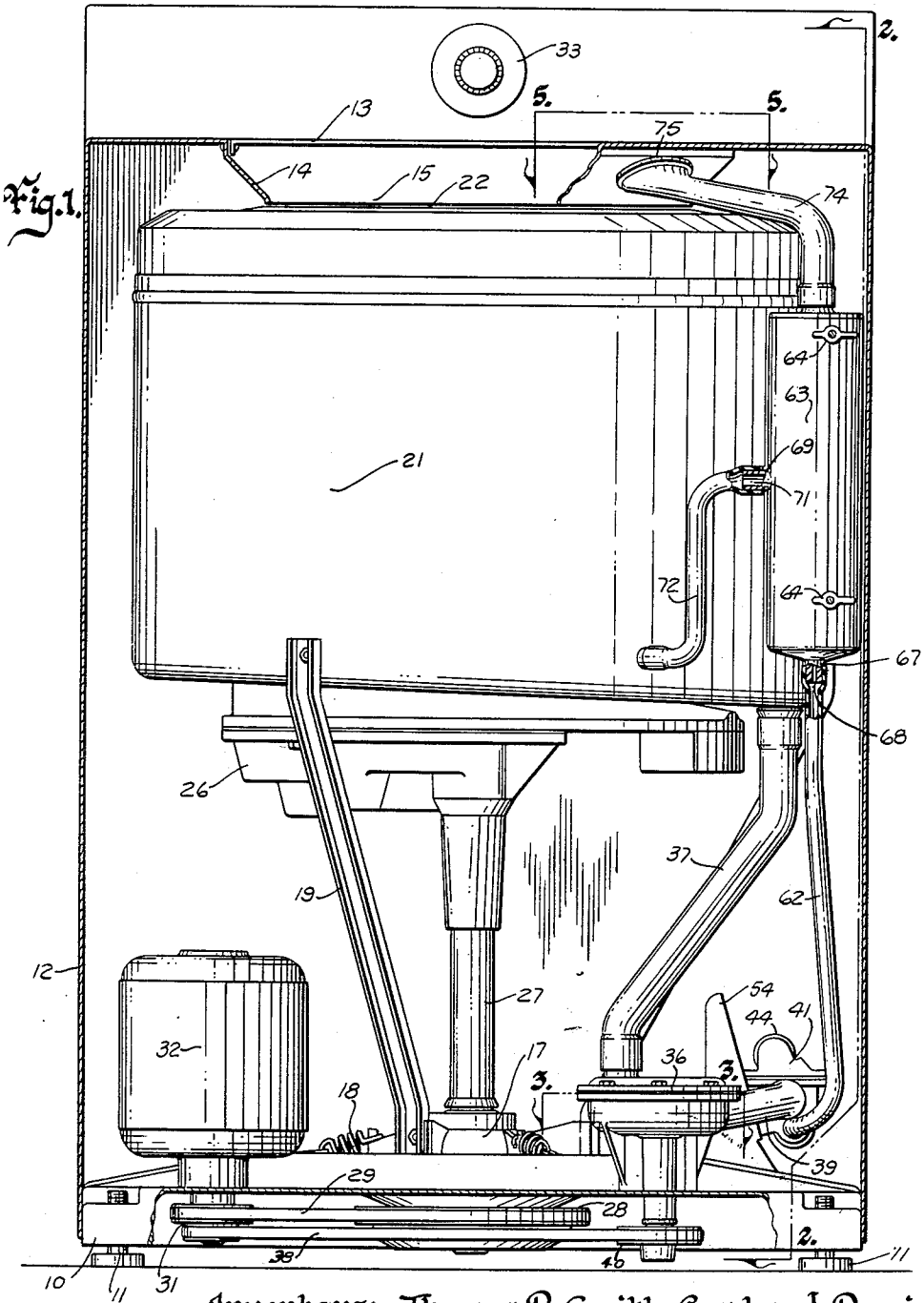
July 27, 1965 T. R. SMITH ETAL 3,197,271

METHOD OF WASHING AND BLEACHING FABRICS

Original Filed March 3, 1958 3 Sheets-Sheet 1

Fig. 1.



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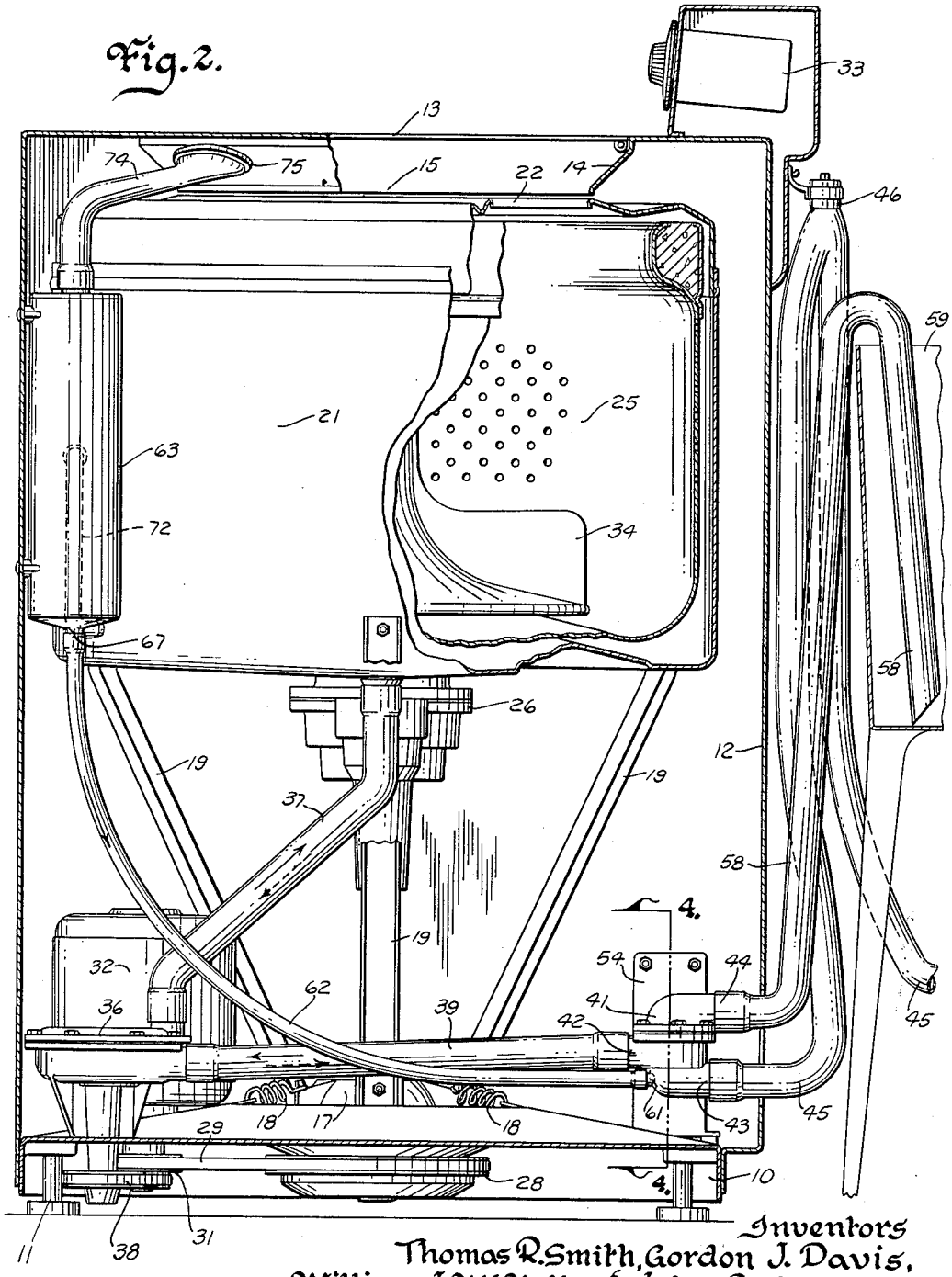
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Fig. 2.



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METHOD OF WASHING AND BLEACHING FABRICS

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Fig.3.

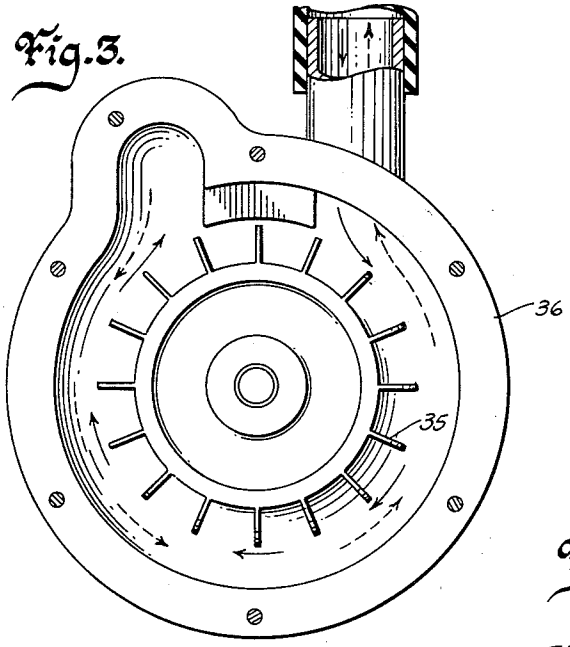


Fig.4.

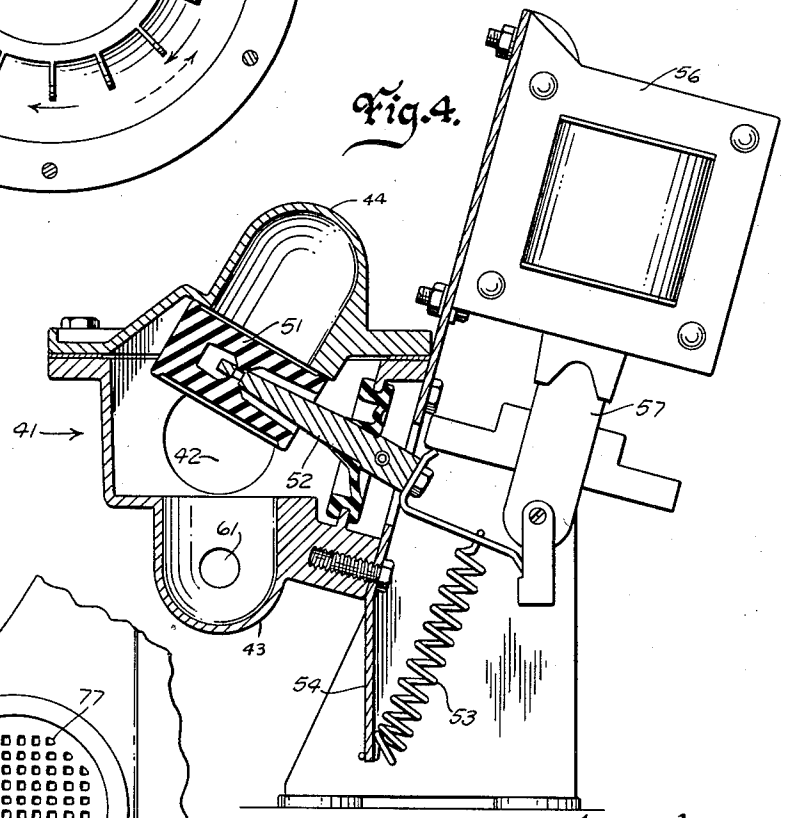
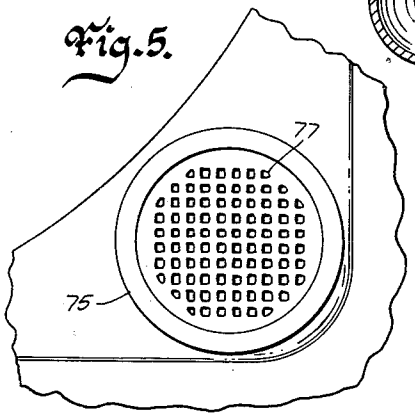


Fig.5.



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3,197,271

METHOD OF WASHING AND BLEACHING FABRICS

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Original application Mar. 3, 1958, Ser. No. 718,639, now Patent No. 3,035,431, dated May 22, 1962. Divided and this application Jan. 22, 1962, Ser. No. 167,671
5 Claims. (Cl. 8—137)

This is a division of our copending application, Serial No. 718,639, filed March 3, 1958, issued May 22, 1962 as U.S. Patent No. 3,035,431.

This invention relates to an automatic dispensing apparatus for a domestic clothes washing machine and while the illustrated dispenser disclosed in the following specification and accompanying drawings is primarily intended for dispensing a bleach solution in such an automatic washing machine, its use may be extended to other solutions containing detergents or fabric softening agents.

The embodiment of the invention shown in the accompanying drawings discloses an illustrative automatic clothes washing machine operable through a washing operation and a fluid extraction operation and incorporating a fluid pump and valve system capable of permitting the pump to pump washing fluid toward the machine's generally imperforate tub during the washing operation and away from that tub during the extraction operation. A dispenser reservoir connected to the normal discharge side of this pump through a small metering tube provided with a restricted orifice permits the bleach solution contained within the reservoir to be gradually admixed with the washing fluid pumped toward the tub during the washing operations. By positioning the bleach reservoir in the same elevational range as that of the tub and then interconnecting the bottom portion of the tub with the dispenser reservoir at an elevational level located above the lowest expected fluid operating level within this tub, the bleach solution fed into the fluid pumped toward the tub is always diluted during the tub filling operations prior to the washing operation when circulation of the bleach takes place. This dilutes the solution both in the reservoir and in the tub so as to prevent any possibility of damage to the fabrics carried within the tub as further explained in greater detail in the following specification.

In the accompanying drawings:

FIGURE 1 is a front elevation of an automatic washing machine embodying our invention;

FIGURE 2 is a side elevational view taken on line 2—2 of FIGURE 1;

FIGURE 3 is an enlarged view taken on line 3—3 of FIGURE 1 showing an interior view of the reversible pump used in our dispenser system;

FIGURE 4 is an enlarged cross-sectional view taken on line 4—4 of FIGURE 1 showing the details of the diverter valve assembly used in our dispenser system; and,

FIGURE 5 is an enlarged fragmentary plan view taken on line 5—5 of FIGURE 1 showing the loading opening communicating with the bleach dispenser reservoir.

Referring now to the accompanying drawings in detail, base frame **10** is shown as being supported on the adjustable leg members **11** and mounting a cabinet enclosure **12** which is provided with a hinged door panel **13** normally covering a recessed rectangular countersunk throat **14** which terminates in a circular loading opening **15**. Mounted on a friction damper surface of a truncated mounting dome (not shown) positioned in the central region of the base frame **10** is a support member **17** which is resiliently connected to base frame **10** by means of the three equally spaced centering springs **18** which

resist rotation of the support member **17** relative to base frame **10** but permit its nutational movement relative to that base frame.

Rigidly connected to and extending upwardly from the support member **17** to form an inverted tripod are the three tub braces **19** which are connected to a generally imperforate tub **21** provided at its upper end with a tub loading opening **22** aligned with the opening **15** formed in cabinet **12**.

Revolubly mounted within tub **21** is the perforate clothes basket **25** which is rigidly connected to a stub shaft (not shown) which is journaled in a bearing (not shown) carried in the bottom of tub **21** and which is directly connected to the counterbalanced gear case **26** affixed to the upper end of spin tube **27**.

Spin tube **27** is supported by and journaled in a thrust bearing (not shown) carried in support member **17** and is capable of being rotated at spin speeds by a drive mechanism (not shown) housed beneath base frame **10** and driven by its input pulley **28** through belt **29** and the double motor pulley **31** attached to the shaft of the reversible drive motor **32**. When motor **32** is reversed by the timer mechanism **33** connected to motor **32**, the reversed rotation of the drive mechanism input pulley **28** produces an oscillatory movement of agitator **34** which is positioned within basket **25** as shown in FIGURE 2. Agitator **34** is powered by means of a center shaft (not shown) journaled within spin tube **27** and connected to a conventional type motion converting mechanism (not shown) mounted within the gear case **26** and connected to an output shaft (not shown) splined to agitator **34**.

In this illustrative embodiment of our invention, the rotation of the motor shaft of motor **32** in a clockwise direction, as viewed from the top of motor **32**, produces an oscillatory movement of agitator **34** of approximately 52 cycles per minute during the washing operation while rotation of that motor shaft in a counterclockwise direction during the fluid extraction or spin-out operations produces a rotation of basket **25** at a speed of approximately 618 revolutions per minute.

Tub **21** is connected to a reversible pump **36**, which includes an impeller **35**, through the flexible hose **37** interconnecting members **21** and **36** and permitting gyratory movements of tub **21** relative to base frame **10**. Pump **36** is rigidly connected to base frame **10** and is provided with a driving pulley **40** which is rotated by means of the double motor pulley **31** through belt **38** so as to rotate in the same direction during the washing and extraction processes as the drive mechanism input pulley **28** controlling the operation of agitator **34** and clothes basket **25**.

Pump **36** is also connected by means of the conduit **39** to a diverter valve assembly **41** mounted on base frame **10**. Diverter valve assembly **41** includes a short tubular intake duct **42** and two effluent ducts or hose connector conduits **43** and **44**. The lower effluent duct **43** constituting the drain conduit of valve assembly **41** is connected to the drain hose **45**, a portion of which is elevated above the highest expected operating fluid level within tub **21** and attached to cabinet **12** to prevent any inadvertent drainage from that tub since this illustrative embodiment utilizes no drain valve other than the diverter valve assembly **41**. A solenoid operated valve (not shown) may be incorporated in hose **45** to eliminate the necessity for the elevation of hose **45** if so desired. A check valve **46** is provided in an opening positioned at the highest level of hose **45** to accommodate fluid flow from tub **21** during the operation of pump **36** while preventing back siphoning through drain hose **45** after motor **32** has been deenergized.

The diverter valve assembly **41** includes a rubber valve

element 51 carried on the end of the pivoted control lever 52 which is normally biased into the position shown in FIGURE 4 by means of the spring 53 connected between lever 52 and the stationary bracket 54 mounting the entire valve assembly 41 on base frame 10. Movement of the valve control lever 52 in a counterclockwise direction against the bias of spring 53 is produced by the energization of solenoid 56, as controlled by timer 33, so as to draw the solenoid armature 57 upwardly within solenoid 56.

When positioned as in FIGURE 4, the valve element 51 permits communication between the intake duct 42 and the drain outlet 43 so as to interconnect tub 21 with drain hose 45. Under these conditions hose 39 which is connected to pump 36 is merely an extension of drain hose 45 and as such can itself be termed a drain hose whenever valve element 51 is in this position. Movement of valve element 51 toward the effluent drain outlet 43 by the energization of solenoid 56 so as to terminate communication between that drain outlet and the conduit 42 interconnects intake conduit 42 with the suds saving conduit 44 which is positioned above conduit 43.

The upper conduit 44 is connected to a suds saving hose 58 which is capable of being inserted into an external suds reservoir such as reservoir 59 in order to salvage washing fluids from one washing operation for reuse in a subsequent washing operation if so desired.

Diverter valve assembly 41 also includes a small tubular fitting 61 which communicates with the drain conduit 43 of that valve assembly. This fitting 61 communicates by means of the small metering hose 62 with the cylindrical dispenser reservoir tank 63 which is rigidly connected to the cabinet 12 by means of the mounting lugs 64 provided on tank 63.

As shown in FIGURE 1, the fitting 67 provided at the lower end of the dispenser reservoir tank 63 includes a restricted orifice 68 while the fitting 69 located approximately midway between the upper and lower ends of that tank 63 includes an orifice 71 which is two to four times that of the internal diameter of orifice 68. For reasons more apparent hereinafter, fitting 69 is located below the lowest expected operating fluid level within tub 21. Fitting 69 is connected to the flexible fluid return tube 72 which is fastened to and communicates with tub 21 at a point just above the bottom of tub 21.

The upper end of the dispenser reservoir tank 63 is attached to a flexible reservoir fill hose 74 which bridges up and over tub 21 and terminates in a circumferentially grooved flange 75 which is received in a snap fit by an appropriate opening provided for this purpose in the recessed cabinet throat 14 as generally indicated in FIGURES 1, 2 and 5. The fill opening provided by the open mouthed hose 74 receives a plastic grill 77 capable of permitting fluid flow therethrough but adequately preventing large solid particles from entering hose 74. It will be noted that the gyratory movements of tub 21 are not impaired in any way by either of the flexible tubes 72 or 74.

In operation of the dispenser system for the illustrated machine shown in the accompanying drawings, door panel 13 is lifted to accommodate both the placement of soiled fabrics within the clothes basket 25 and the loading of the dispenser reservoir tank 63 with the selected bleach solution. For commercial bleach solutions most readily available for home laundry use, a half cup of bleach per clothes load is usually sufficient while it may be desirable to dilute commercial powder bleaches by mixing as much as two cups of water with the powdered bleaching agent in order to produce the desired solution to be placed within dispenser tank 63. These factors enter into the designed capacity of tank 63 as well as in the relationship between the elevational location of fitting 69 on that tank with respect to the lowest operating fluid level expected within tub 21.

After the loading of the reservoir tank 63, tub 21 is then preferably filled to the desired operating liquid level within tub 21 by means of a fill spout (not shown) controlled by a solenoid operated valve (not shown) electrically connected to and controlled by the timer mechanism 33.

This resulting liquid level should be at least above the elevational level of fitting 69 so that fluid from tub 21 may freely circulate into the dispenser tank 63 to dilute the bleach solution within that reservoir and provide a means for a closed fluid circuit through than tank during the operation of pump 36.

In the illustrated machine, timer mechanism 33 automatically energizes motor 32 to initiate the washing operation by oscillating agitator 34 once the tub fill process is completed. The energization of motor 32 not only causes an oscillation of agitator 34 but also produces a clockwise rotation of the pump impeller 35, as viewed in FIGURE 3, to create a fluid flow through pump 36 and its associated conduts as shown by the solid arrows in FIGURES 2 and 3. These arrows show fluid moving from pump 36 upwardly through hose 37 into tub 21, up through the fluid return tube 72, through dispenser reservoir tank 63, down through the metering tube 62, into the lower valve assembly conduit 43, and then back to pump 36 through hose 39 to complete the fluid circuit.

It will be noted that in the illustrated machine with metering orifice 68 of a rather restricted internal diameter, in practice approximately 0.078 inch, it will take between three to four minutes for the bleach solution from dispenser tank 63 to be pumped into and completely circulated within tub 21. At this point it should be realized that even though no control valve is positioned at the bottom of the dispenser tank 63 to prevent inadvertent discharge of the bleach solution from reservoir tank 63 during or prior to the tub fill operations, it has been found in practice that no such valve for retaining the bleach solution within tank 63 is necessary. The optional use or elimination of such a valve is based upon various factors and conditions in addition to the restricted size of orifice 68 itself.

This is due to the fact that following each centrifugal extraction operation when fluid from tub 21 has been pumped through the drain hose 45 by the cooperation of motor 32 and pump rotor 35, a column of rinse fluid extending from pump 36 to the siphon break check valve 46 is not pumped from hose 45 and consequently flows downwardly under the influence of gravitational forces through hose 45 and in a reverse direction through hose 39 and up hose 37 as well as into metering tube 62 when motor 32 is deenergized to terminate the operation of pump 36. The resultant fluid level produced by this back flow at the end of the centrifuging operations in the illustrated machine reaches an elevational equilibrium level which is just below the bottom of tub 21 so that each subsequent tub filling process commences from that liquid level.

The addition of bleach solution to reservoir tank 63 therefore adds to this static liquid level within metering tube 62 so that the bleach solution is actually subject only to fluid diffusion which is negligible for all practical purposes. With the bleach solution positioned within tank 63 under these conditions, the initiation of the agitation or washing operation subsequent to the tub filling process immediately produces a slow dissemination of the bleach solution through metering orifice 68 and into the fluid entering tub 21 by way of hose 37. It should be noted that the fluid entering tub 21 through hose 37 is further diffused within tub 21 by reason of that fluid's impingement on the lower imperforate peripheral portion of basket 25.

Of further interest is the fact that no diffusion of any consequence is produced by flow of the bleach solution from tank 63 into tub 21 by way of the return tube 72 during the tub filling process due to the presence of the restricted orifice 68 which permits tub 21 to fill faster than tank 63 is filled through orifice 68 thereby providing

a pressure head on tube 72 so as to prevent such reverse flow.

It has been found in practice that even with an empty drain hose 45, as would be expected in the first cycle of a new machine of the illustrated type or with a machine utilizing a solenoid drain valve immediately adjacent drain conduit 43, instead of an elevated drain hose, a major portion of the bleach agent draining down through orifice 68 prior to or during the tub fill cycle rises back up again into the dispenser tank 63 during the tub fill operations to permit a slow dissemination of the bleach solution into the fluid entering tub 21 in a manner similar to that previously described. The addition of a control valve at the bottom of dispenser tank 63 capable of closing during the deenergization of motor 32 to prevent such premature drainage of bleach solution into the valve assembly 41 would therefore not constitute any major deviation from the spirit or scope of this invention.

The slow injection of the bleach solution from dispenser reservoir 63 into tub 21 over the first 3 to 4 minutes, or longer if desired depending upon the size of orifice 68, of the washing operation is advantageous in that such a prolonged injection automatically places the bleach solution within tub 21 without causing any large quantity of raw bleach to come into contact with the fabrics placed within basket 25 as might possibly occur if the bleach were manually poured into tub 21. It will be seen from this that while the gradual metering of the bleach solution is achieved through the use of orifice 68, the inside diameter of metering tube 62 may be made small enough to accomplish the same purpose.

A second advantage of this invention is also realized since it is an accepted fact that chlorine types of bleaches not only bleach fabrics with which they come into contact but also add to the detergency of the synthetic detergents placed in solution with them. It is therefore desirable for this reason to put the bleach into the wash solution to obtain this increased detergency but since there may be fluorescent dyes in the detergent which are apt to be nullified by the addition of the bleach, it is also desirable that the detergent be agitated in the wash water for a short period prior to the addition of the bleach solution so as to allow these fluorescent dyes to first come into contact with and attach themselves to the fabrics so as to be unaffected by the subsequent addition of the bleaching agent. This sequence is achieved in the illustrated machine without utilizing any valves or time control devices other than those controlling motor 32.

In this connection, it will be noted that diverter valve assembly 41 which is utilized during the centrifugal extraction or spin out processes determines the disposition of the fluid from tub 21. For example, if solenoid 56 remains deenergized as is shown in its position in FIGURE 4, wash water will be pumped from tub 21 to an external drain by way of the drain hose 45. On the other hand, if the circuit controlled by timer 33 and other appropriate devices (not shown) is preset to permit solenoid 56 to be energized during these pump out periods, the fluid from tub 21 will be pumped into the external reservoir 59 for subsequent reuse.

Since suds contained within external suds reservoir 59 can be returned to tub 21 at the beginning of the next subsequent washing cycle, prior to the addition of clothes to basket 25, it will be noted that in the case of such a reuse of any suds within tank 59 which may contain bleach no further addition of a bleaching agent would be necessary though any additional bleaching solutions added to reservoir tank 63 would be diluted during these subsequent tub fill periods in the manner previously described as the suds are returned through hoses 58, 39 and 37 due to the reversal of motor 32 and pump 36.

An important feature produced by the disclosed dispenser arrangement is the automatic backflush of dispenser tank 63 during the spin out process when all fluids are removed from tub 21. Since the lower end of the

metering tube 62 is positioned on the downstream side of pump 36 during the pump out operations to produce a fluid flow as shown by the dotted arrows in FIGURES 2 and 3, some fluid is forced upwardly through orifice 68 and into the dispenser tank 63. Though splashout through fill hose 74 into the recessed cabinet throat 14 is prevented by the flow control effect of the small metering orifice 68, the entire dispenser system, including the return tube 72, is flushed for subsequent flushing operations.

While our dispenser system has been shown incorporated in a machine utilizing a suds saving apparatus, it will be appreciated that this suds saving feature could be omitted by eliminating valve assembly 41 and then interconnecting hoses 39 and 45 without interfering with the described bleach dispenser construction or operation so long as the lower end of the metering tube 62 is connected to the downstream side of pump 36 during the pump out operations. In practice, nonsuds saving models produced by the assignee of the instant invention are produced in this manner by attaching the lower end of metering tube 62 to the top cover of pump 36 on the downstream side of that pump so as to be in somewhat of a juxtapositional relationship with the adjacent connection for hose 37. In other words, while metering hose 62 is connected to pump 36 through hose 39 in the illustrative embodiment because of the illustrated suds saving apparatus, metering hose 62 can be said to be connected to the normal discharge side of pump 36 for functional purposes of the described dispensing apparatus.

We claim:

1. A method of introduction of a bleach solution to the clothes receptacle of a washing machine operable through a washing operation comprising, filling said receptacle with a washing fluid containing a detergent-fluorescent dye composition, initiating said washing operation by agitation of said washing fluid, introducing said washing fluid from said receptacle to a reservoir containing a bleach solution, and gradually admixing said bleach solution diluted with said washing fluid into said receptacle after initiation of the agitation of the washing fluid.

2. A method of introduction of a bleach solution from a reservoir to the clothes receptacle of a washing machine operable through a agitation operation comprising, filling said receptacle with a washing fluid containing a detergent-fluorescent dye composition, dilution of said bleach solution in said reservoir by said washing fluid during said filling step, initiating said agitation operation, pumping said washing fluid from said receptacle to said reservoir, and gradually pumping said bleach solution diluted with said washing fluid into said receptacle after the agitation operation has been initiated.

3. A method of washing and bleaching fabrics contained in a clothes receptacle of a washing machine comprising, filling said receptacle with washing fluid containing a detergent-fluorescent dye composition, initating the agitation of said fabrics within said receptacle, recirculating said washing fluid from said receptacle during the agitation of said fabrics to a bleach solution contained outside said receptacle and simultaneously and gradually admixing said diluted bleach solution to said clothes recepacle for bleaching said fabric.

4. A method of washing and bleaching fabrics contained in a clothes receptacle of a washing machine comprising, filling said receptacle with washing fluid containing a detergent-fluorescent dye composition, initiating the agitation of said fabrics within said receptacle, introducing washing fluid from said receptacle during the agitation of said fabrics to a bleach solution contained outside said receptacle, and gradually admixing said diluted bleach solution to said clothes receptacle for bleaching said fabric after initiating said agitation.

5. A method of introduction of a bleach solution to the perforate revoluble clothes basket of a washing ma-

chine operable through a washing operation by the agitation of fabrics placed within said perforate clothes basket comprising, filling said basket with a washing fluid containing a detergent-fluorescent dye composition, initiating said washing operation within said basket, dilution of said bleach solution outside said perforate clothes basket by said washing fluid, and gradually pumping said bleach solution diluted with said washing fluid into said perforate basket after the washing operation has been initiated.

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