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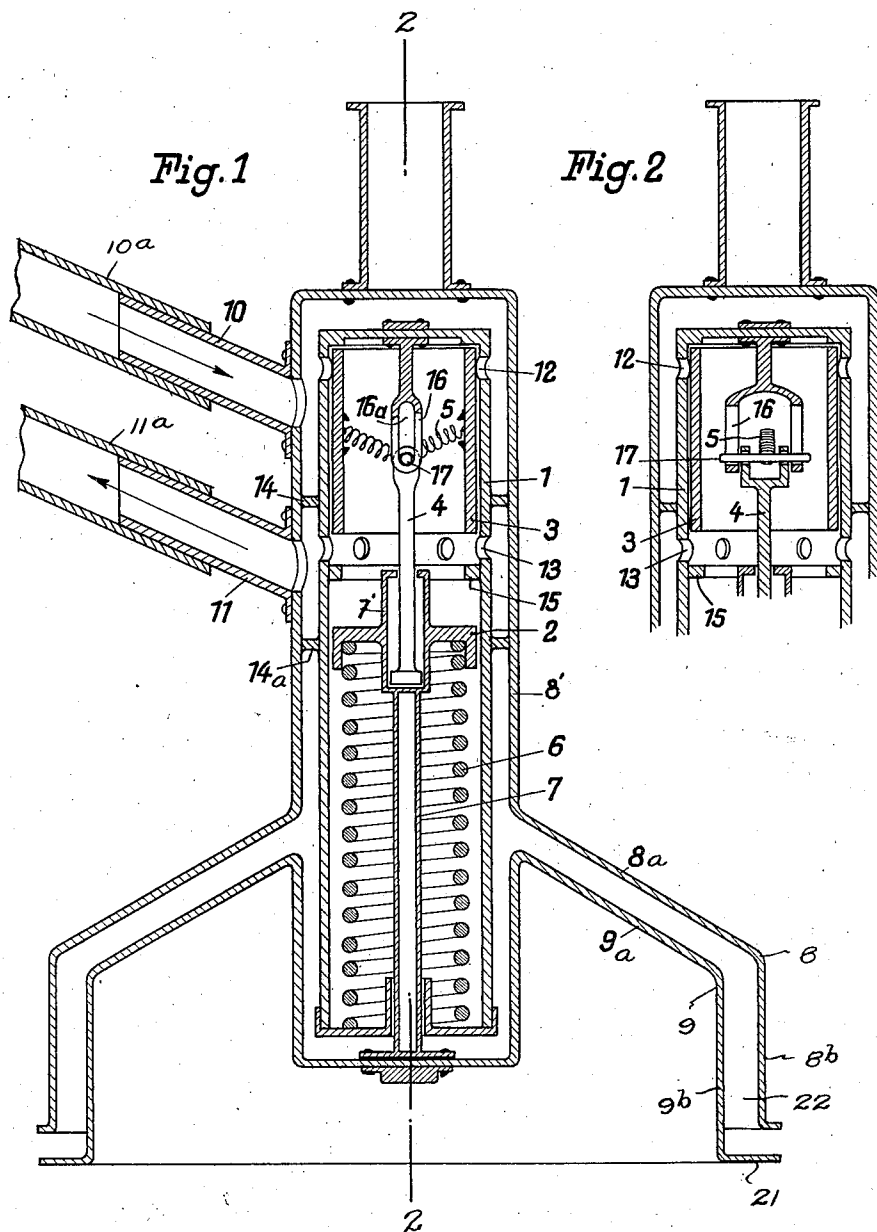
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2,124,635

WASHING APPARATUS.

Filed April 24, 1934

2 Sheets-Sheet 1



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Fig. 4.

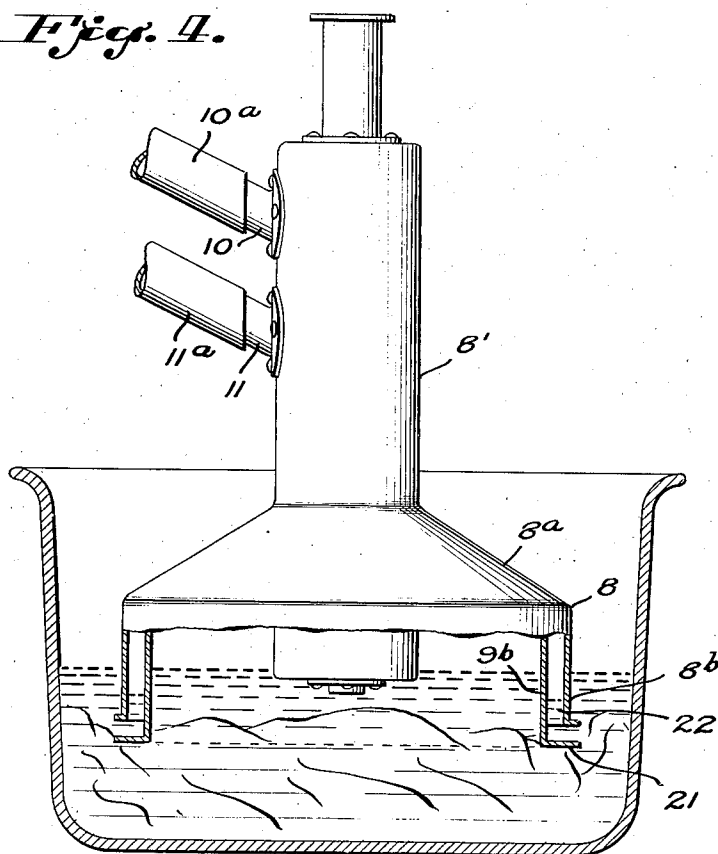
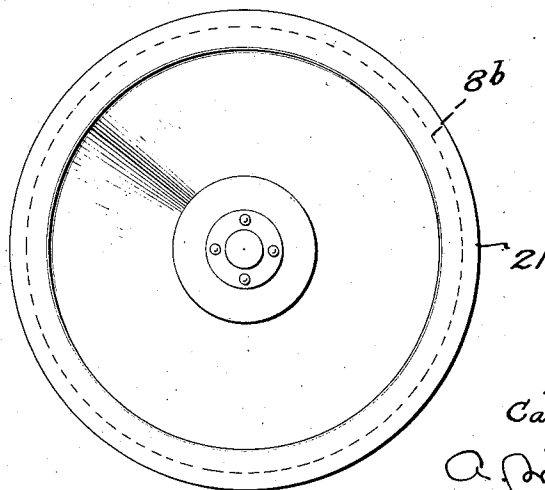


Fig. 3.



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WASHING APPARATUS

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2 Claims. (Cl. 68—124)

My invention relates to a washing device of the kind in which a self-contained apparatus of relatively small dimensions is freely put in the vessel or tub containing both the clothes and the washing liquid and is actuated by a fluid under pressure, preferably by the pressure water of the house supply, to produce a fluctuation of this liquid. This fluctuation may be caused by agitating plates advantageously in the form of bells or cups—one put on top of the other—that are moved to approach to and recede from one another thus drawing in the washing liquid and driving it out alternatively. One of these cups may be attached to a cylinder and the other to a piston sliding in this cylinder and may be moved by the pressure of water or some other fluid.

In a known apparatus of this type the fluid under pressure is alternately directed to both sides of the piston as in a double-acting motor and the distribution of the fluid is accomplished by means of a valve device reversed by the contact of the piston when it reaches the end of its stroke. I have found that such an apparatus has a number of shortcomings. If the fluid under pressure acts on both sides of the piston, channels leading to both ends of the cylinder and a distribution device arranged exteriorly or a separate valve device for each end of the cylinder must be applied, this arrangement causing the mechanism to become complicated and too heavy for its being able to rest somewhat floatingly upon the clothes. Moreover, the pressure of the house water supply may considerably vary according to the height of the place where the water is discharged from and if there is no other resistance against the movement of the piston than that afforded by the agitation of the washing liquid, the same apparatus may be actuated much too slowly in one case and much too fast in another as to give a practical result. Furthermore, the reversing of the motion by contact at the end of the piston stroke is disadvantageous, for it causes uncertainty in the operation; if accidentally the two bells are hindered from completely approaching one another—for instance, by any part of the clothes getting caught between them—the reversing cannot take place and the mechanism will immediately cease working.

It is the object of my invention to eliminate all these shortcomings. This object is attained by only one of the to and fro movements being realized by the action of the fluid under pressure, the other being performed by a spring that

is tensioned during the first movement. In this case the apparatus can be manufactured in a simple form and with but slight weight, for the cylinder can be made of an ordinary tube and the distribution of the fluid under pressure can be effected by only one valve, this valve consisting preferably also of a simple tubular part fitted within the tube forming the cylinder. On account of the tensioning of the spring added to the resistance through the washing liquid, one of the two piston-strokes would be limited in speed and would thus be uneffected by too high a pressure—this stroke being less essential for the washing process—whereas the other stroke would only be dependent on the spring power, the releasing of the spring always producing a movement of constant speed but with a decided jerk very useful for the washing process. To ensure safe operation of the apparatus I provide a snap action device for shifting the valve actuated by the piston before the end of each stroke and this snap action device is set to work in a well-chosen point of the piston stroke, a lost-motion device ensuring the action of the snap action device being executed at the right moment.

In the drawings, in which a preferred embodiment of the invention is shown by way of example,

Fig. 1 illustrates a vertical sectional view of a washing apparatus embodying the principles of the present invention;

Fig. 2 depicts a vertical sectional view of the upper portion of the apparatus, taken at right angles to the first and on line 2—2 of Fig. 1;

Fig. 3 is a bottom plan view of the agitating members; and

Fig. 4 shows the apparatus embodying the invention in the water with the articles to be washed.

The washing apparatus according to the invention comprises a cylinder 1 in the interior of which are arranged a piston 2 and a distributing sleeve or slide valve 3, both parts joined together by a connecting-rod 4. This rod 4 is not tightly fastened to the piston 2 but connected to it by a lost-motion device in such a manner that it is only pushed up and down in the last part of each piston stroke. The rod 4 is connected to the sleeve 3 by a snap action device forcing the latter to suddenly shift its position, for example (as shown) by a pair of springs 5 in such a way that their angular position is reversed at each stroke of the piston, the component of the spring tension acting in the di-

rection of the axis causing the changing of the effective position of the sleeve 3. In the lower part of the cylinder 1 there is a coiled spring 6 acting on the underside of the piston; this spring 5 is pressed together when the piston moves downwards and is released back to its original position after the compression stroke has been performed.

The piston 2 is secured to a piston rod 7 the upper part 7' of which being hollow and embracing the enlarged lower end of the rod 4 with a considerable axial slip thus forming the above mentioned lost-motion device. At the other end the piston rod 7 is fastened to a plate 9 in form of a bell or an inverted cup, this cup 15 9 participating in the motion of the piston and moving to and fro relatively to the cup 8. This cup 8 is similar in form to the other and preferably at a short distance from it and may be integral with the casing 8' surrounding the cylinder and the reciprocating parts of the device. It will be noted that both cups or agitating members 8 and 9 have a conical upper portion and a substantially vertically depending cylindrical lower portion. At one side of casing 8' there 20 are arranged two tubular parts 10 and 11 for the connection of hoses 11a and 11a serving for the introduction and discharge of the fluid under pressure. The part 10 is in communication with the interior of the cylinder 1 by ports 12 and the part 11 also with the interior of the cylinder 30 by ports 13. The casing 8 is connected with the cylinder 1 by partitions 14 and 14a soldered or welded or secured thereto in some other appropriate manner and dividing the space between these walls in such a manner that only the communication mentioned above is possible.

The sleeve of slide valve 3 is so arranged in the upper part of the cylinder that it alternately shuts ports 12 and 13. The movement of this 40 valve is limited, upwards by the top plate of the cylinder and downwards by a stopping flange 15. The connecting-rod 4 is joined to the inner ends of the springs 5 by means of a pin 17 slidable in slot 16a of a fork 16 secured to the top plate 45 of the cylinder, the outer ends of the springs being attached to the inner surface of the sleeve in a suitable manner.

The drawings show the mechanism when the spring 6 of the piston is released, the piston moving upwards and the fluid under pressure escaping through the ports 13 into the tube 11 whereas the ports 12 are closed. The position of the movable parts represented in Fig. 1 corresponds to the moment in the ascending stroke of the 55 piston when the piston has approached its uppermost position so far that it is just touching the rod 4 and begins to push it upwards till the end of its stroke. This upward movement is also transmitted to the pin 17 so that the springs in 60 being compressed pass their dead-center position and suddenly turn in a reversed angular position contrary to that shown in the drawings. In reversing, the springs 5 exercise a downward push to the sleeve 3 thereby shifting it into its 65 lower position till it reaches the stop 15. The ports 12 are now uncovered and the ports 13 are shut. The fluid under pressure entering by the tubular part 10 is now acting on the piston 2 thereby causing its downward stroke. When 70 a certain part of the way is accomplished the piston gets in touch with the rod 4 and carries it on together with the pin 17, thus bending the springs downwards into the angular position shown in the drawings. In this position the 75 springs produce a push acting in an upward di-

rection and replacing the sleeve 3 in the position represented in Fig. 1.

It will be noted that in practical operation the washing apparatus is placed into a tub 18 containing a washing liquid 19 and the articles to 5 be washed 20. The apparatus rests on the lower flange 21 of agitating member 9. Both cups or agitating members 8 and 9 are provided with an upper conical portion 8a and 9a, and with a substantially vertically depending cylindrical lower 10 portion 8b and 9b, respectively. Between the vertically depending lower portions 8b and 9b, a constricted annular space 22 is formed, the cross section of which remains substantially constant during the reciprocation of the agitating 15 members. It follows from the structure of the fluid motor employed in the apparatus of the invention that the downward movement of the piston will be gradual as the upper cylinder space is filled up with the fluid under pressure. Therefore, the distance between the agitating members 20 will be gradually increased and will be filled up with washing liquid drawn in as by a pump. At the same time return spring 6 will be completely compressed. After the piston has reached its 25 lowermost position, slide valve 3 will be reversed in a trigger-like manner and the fluid under pressure will be shut off. As the pressure on the upper surface of the piston will be suddenly removed, piston 2 will be almost instantaneously 30 returned to its uppermost position by return spring 6. Agitating members 8 and 9 will be pressed together at a high speed and will forcibly eject the liquid contained in the space between the upper portions of the agitating members 35 through the constricted annular space 22 between the vertically depending lower portions thereof. Thus, the washing liquid will be ejected at a very high velocity and pressure and will set up powerful and high speed pulsations in the 40 liquid which will readily loosen the particles of dirt adhering to the articles to be washed.

What I claim is:

1. In a washing machine adapted to be placed into a tub containing articles to be washed and 45 a body of a liquid washing medium, the combination comprising a pair of concentrically mounted cup-like agitating members each having a substantially conical upper portion and a substantially vertically depending cylindrical lower portion closely conforming and arranged in close 50 proximity to each other, a cylinder rigidly connected to one of said agitating members, a piston reciprocably arranged in an intermediate region of said cylinder connected to the other 55 of said agitating members, intake and exhaust ports for an actuating fluid in said cylinder at one side of said piston, a return spring within said cylinder and engaging the other side of said piston for quickly returning the same into its 60 original position of rest after each stroke, a slide valve in the upper portion of said cylinder operatively associated with said intake and exhaust ports and capable of alternately opening and closing same, snap action means within said 65 slide valve adapted to be actuated to snap said valve over into its other extreme position, and lost motion actuating means for said valve connecting the same to said piston to cause trigger-like operation of said valve and reciprocation of said piston including a relatively slow downward 70 displacement and an extremely fast and impact-like upward displacement, said cup-like agitating members being constructed and arranged with respect to each other to operate as a pump to slowly draw in and to quickly and forcibly, 75

eject washing liquid from the space formed between said agitating members and having a substantially constant constriction between their vertically depending portions whereby powerful and high speed pulsations will be set up in said liquid and will readily loosen particles of dirt adhering to the articles to be washed.

2. In a washing machine adapted to be placed into a tub containing articles to be washed and a body of a liquid washing medium, the combination comprising a pair of concentrically mounted cup-like agitating members each having a substantially conical upper portion and a substantially vertically depending lower portion closely conforming and arranged in close proximity to each other, a cylinder connected to one of said agitating members, a piston reciprocally arranged at an intermediate region of said cylinder connected to the other of said agitating members, intake and exhaust ports for an operating fluid in said cylinder located at one side of said piston, a return spring asso-

ciated with the opposite side of said piston for quickly returning the same into its original position of rest after each stroke, a snap action slide valve cooperating with said ports to control the introduction and discharge of said fluid through said ports, and a lost motion device intermediate to said piston and said valve for reversing said valve substantially at the end of each stroke to cause reciprocation of said piston including a relatively slow downward displacement and an extremely fast and impact-like upward displacement, said cup-like agitating members being constructed and arranged to operate as a pump to slowly draw in and to quickly and forcibly eject washing liquid from the space formed between said agitating members and having a substantially constant constriction between their vertically depending portions whereby powerful and high speed pulsations will be set up in said liquid and will readily loosen particles of dirt adhering to the articles to be washed.

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