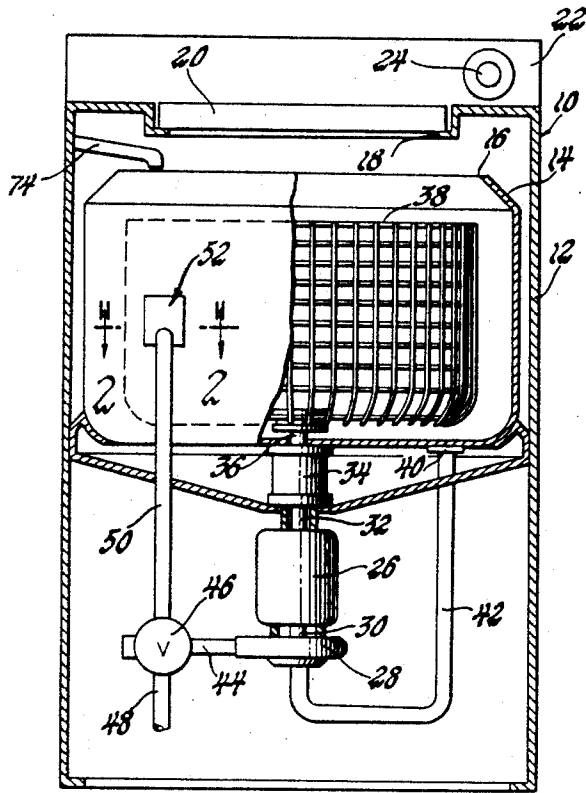


Fig. 1

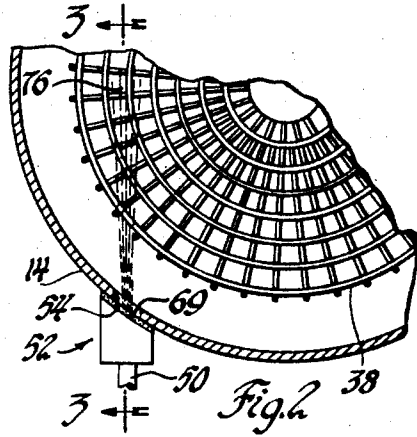


Fig. 2

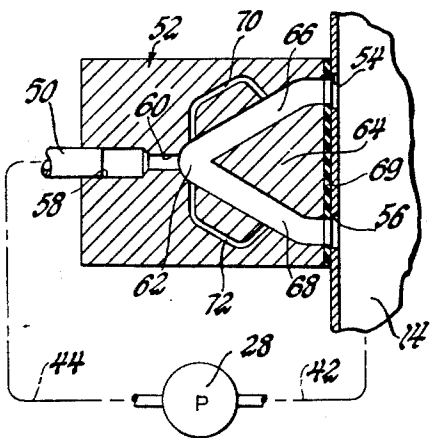


Fig. 3

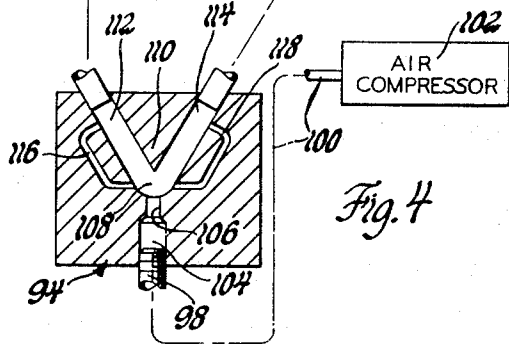
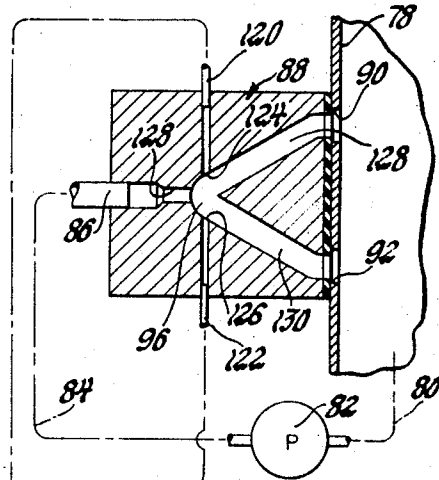


Fig. 4

INVENTORS
Richard S. Gaugler, &
Donald C. Siegla
J. C. Evans
ATTORNEY.

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**DOMESTIC CLOTHES WASHER WITH
 FLUID FLOW AGITATION**

Richard S. Gaugler and Donald C. Siegl, Dayton, Ohio,
 assignors to General Motors Corporation, Detroit,
 Mich., a corporation of Delaware

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3 Claims

ABSTRACT OF THE DISCLOSURE

In a preferred form, a domestic clothes washer including a clothes container into which fluid is surged by a cleaning fluid distributing system that includes a drain pump operative during a cleaning cycle of operation to circulate fluid from the container to a fluid amplifier that directs a pulsating jet flow into the container that serves to produce a high level of agitation within the container for removing soil from articles therein and to produce a fluid pattern within the container for continuously circulating articles through the cleaning fluid.

This invention is directed to domestic clothes washing apparatus and more particularly to an improved fluid flow circuit in a domestic clothes washer for directly surging fluid into an intimate soil removing contact with articles being cleaned therein.

In domestic clothes washers, typically, a mechanical agitator is present and operative during a washing phase of an automatically controlled sequence of operation to rapidly move relative to articles within a tub portion of the washer so as to surge cleaning fluid through the articles for removing soil therefrom.

Such mechanical agitators take many forms but are all characterized by at times having the washing load passed directly in physical contact therewith. This physical contact can produce a noticeable, physical wear of articles being cleaned.

An object of the present invention therefore is to improve domestic clothes washers by eliminating the need for a mechanical agitator therein.

A further object of the present invention is to provide a domestic clothes washing apparatus that includes a fluid circuit therein operative during the washing cycle of operation to circulate fluid through a wash tub of the apparatus and to control the fluid circulating during the washing cycle of operation to produce a pulsating action in the flow within the tub that will cause a continuous circulation of articles within the tub and a fluid surging action for removing soil from the articles being cleaned.

Still another object of the present invention is to provide a domestic washing apparatus that eliminates direct physical contact between a mechanical agitator and articles being cleaned by inclusion therein of a fluid distributing system operative during a washing phase of an automatically controlled sequence of operation including a pump, valve means for selectively directing fluid from the pump to drain or to a washing tub portion of the apparatus and a fluid amplifier including means for continually diverting a jet stream between first and second fluid inlets to the washing container and at a frequency to produce a pulsing fluid action within the washing tub in the vicinity of the inlets thereto for producing a surging of fluid through articles being cleaned.

Yet another object of the present invention is to improve domestic washer apparatus without a mechanical agitation therein by the provision of an improved fluid impulse generating system for producing a pulsating fluid surging action within a washing tub portion of the ap-

paratus and including inlet means to the water container for producing an inlet flow tangential to the periphery of the water container and of a pulsing nature which causes articles within the container to recirculate along a path defined by the periphery of the washing tub.

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

In the drawings:

FIGURE 1 is a view partially in vertical section and partially in elevation of a domestic washer including the present invention;

FIGURE 2 is an enlarged fragmentary horizontal sectional view taken along the line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged fragmentary vertical sectional view taken along the line 3—3 of FIGURE 2; and

FIGURE 4 is a diagrammatic representation of a washer system including another embodiment of the present invention.

In FIGURE 1, a clothes washer 10 is shown including an outer casing 12 in which is located a water container 14 having a top access opening 16 which is below a loading port 18 in the top of the casing 12 which is closed by a door closure member 20.

A control panel 22 on the rear of casing 12 includes a user control knob 24 for selecting an automatically controlled sequence of washing operation, for example, of the type that includes timer controlled fill, wash, rinse, and spin dry phases of operation.

The timer controller is not shown but is understood to include motor means and cam operated switch means or the like connected across a power source and operative to periodically actuate an electrically energizable motor 26 to operate a pump 28 through a first drive shaft 30. The motor 26 includes an output shaft 32 connected by a clutch assembly 34 to a spin shaft 36 secured to the underside of an article containing basket 38 located within the container 14.

The water container 14 has a drain fitting 40 in the bottom thereof which connects to a drain conduit 42 thence through the inlet of the pump 28. The outlet of the pump 28 connects to a discharge conduit 44 and to a solenoid operated valve 46 that is conditionable either to direct fluid through a conduit 48 to drain or through a supply conduit 50 to a fluid pulse generating device 52 which communicates with spaced apart inlet openings 54, 56 through the interior of the water container 14.

The fluid pulse generating device 52 more particularly is a self-excited fluid amplifier including an inlet 58 with a jet forming nozzle 60 which discharges through an interaction region 62 located down-stream of the tip of a fixed flow divider or splitter 64. On one side of the splitter 64 is located a first flow path 66 and on the other side thereof is located a second flow path 68. Flow paths 66, 68 connect with inlet openings 54, 56 respectively through a seal 69 between the device 52 and container 14.

The interaction region 62 is communicated with a down-stream portion of the flow path 66 by a control passageway 70. Likewise, the region 62 is communicated with a down-stream portion of the flow path 68 by a control passageway 72.

A feature of the present invention is the arrangement of the inlets 54, 56 to face in a direction so that fluid flow therethrough will be more or less tangential to the periphery of the perforated article containing basket 38 as best seen in FIGURE 2. This flow pattern induces a circulation of fluid through the water container circumference so that articles within the basket 38 will be re-

peatedly passed into close proximity with fluid issuing from inlets 54, 56.

The operation of the embodiment of the illustrated arrangement in FIGURES 1 through 3 includes a fill cycle of operation wherein the timer controller is set by the user control knob 24 to condition a fill circuit (not shown) to allow a predetermined amount of water to pass through an inlet chute 74 into the interior of the water container 14.

Following the fill phase of operation, the timer controller conditions the motor 26 to operate the shaft 30 whereby the pump 28 will draw fluid from the water container 14 and pass it through valve 46 which is conditioned to direct the fluid upwardly through conduit 50 thence through the fluid amplifier 52. The fluid amplifier power jet is initially directed through the flow path 66 or flow path 68. In either event, the fluid flows back through one of the control passageways 70 or 72 to produce a pressure differential across the interaction region 62 that acts to shift the power jet into the other of the flow paths. Immediately the pressure differential through the interaction region 62 will reverse to cause a reshift of the power jet to its original path. This shifting action of the power jet will continue at a predetermined cyclic rate to produce a pulsing fluid flow through the spaced apart inlet openings 54, 56, which pulsing flow will produce a fluid impulse within the container 14 with impulses being at the highest level of intensity in the region 76 as seen in FIGURE 2. The fluid pulses from the inlet openings 54, 56 desirably have a frequency in the sonic range for example, 100 cycles per second. During the washing cycle the pump 28 continually draws fluid from the container 14 to supply the pulse generating device 52.

Following the washing cycle of operation, the clutch 34 is conditioned so that the motor 26 will rotate the basket 38 at a predetermined speed so that fluid will be centrifuged from articles therein and drained from the water container 14 through the conduit 42, pump 28 and valve 46 that is conditioned to divert fluid through the drain conduit 48 and exteriorly of the casing 12 through a suitable household drain fixture.

Following the spin cycle of operation, the water container may be filled with rinse fluid which is subsequently extracted therefrom during a final spin phase of operation.

In the embodiment of the invention illustrated in FIGURE 4, a diagrammatically shown system is illustrated that includes a water container 78 like that in the first embodiment which includes an outlet 80 connected to a pump 82 which discharges through a supply conduit 84 to the inlet 86 of a modified fluid pulse generating device 88 which discharges pulsating fluid jets through spaced apart openings 90, 92 in the water container 78. In this embodiment of the invention, the fluid pulse producing device 88 rather than being self-excited as was the case in the previously described embodiment, is associated with a self-excited fluid amplifier 94 to produce a rapidly cycling differential control pressure across a fluid interaction region 96 in the device 88 to increase the frequency of fluid pulses within the water container 78.

More particularly, the fluid amplifier 94 includes an inlet 98 connected by a conduit 100 to a suitable source of compressed fluid such as an air compressor 102. The inlet 98 of the amplifier 94 is connected by path 104 to a power jet producing nozzle 106 and into a fluid interaction region 108 that is divided by a fluid divider 110 or splitter into spaced apart outlets or discharge paths 112, 114. The outlet end of the path 112 is communicated through a control passageway 116 to one side of the interaction region 108. Likewise, the down-stream end of the flow path 114 is communicated through a control passageway 118 with the opposite side of the interaction region 108.

The jet issuing from the nozzle 106 will be shifted back and forth between the flow paths 112, 114 in the same

manner as was the power jet in the first embodiment thence to be discharged as a plurality of rapidly shifting fluid flows through control conduits 120, 122 terminating in openings 124, 126 located on opposite sides of the interaction region 96 of pulse generating device 88. Thus, a power jet issuing from a power jet forming nozzle 128 of the device 88 will be shifted at an increased frequency between outlet paths 129, 130 communicating respectively through inlets 90, 92 to the interior of the water container 78. By virtue of the second described embodiment of the invention, the intensity of the fluid pulses of the water container 78 will be of a somewhat greater magnitude with that experienced in the water container 14 in the first embodiment.

While the embodiment of the present invention as herein disclosed constitutes a preferred form it is to be understood that other forms might be adopted.

What is claimed is:

1. In a domestic clothes washer apparatus, the combination of a water container, a perforated basket having a peripheral wall located within said water container including a peripheral wall of generally circular form surrounding said basket peripheral wall, a fluid inlet fitting in said water container for directing fluid interiorly of said water container and into said perforated basket, said fluid fitting including a first and a second opening located above another on said container, means for drawing fluid from said water container and for directing fluid to said first and second openings, said means including a fluid jet nozzle and a fixed flow divider member forming first and second flow branches down-stream of said fluid jet nozzle for diverting said fluid jet into said first and second openings, means forming a control region between said fixed diverter member and said fluid jet nozzle, and means for creating a pulsating pressure differential across said control region for oscillating said fluid jet back and forth between said first and second fluid branches to produce pulsing jets of fluid through said fluid inlet fitting openings into said perforated basket, said first and second openings of said fluid inlet fitting both facing in the same direction to produce a high intensity impulse cleaning region within said basket, said first and second openings further being directed tangentially to said peripheral basket wall whereby said pulsing jets promote a generally circular flow of clothes within said perforated basket along the peripheral wall thereof to move articles therein into and out of cleaning contact with the high intensity impulse cleaning region.

2. In a domestic clothes washer apparatus, the combination of a water container, a perforated basket having a peripheral wall located within said water container including a peripheral wall of generally circular form surrounding said basket peripheral wall, a fluid inlet fitting in said water container for directing fluid interiorly of said water container and into said perforated basket, said fluid fitting including a first and a second opening located above one another on said container, means for drawing fluid from said water container and for directing fluid to said first and second openings, said means including self-excited fluid amplifier means including a jet nozzle and a fixed flow divider member forming first and second flow branches down-stream of said fluid jet nozzle for diverting said fluid jet into said first and second openings, means forming a control region between said fixed diverter member and said fluid jet nozzle, said self-excited fluid amplifier means including means for creating a pulsating pressure differential across said control region for oscillating said fluid jet back and forth between said first and second fluid branches to produce pulsing jets of fluid through said fluid inlet fitting openings into said perforated basket, said first and second openings of said fluid inlet fitting both facing in the same direction to produce a high intensity impulse cleaning region within said basket, said first and second openings further being directed tangentially to said peripheral basket wall whereby

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said pulsing jets promote a generally circular flow of clothes within said perforated basket along the peripheral wall thereof to move articles therein into and out of cleaning contact with the high intensity impulse cleaning region.

3. In a domestic clothes washer apparatus, the combination of a water container, a perforated basket having a peripheral wall located within said water container including a peripheral wall of generally circular form surrounding said basket peripheral wall, a fluid inlet fitting in said water container for directing fluid interiorly of said water container and into said perforated basket, said fluid fitting including a first and second opening located above one another on said container, means for drawing fluid from said water container and for directing fluid to said first and second openings, said means including a first fluid amplifier having a jet nozzle and a fixed flow divider member downstream of said fluid jet nozzle for diverting said fluid jet into said first and second openings, means forming a control region between said fixed diverter member and said fluid jet nozzle, a source of compressed air, a second fluid amplifier having an inlet connected to said source and a pair of outlets, means between said inlet and said outlet producing oscillating air pressure impulses in said outlets, means connecting said outlets across said control region of said first fluid amplifier for creating a

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pulsating pressure differential across said control region for oscillating said fluid jet back and forth between said first and second fluid branches to produce pulsing jets of fluid through said fluid inlet fitting openings into said perforated basket, said first and second openings of said fluid inlet fitting both facing in the same direction to produce a high intensity impulse cleaning region with said basket, said first and second openings further being directed tangentially to said peripheral basket wall whereby said pulsing jets promote a generally circular flow of clothes within said perforated basket along the peripheral wall thereof to move articles therein into and out of cleaning contact with the high intensity impulse cleaning region.

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WILLIAM I. PRICE, *Primary Examiner.*

U.S. Cl. X.R.

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