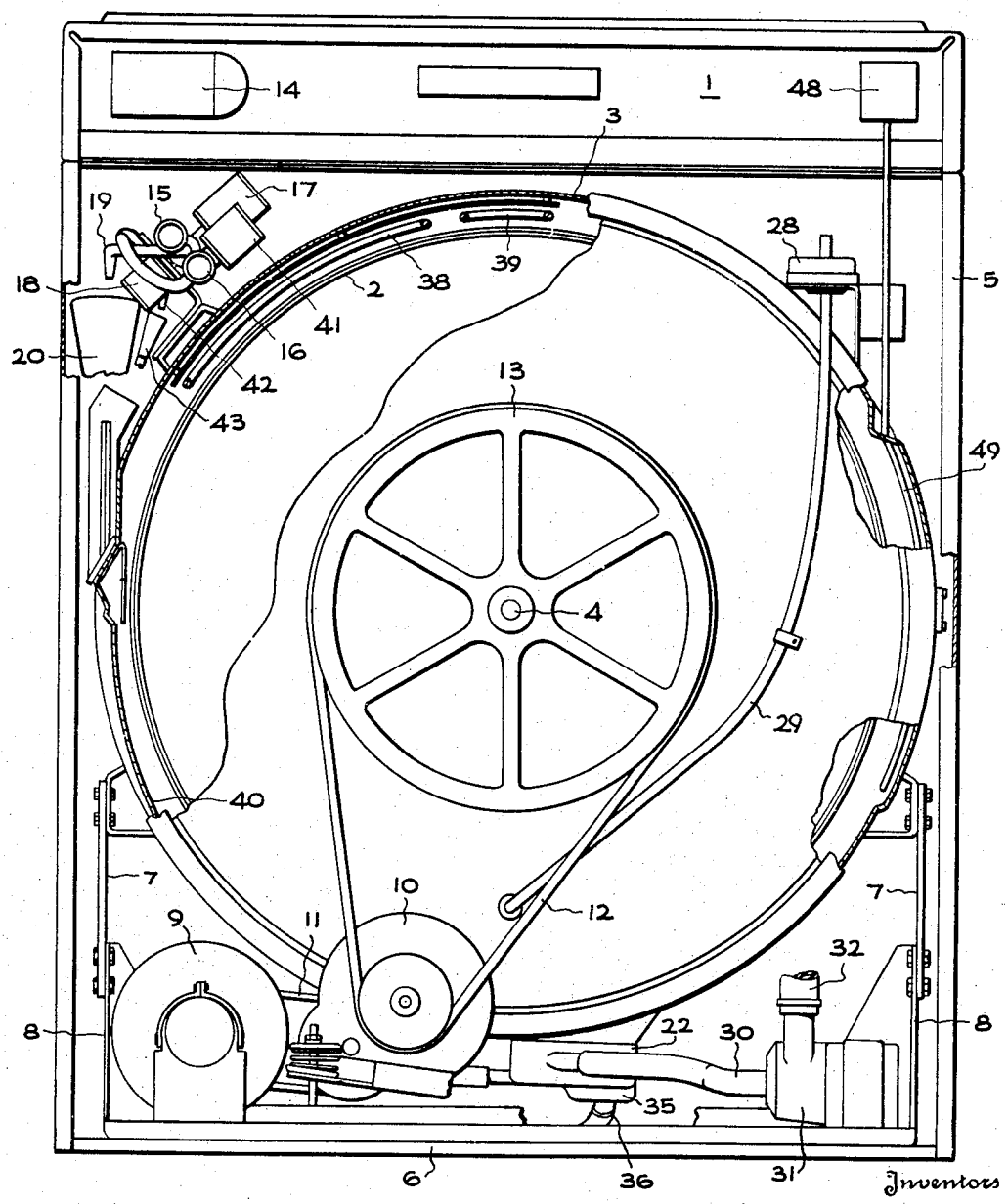
Aug. 18, 1959 W. J. RACZYNSKI ET AL 2,900,080

DRAIN MEANS FOR CLOTHES WASHER

Filed Feb. 17, 1956 3 Sheets-Sheet 1

FIG. 1



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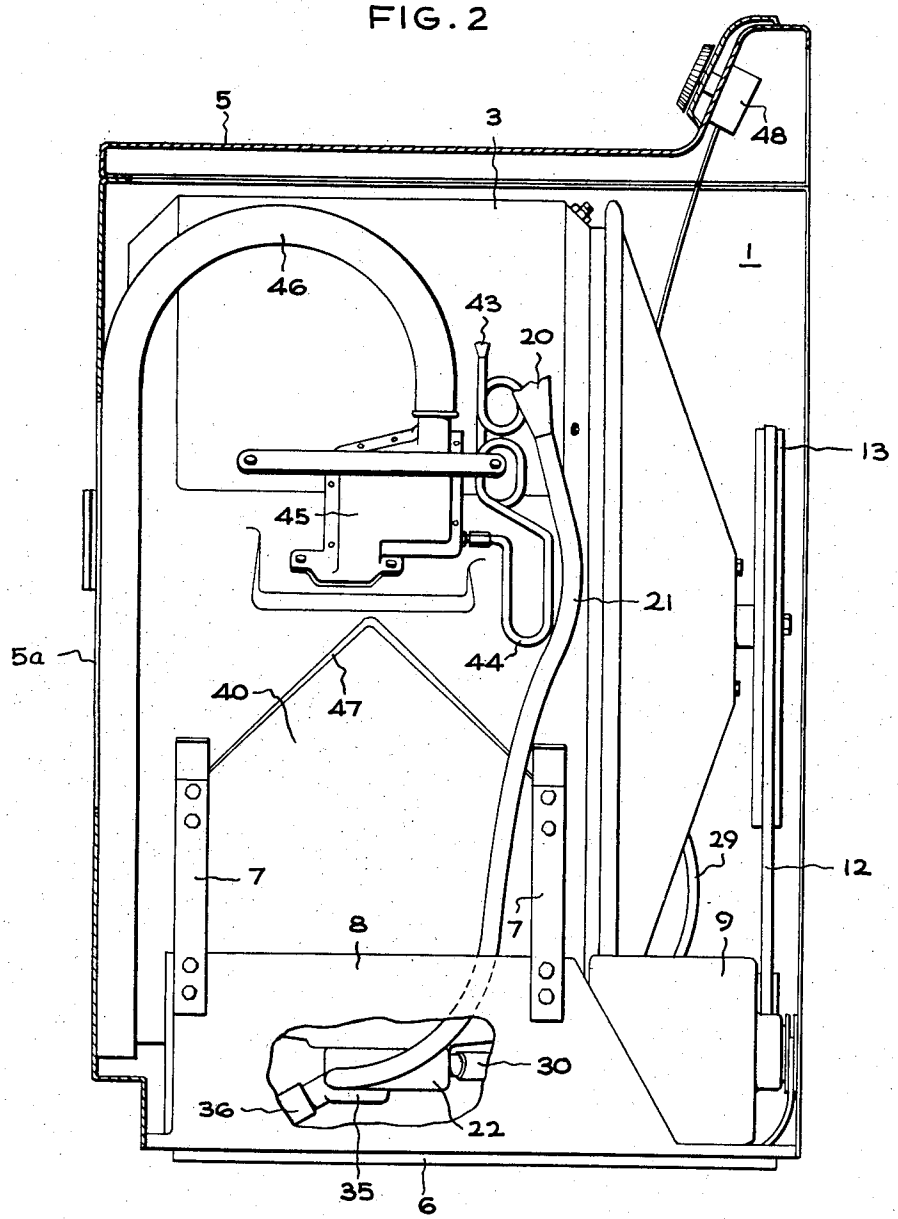
Their Attorney

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DRAIN MEANS FOR CLOTHES WASHER

Filed Feb. 17, 1956 3 Sheets-Sheet 2

FIG. 2



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DRAIN MEANS FOR CLOTHES WASHER

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FIG. 3

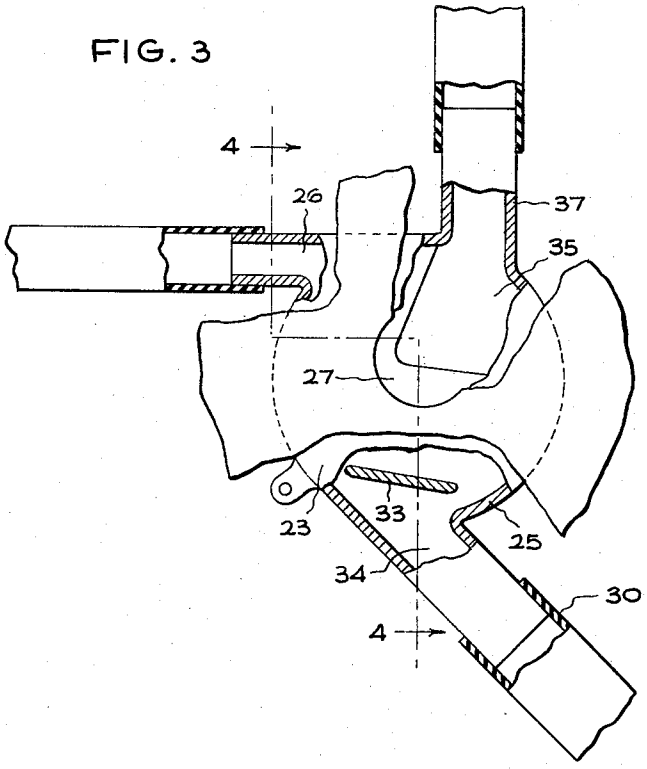
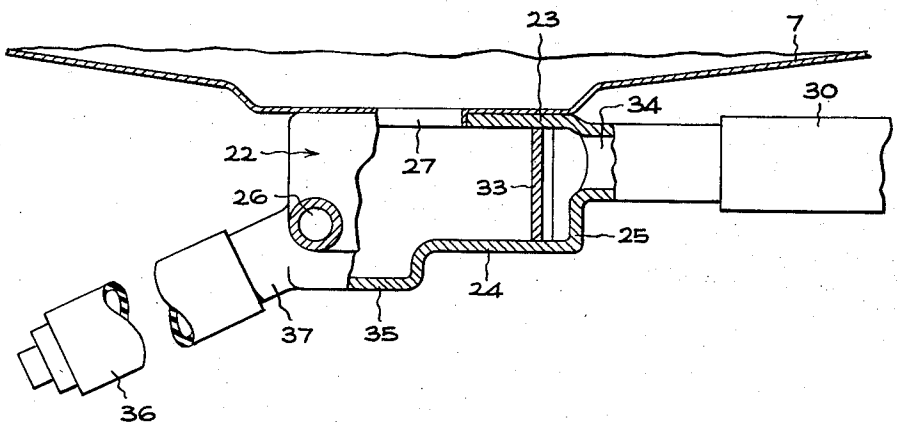


FIG. 4



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United States Patent Office 2,900,080 Patented Aug. 18, 1959

2,900,080

DRAIN MEANS FOR CLOTHES WASHER

Walter J. Raczynski and Joseph C. Worst, Louisville, Ky., assignors to General Electric Company, a corporation of New York

Application February 17, 1956, Serial No. 566,154

5 Claims. (Cl. 210—171)

Our invention relates to clothes washing machines and more particularly to an improved arrangement for draining such machines after the washing operation.

Clothes washing machines of the automatic extraction type are customarily provided with a drain pump for draining the washing container or tub after the washing operation is completed. The pump is driven either from the main drive motor of the machine or from a separate pump motor and is automatically placed in operation at the close of the washing operation to drain the tub. It has been found, however, that these washing machine pumps are often susceptible to clogging and failure due to solid objects such as buttons, marbles, nails and the like getting into them as the tub is drained. This is particularly true in horizontal axis machines wherein the clothes are washed in a rotating drum. These drums are customarily provided with perforations in order to let the wash water onto the clothes, and any solid objects separated from the clothes during washing may escape through these perforations into the tub and thence into the drain pump.

Accordingly, it is a primary object of our invention to provide a new and improved arrangement for draining a washing machine, whereby solid objects are caught and prevented from entering the drain pump.

It is another object of our invention to provide a new and improved drain sump for washing machines, which includes a removable collecting chamber for solid objects and means for directing such objects away from the drain line and into the collecting chamber.

A further object of our invention is to provide an improved object catching sump for both filling and draining a washing machine, in which sump the inlet port and the drain port are so arranged that the objects collected during the drain periods are not disturbed during the fill period.

In carrying out our invention we provide a clothes washing machine having a liquid holding tub. At the bottom of the tub there is mounted a sump which has an opening communicating with the interior of the tub. By our invention this sump provides for draining the tub without allowing solid objects such as buttons, marbles, etc. to reach the drain pump. To effect this result, the sump has a drain port for discharging the water entering from the tub, and disposed between the opening from the tub and the drain port it is provided with an object deflecting baffle. This baffle deflects the solid objects entering from the tub away from the drain port and into a depressed area formed in the floor of the sump on the opposite side of the baffle from the drain port. A downwardly extending, closed end chamber opens off the depressed area of the sump floor, and this chamber collects and retains the solid objects moving into the depressed area. In this manner the solid objects are trapped before they can reach the drain pump and thereby clogging and failure of the pump are substantially avoided.

The subject matter we regard as our invention is particularly pointed out and distinctly claimed in the concluding portion of this specification. Our invention itself, however, both as to its organization and method of operation, may be best understood by reference to the following description taken in conjunction with the accompanying drawings in which:

Fig. 1 is a rear elevational view of a combined clothes washing and drying machine including drain means embodying our invention, the view being partially broken away and partially in section in order to illustrate details of the machine;

Fig. 2 is a side elevational view of the machine of Fig. 1 with the side panel removed and with surfaces broken away to show the drain means;

Fig. 3 is a top view, partially broken away and partially in section, of the combination fill and drain sump incorporated in the machine of Fig. 1; and

Fig. 4 is a sectional view taken on the line 4—4 of Fig. 3.

Referring now to the drawings, we have shown therein a domestic laundry machine 1 comprising a combination washer and dryer. As explained hereinafter, this machine includes new and improved drain means which are effective to remove solid objects such as marbles, nails and buttons from the drain flow as it leaves the machine. The drain means by so collecting the solid objects prevents clogging and failure of the drain pump. The drain means are preferably so arranged that the object collecting member may be periodically removed and emptied.

The machine 1 is of the horizontal axis type, that is, it includes a clothes basket 2 which is rotatable about a generally horizontal axis. The basket 2 is mounted within an outer imperforate tub 3 and the cylindrical side wall of the basket is provided with a plurality of perforations or holes (not shown) in order to allow communication between the basket and the tub. The basket is rotatably supported from the tub 3 by a horizontally extending shaft 4 which is mounted in an elongated bearing hung from the rear wall of the tub structure. The shaft 4 as well as supporting the basket 2 also serves to drive it during the operation of the machine. The basket is loaded and unloaded in the usual manner through an opening in the front wall thereof which is aligned respectively with openings in the tub 3 and the outer appearance cabinet 5 of the machine. A hinged door 5a mounted on the appearance seals around the tub opening so as to close off the tub 3 during the operation of the machine.

The tub 3 and the appearance cabinet 5 are both mounted on a suitable base structure 6 at the bottom of the machine. The tub specifically is mounted thereon by means of a plurality of brackets or arms 7 which are mounted on upstanding plates 8 fixedly attached to the base. In addition to the tub and the appearance cabinet, the base 6 also mounts the basket drive means. The drive means comprise a motor 9 and a multi-speed transmission 10 (see Fig. 1). The motor 9 drives the transmission assembly by means of a belt 11 and the transmission assembly in turn drives the basket through a belt 12. The belt 12 specifically turns a basket drive pulley 13 which is mounted on the outer end of the basket drive shaft 4. The transmission assembly 10 is shiftable between two different gear ratios so that the basket 2 may be driven at one speed for tumbling clothes and at a second or higher speed for centrifugally extracting water from the clothes. The clothes tumbling speed may, for example, be about 45 r.p.m. and the centrifugal extraction speed about 200 r.p.m. The means whereby the transmission is shifted between the lower and higher speeds preferably comprises a solenoid operated plunger (not shown).

As mentioned above, the machine 1 is combination washer-dryer, that is, it proceeds through a cycle of operations first washing and damp drying the clothes and then, if desired, completely or fluff drying the clothes. The clothes basket 2 is driven at its lower speed both for washing the clothes and for tumbling them during the drying operation. It is driven at its higher speed for extracting both wash and rinse water from them by centrifugal extraction. The machine during its sequence of operations is under the control of a suitable timer operated sequence control 14 which energizes and deenergizes the various electrical components of the machine in a predetermined sequence. Since the sequence control forms no part of the present invention, it will not be described herein. However, a sequence control and circuit suitable for use in the illustrated machine are described and claimed in the copending application of Walter E. Gray, Jr., S.N. 512,612, filed June 2, 1955, and assigned to the same assignee as the present invention. That control is so arranged that either the washing or the drying cycle may be used separately at the option of the operator as well as together for the combination operation.

In order to supply water to the tub 3 for washing and rinsing purposes, the machine is provided with suitable hot and cold water supply connections 15 and 16. A valve controlled by a solenoid 17 admits hot water to the machine and a valve controlled by an opposed solenoid 18 admits cold water to the machine. The hot and cold water valves under the control of the solenoids 17 and 18 discharge through a common outlet conduit 19. From the conduit 19 the inlet water passes across a suitable air gap into a funnel 20, and the funnel 20 discharges into a hose or conduit 21 which leads to a sump 22 mounted at the bottom of the tub (see Fig. 2). The construction of the sump 22, as pointed out hereinafter, comprises one important aspect of my invention.

The sump 22 includes a roof 23, a floor 24, and a circular side wall 25 (Figs. 3 and 4). The inlet water flow from the hose 21 enters the sump through an inlet port 26 in the side wall. The inlet port 26 specifically comprises a nipple or tube-like extension which protrudes outwardly from the side wall and on which the hose 21 is fitted. The inlet water entering the sump first fills the sump and then rises into the tub through an opening 27 in the sump roof. The bottom wall of the tub 7 is provided with a flanged aperture as shown which communicates with the port 27 in the sump roof. The roof 23 is firmly sealed to the tub around these aligned apertures so that no leakage occurs as the tub is filled. Incidentally, it will be noted that the inlet port or nipple 26 enters the sump in a direction which is generally tangential to the circular side wall 25. As a result the inlet water entering through the port 26 tends to swirl around the interior of the sump in a clockwise direction (as viewed in Fig. 3) before it flows through the opening 27 into the tub. The reason for positioning the inlet port 26 so that this clockwise swirling flow is created will be explained hereinafter.

In the illustrated machine a pressure sensing device 28 (Fig. 1) controls both the water valve solenoids 17 and 18 to produce the proper water level in the tub during the washing operation. This sensing device is connected to the interior of the tub by a suitable line 29. It will be understood, of course, that the sensing device 28 controls the water valve solenoids only when suitable circuits are closed by the timer operated sequence control 14. The water level in the tub during the washing operation is such that the lower portion of the perforated basket 2 is covered, whereby the basket dips continually into the water as it rotates. For example, in a size of the illustrated machine suitable for domestic use having a clothes basket 26 inches in diameter, the water level in the tub during washing is about 5 inches above the bottom of the basket.

The sump 22 in addition to serving as a means for filling the tub also serves as the means whereby the dirty water is drained from the tub at the conclusion of the washing and rinsing operations. The water is drained from the tub into the sump through the opening 27 and then is discharged from the sump through a hose 30 to a drain pump 31. From the drain pump the water is passed out of the machine through a suitable waste line 32. It will be understood, of course, that the drain pump 31 like the other electrical elements of the machine is under the control of the sequence control 14.

By our invention, the sump 22 is so constructed that it removes solid objects from the drain flow during the drain operation before they reach the pump 31. In other words the sump 22 is provided with means for trapping buttons, nails, marbles and the like during the drain flow whereby clogging and failure of the pump 31 is avoided. In order to prevent solid objects of this type from entering the drain hose 30, the sump 22 is provided with a baffle 33 which is disposed between the opening 27 and the drain port 34 of the sump. The drain port 34 comprises a nipple or tube-like extension through the side wall 25 of the sump, and the baffle 33 extends from the roof 23 of the sump to the floor 24 generally in front of this nipple. The ends of the baffle 33 do not, however, touch the side wall 25 of the sump. Rather at both ends of the baffle a space is left between it and the side wall whereby water may pass from the sump into the drain port.

As the drain water flows from the tub through the sump into the drain port 34, the baffle 33 acts to deflect solid objects away from the drain port. Being positioned in front of the drain port and between it and the opening 27, the baffle acts as a barrier preventing the solid objects from entering the drain port. Rather it deflects the solid objects back into the interior of the sump. The baffle retards disc-shaped objects such as buttons and coins from entering drain port 34 as well as other objects because the disc-shaped objects can only possibly pass past the ends of the baffle when in one orientation, i.e. on edge. Moreover, even if the disc-shaped objects are on edge, there is little chance they will enter the port because in that position they sink readily to the floor of the sump.

In order to catch the solid objects deflected by the baffle 33 and remove them from the drain flow, the floor 24 of the sump is provided with a depressed or downwardly recessed portion 35. As the solid objects are deflected by the baffle 33, they tend to fall into this depressed or recessed area 35 and not get back into the drain flow again. In order, however, to insure positive trapping of the solid objects, we have provided a closed end collecting chamber connected to the recessed area 35. The closed end collecting chamber specifically comprises a closed end tube 36 which is connected to the recessed area 35 of the sump by means of a tube-like extension or appendage 37 of the sump which extends through the side wall 25 into the recessed area. Due to the random movement of the solid objects within the recessed area 35 they sooner or later work their way to the mouth of the extension 37. Then due to the downwardly inclined direction of the extension 37 and the tube 36, the objects move downwardly into the tube.

Having once entered the tube or chamber 36 the particles tend to remain therein, being effectively trapped. Because of the closed end of the chamber 36 a quiescent region is created therein with little or no turbulence tending to move the buttons back into the main drain flow. Also, since the end of the chamber is lower than the floor of the sump, the force of gravity helps to keep the objects within the chamber. Thus having once entered the appendage 37 the buttons and similar objects tend to fall to the bottom of the tube 36 and remain therein. Our

new drain means are thereby effective not ony to remove the solid objects from the flow but also to prevent their return to the flow at a later time.

In order that the buttons may be periodically removed from the tube **36**, it is preferably attached to the nipple **37** in a removable manner. For example in the illustrated embodiment the tube **36** comprises a resilient member which is fitted or stretched over the extension **37**. Attached in this manner it may be periodically removed and emptied.

With regard to another feature of our new and improved drain means it will be noted that the drain outlet or nipple **34** extends generally tangential to the side wall **25** of the sump in the same manner as the water inlet nipple **26**. Specifically the nipple **34** is arranged so that the normal drain flow through it creates a counterclockwise swirling within the interior of the sump as viewed in Fig. 3, whereas a reverse or return flow through it creates a clockwise swirling within the sump interior. A back surge or return flow normally occurs through the hose **30** and the nipple **34** when the pump **31** is turned off at the end of the drain operation. A column of water is created in the waste hose **32** during the operation of the pump and this column of water tends to cause a back surge when the pump is turned off. By arranging the drain port **34** in the manner shown the energy of this back surge tends to be used up within the sump itself. In other words the tangential arrangement of the drain port causes the back surge to swirl around in the sump and thereby lose its energy. As a result there is very little splashing up through the opening **27** into the tub itself. It is desirable, of course, to prevent such splashing or return of water to the tub **3** so that the clothes are not re-wet and contaminated with the drain water.

The tangential arrangement of the drain port **34** in the manner shown also has another advantage. As mentioned above, it is so arranged that it creates a counterclockwise swirl (as viewed in Fig. 3) in the sump during drain. With the drain port arranged in this manner a clockwise swirl in the pump tends to rush past it rather than entering directly into it. This has the result that when inlet water is being introduced through the nipple **26** during the fill periods of the machine, the inlet flow tends to swirl right past the drain port **34** rather than trying to enter it. In fact the clockwise swirl of the inlet flow even creates a slight aspirator or sucking effect with regard to the drain port **34**. As a result, there is little or no tendency for the inlet flow to pick up buttons and the like from the floor recess **35** of the sump and force them into the drain port. If this inlet flow should happen to pick up a button, it will be merely whirled past the drain port and returned to the floor recess **35**.

It will also be noted with regard to the drain port **34** that it is connected to the sump **22** at a higher level than the wash water inlet or fill port **26**. Specifically the port **34** extends through the side wall **25** of the sump adjacent its top and the inlet port **26** extends therethrough adjacent its bottom. Thus throughout the entire operation of the machine, even when the drain pump is running as during the drain periods of the wash cycle and during the drying cycle, a liquid pool or seal is maintained over the end of the fill hose **21**. This prevents the blowing out of suds through the hose **21** and the funnel **20** if an oversuds condition should occur during the washing operation, and also prevents the escape of steam through the hose and the funnel during the drying operation. Further, if the door should be briefly opened during the drying operation so that cool air enters the machine, the pool in the sump will prevent the escape of air through the fill hose **21** as the air expands. This avoids the introduction of a relatively large quantity of moist air to the interior of the cabinet. This arrangement of the discharge port higher than the inlet port in a sump is however not our joint invention but rather is described and claimed in the copending sole application of Walter J. Raczynski, S.N. 538,891, filed October 6, 1955, now U.S. Patent 2,800,008 and assigned to the same assignee as the present invention.

Although the present invention is not directed to the drying operation conducted in the machine **1**, it will be understood that the machine is provided with suitable heating elements for causing vapor migration out of the clothes during the drying cycle. Preferably two heating elements **38** and **39** for effecting that result are mounted at the top of the tub **3** adjacent the cylindrical side wall of the basket **2**. When these heating elements are energized, they heat the side wall of the basket which in turn heats the clothes. Also there is some direct radiation from the heating elements to the clothes through the perforations in the basket side wall. The heating elements **38** and **39** may also be used as water heaters for heating the wash water during the washing operation. When used as water heaters the elements **38** and **39** heat the basket and it in turn heats the wash water as it dips into it at the bottom of its rotational path. Also there is some heating of the water due to convection currents set up within the tub by the basket.

During the drying cycle the moisture extracted from the clothes is condensed by flowing a sheet of cold water down the portion of the tub wall indicated at **40**. In the illustrated machine the condenser water is admitted to the tub through a solenoid actuated valve controlled by a solenoid **41**. The solenoid **41** is energized by the sequence control **14** during the drying operation so that the valve controlled by it passes water at a slow rate sufficient to condense the water extracted from the clothes. The inlet to the condenser water valve is through the water line **16** and the valve discharges through a conduit **42** into a funnel **43**. From the funnel **43** the condenser water flows through a line **44** into a trap device **45** which connects the interior of the tub **3** to a vent hose **46** (see Fig. 2). The condenser water flows through the trap **45** into the tub and in doing so forms a liquid seal therein whereby steam cannot escape from the tub to the vent hose during the drying operation. The arrangement of the trap **45** and in fact the venting system as a whole are not our joint invention but rather are described and claimed in the above-mentioned sole application of Walter J. Raczynski, S.N. 538,891.

The condenser water flowing slowly into the tub through the trap **45** is spread over the side of the tub by an inverted V-shaped bead **47** formed on the tub wall directly below the device **45**. The condenser water being so spread out controls a considerable portion of the area **40** of the side wall whereby there is provided a large cool surface for condensing the moisture extracted from the clothes. The condenser water and the moisture extracted from the clothes are then discharged from the tub through the sump **22** and the drain pump **31**. The pump **31** is energized continuously during the drying operation to drain the condenser water and moisture from the machine.

Preferably, a thermostat **48** having a sensing element **49** within the tub **7** is provided for controlling both the length of the drying cycle and the energization of the heating elements **38** and **39** during the drying cycle.

From the above it will be seen that we have provided a new and improved drain means for a washing machine, which is particularly effective to prevent clogging of the drain pump by solid objects carried in the drain flow. The sump arrangement included in our drain means effectively removes these solids objects from the drain flow so that they cannot be carried into the drain pump. Further, the sump retains these objects in a closed-end chamber which is so arranged that the objects do not escape back into the drain flow during succeeding operations of the machine. Rather the buttons and like objects are effectively trapped until such time as the chamber is emptied by the operator.

While in accordance with the Patent Statutes we have described what at present is considered to be the preferred

embodiment of our invention, it will be obvious to those skilled in the art that various changes and modifications may be made therein without departing from the invention, and we, therefore, aim in the appended claims to cover all such equivalent variations as fall within the true spirit and scope of our invention. It will be understood that the term clothes washing machine in the appended claims is intended to include combination washer-dryers within its coverage.

What we claim as new and desire to secure by Letters Patent of the United States is:

1. For use with a clothes washing machine having a liquid holding tub, a sump arranged for mounting at the bottom of said tub for draining said tub, said sump having an opening through the roof thereof for communicating with the interior of said tub for emptying said tub, a drain port in the side wall of said sump for discharging the liquid entering through said opening, a generally rectangularly shaped baffle having upper and lower edges and lateral ends positioned within said sump and disposed between said opening and said drain port for deflecting solid objects entering through said opening away from said drain port, said baffle being positioned directly in front of said drain port and extending generally vertically from said roof of said sump to the floor thereof, and being spaced at its ends from the side wall of said sump for the passage of liquid to said drain port, means forming a recessed area on the floor of said sump on the opposite side of said baffle from said drain port for catching said solid objects, and a downwardly extending chamber opening off of said recessed area for collecting and retaining said solid objects.

2. For use with a clothes washing machine having a liquid holding tub, a sump arranged for mounting at the bottom of said tub for draining said tub, said sump having a floor, a roof, and a circular side wall, an opening through said roof for communicating with the interior of said tub for emptying said tub, a drain port in the side wall of said sump for discharging the liquid entering through said opening, said drain port opening through said side wall in a direction generally tangential thereto, means forming a recessed area on the floor of said sump, a generally rectangularly shaped baffle having upper and lower edges and lateral ends positioned within said sump and disposed between said opening and said drain port for deflecting solid objects entering through said opening away from said drain port, said baffle being positioned directly in front of said drain port and extending generally vertically from said roof to said floor of said sump and being spaced at its ends from the side wall of said sump for the passage of liquid to said drain port, and a downwardly extending chamber opening off of said recessed area for collecting and retaining said solid objects.

3. For use with a clothes washing machine having a liquid holding tub, a sump arranged for mounting at the bottom of said tub for filling and draining said tub, said sump having an opening in the roof thereof for filling and emptying said tub, a water inlet port through the side wall of said sump whereby said tub may be filled by water rising from said sump into said tub through said opening, a drain port in said sump spaced from said inlet port, the liquid in said tub flowing from said tub through said opening and said sump into said drain port during the draining of said tub, means forming a recessed area on the floor of said sump, a baffle disposed between said opening and said drain port for deflecting solid objects entering through said opening away from said drain port and into said recessed area, said baffle being positioned directly in front of said drain port and extending generally vertically from said roof to said floor of said sump and being spaced at its ends from the side wall of said sump for the passage of liquid to said drain port, and a downwardly extending chamber opening off of said recessed area for collecting and retaining said solid objects.

4. The sump of claim 3 wherein said sump includes a circular side wall and both said drain port and said inlet port extend through said side wall in directions generally tangential thereto, with said drain port and said inlet port being arranged relative to each other so that the inlet and drain flows swirl in opposite directions in said sump.

5. For use with a clothes washing machine having a liquid holding tub, a sump arranged for mounting at the bottom of said tub for draining said tub, said sump having an opening for communicating with the interior of said tub for emptying said tub, a drain port in a wall of said sump for discharging the liquid entering through said opening, a generally rectangularly shaped baffle having upper and lower edges and lateral ends positioned within said sump and disposed between said opening and said drain port for deflecting solid objects entering through said opening away from said drain port, said baffle being positioned directly in front of said drain port and extending generally vertically from said roof to said floor of said sump and being spaced at its ends from the side wall of said sump for the passage of liquid to said drain port, and trap means on the opposite side of said baffle from said drain port for collecting and retaining said solid objects.

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