June 21, 1938. K. P. HAMM 2,121,431

WASHING MACHINE

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FIG. 1

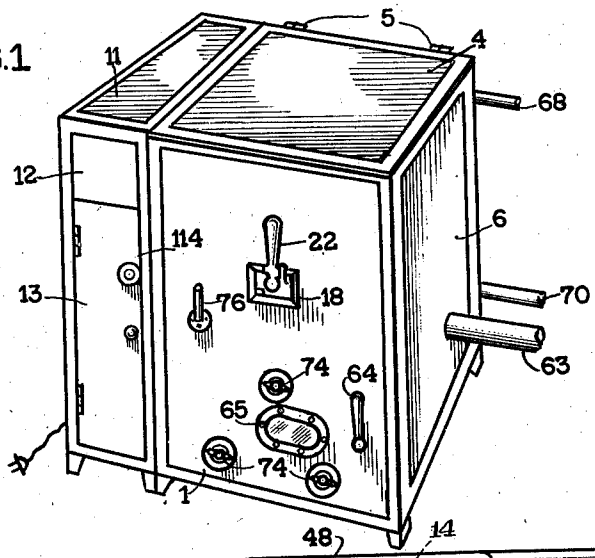
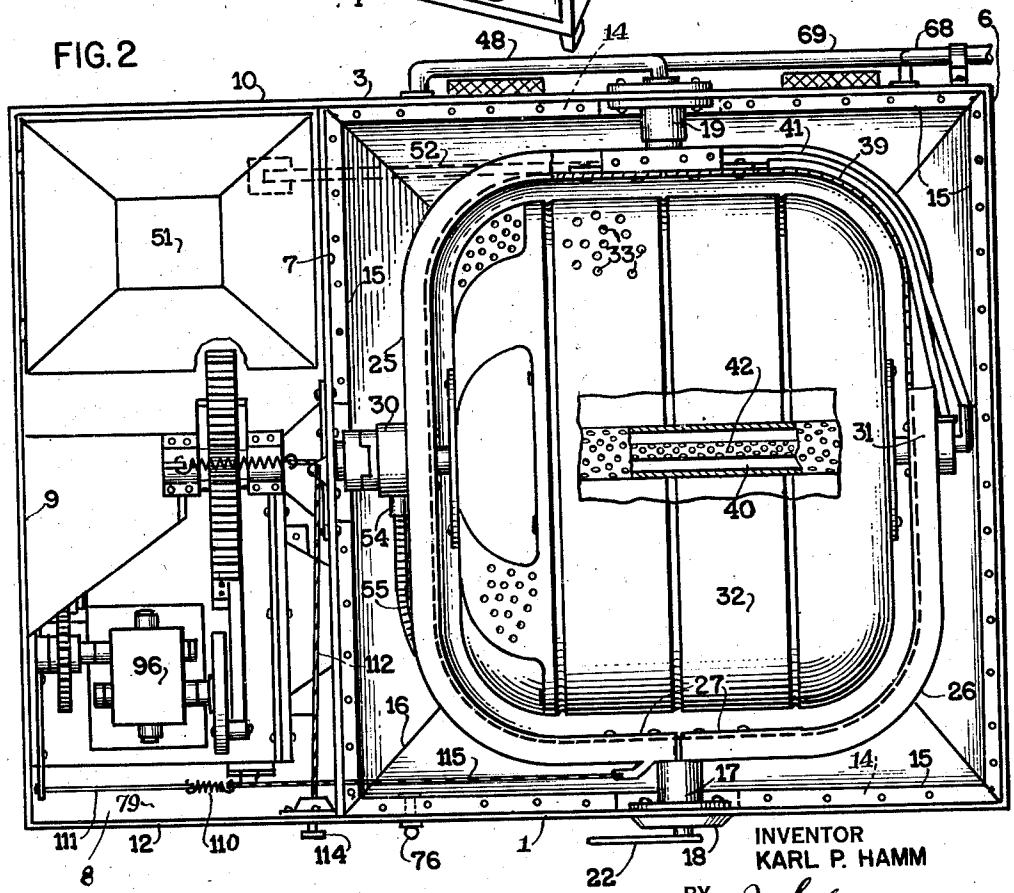


FIG. 2



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FIG. 4

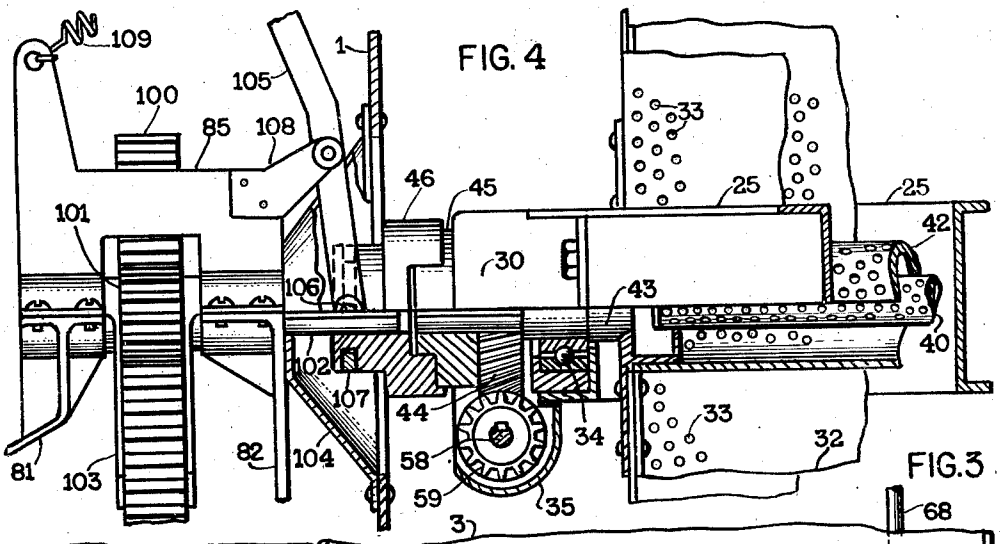
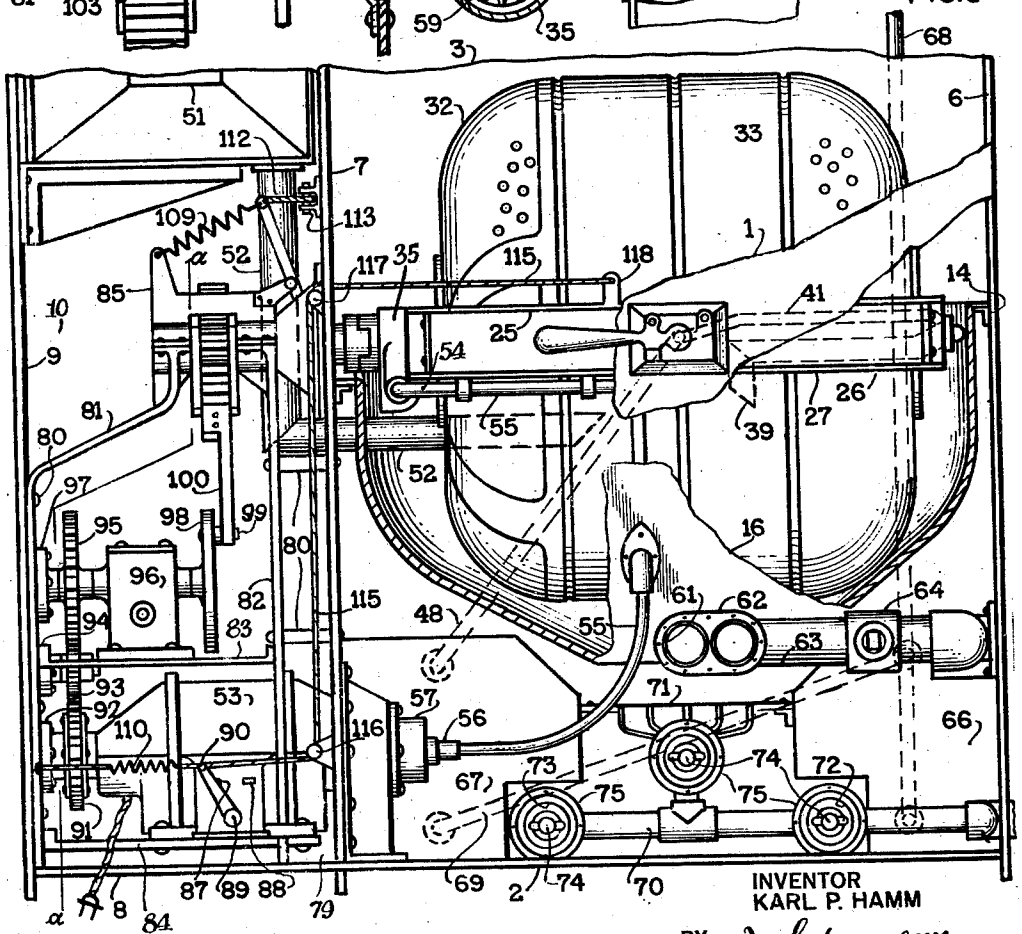


FIG. 3



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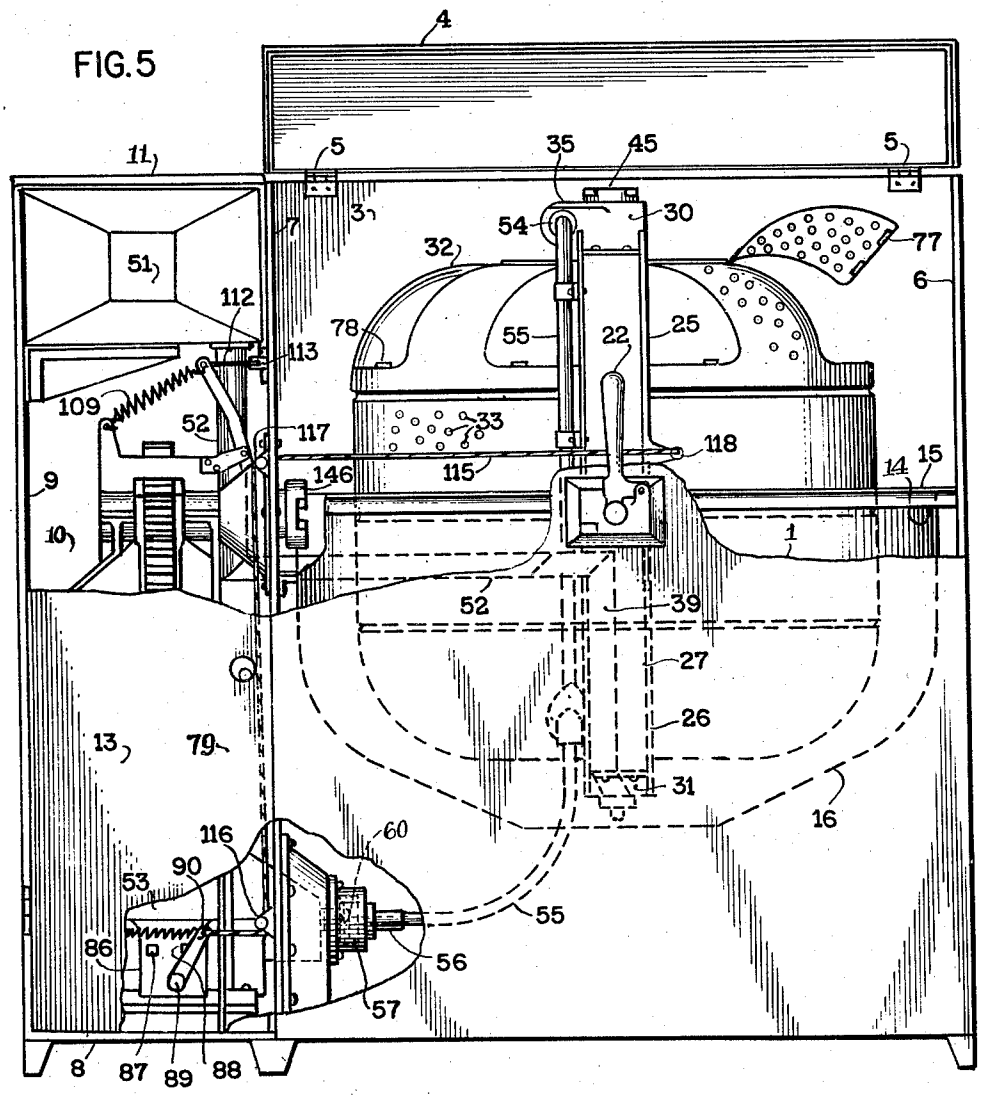
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FIG.5



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WASHING MACHINE

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FIG. 7

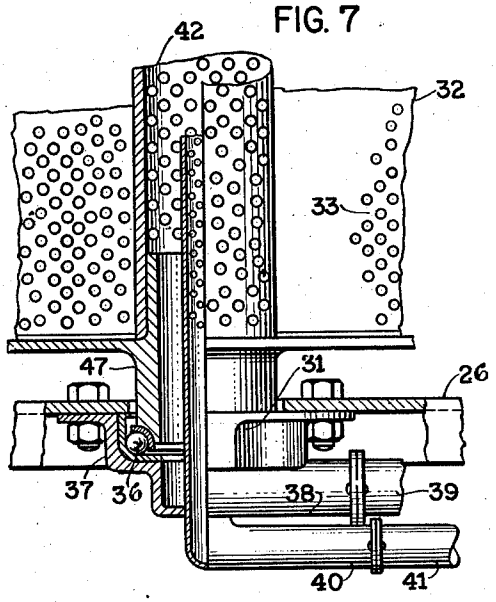


FIG. 8

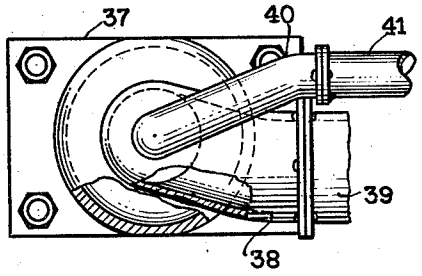
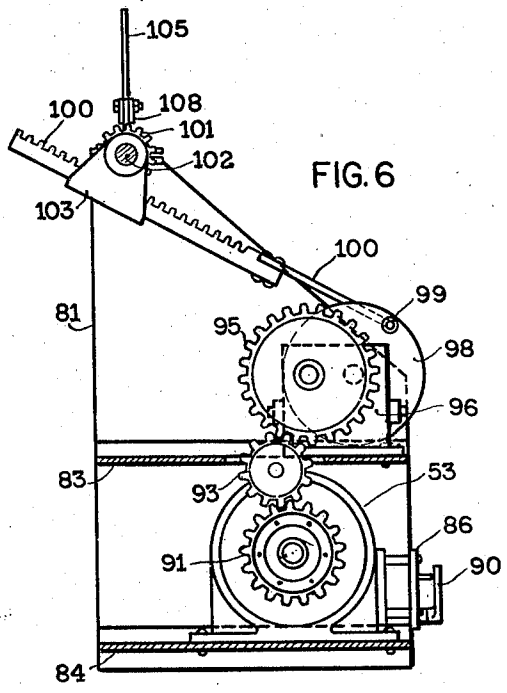


FIG. 6



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FIG. 9

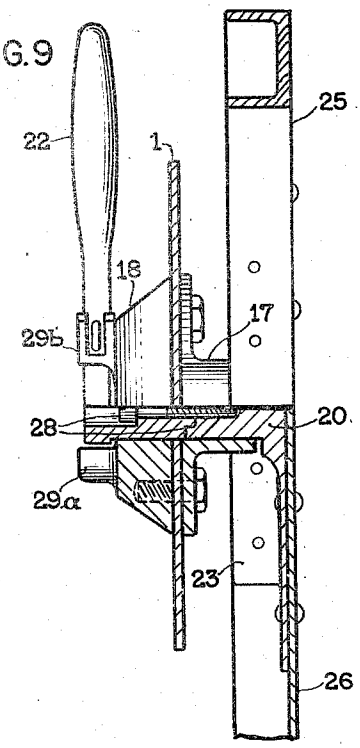


FIG. 10

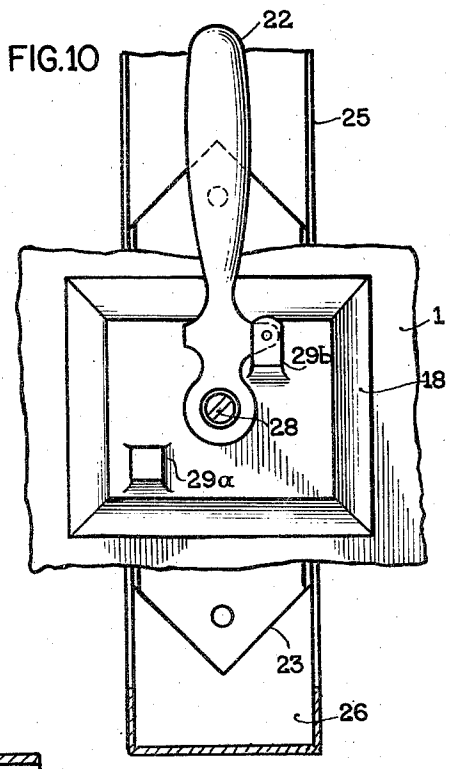


FIG. 12

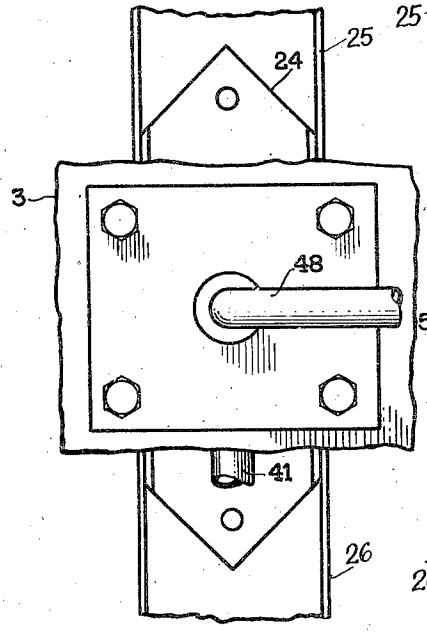
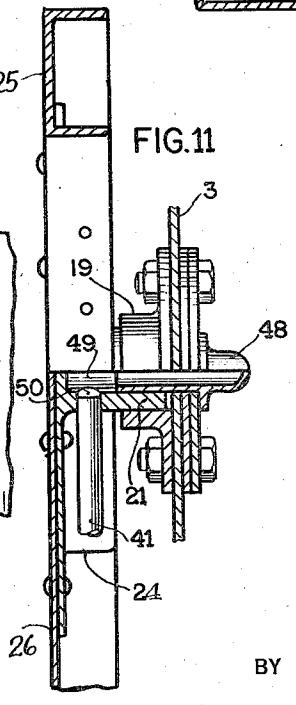


FIG. 11



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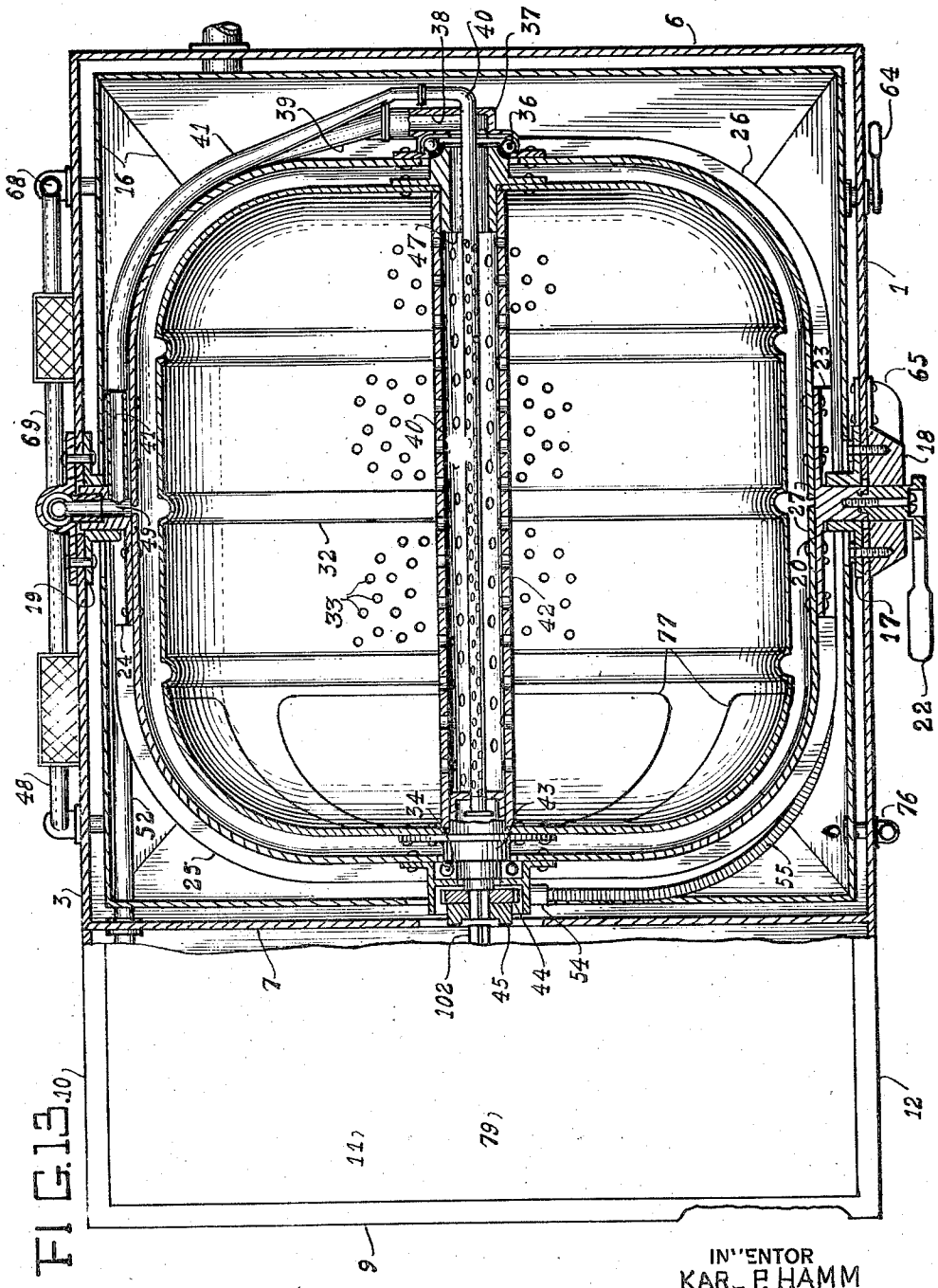


FIG. 13

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WASHING MACHINE

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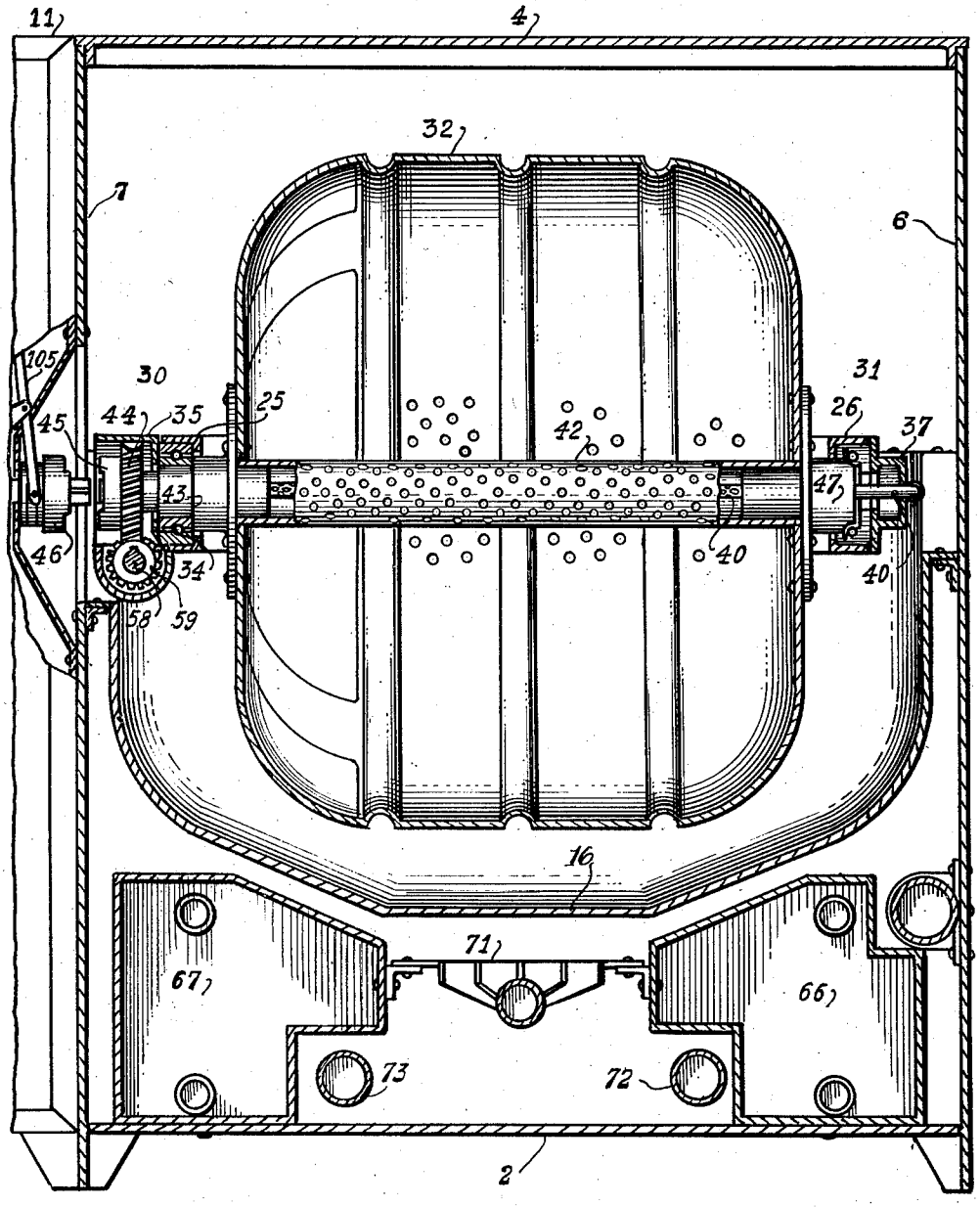


FIG. 14

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Patented June 21, 1938 2,121,431

UNITED STATES PATENT OFFICE

2,121,431

WASHING MACHINE

Karl P. Hamm, New York, N. Y.

Application February 19, 1935, Serial No. 7,162

3 Claims. (Cl. 68—18)

The main object of this invention is to provide a washing machine in which a tumbler is oscillated to and fro in a reservoir of liquid, in a horizontal position, through an arc of 360 degrees, so that complete and effective agitation of the articles to be washed is obtained.

Another object of the invention is the provision of a washing machine in which the said tumbler in the said reservoir, with the latter free of liquid, is centrifugally rotatable in a vertical position so that effective removal of residuary liquid from the washed articles, is had.

The above and other objects will become apparent in the description below, in which characters of reference refer to like-named parts in the accompanying drawings.

Referring briefly to the drawings, Figure 1 is a perspective view of the complete machine, showing the means for operating the machine as well as the inspection glasses and the various pipes to be connected to the sources of water, gas, drainage, and electricity.

Figure 2 is a top plan view of the complete machine as shown in Figure 1, with the tops removed and the frame and tumbler in a horizontal position (the position of oscillation), the oscillating mechanism being in engagement.

Figure 3 is a front elevational view of the complete machine as shown in Figure 1 and partly in Figure 2, with the front wall for the larger part removed and the reservoir partly in section, the tumbler being in the position of oscillation.

Figure 4 is an enlarged front elevational view of the engagement mechanism for oscillation (forming part of Figure 3), partly in section, showing the journal in the upper part of the frame, the means for centrifugally rotating the tumbler through the spiral gears, as well as partly the means or mechanism for oscillating the tumbler, and the means for engaging and disengaging the jaw-coupling.

Figure 5 is a front elevational view of the complete machine as shown in Figures 1, 2, and 3, with the front walls partly removed, the tumbler and frame being in the vertical position or the position for centrifugally rotating the tumbler; the oscillating mechanism is partly shown in a disengaging position, and some of the controls and inspection glasses are omitted.

Figure 6 is a side elevational view of the oscillating mechanism along the line *a—a* in Figure 3, showing the mechanism for sliding the rack bar to and fro, which results in the oscillating motion of the engaging pinion.

Figure 7 is an enlarged elevational view of the journal in the lower part of the frame as indicated in Figure 2, showing in enlarged scale and partly in section, parts of the tumbler and the hollow shaft, the shaft end being mounted therein. Figure 7 also shows the shaft end mounted in the combination bearing housing, its hot air inlet and water inlet, as well as part of the lower portion of the frame to which it is secured.

Figure 8 is a bottom plan view of the combination ball bearing housing, partly in section, which is shown in Figure 7.

Figure 9 is an enlarged side elevational view, partly in section, of the handle and frame bearing pin connection, showing the upper and lower part ends of the frame; this figure also shows the bearing pin of the connection member between said upper and lower ends of the frame, resting in the cup-shaped member which is secured to the front wall and the head member, in which combined bore the handle and bearing pin are mounted.

Figure 10 is a front elevational view of Figure 9.

Figure 11 is an enlarged side elevational view, partly in section, of the frame bearing pin connection as seen diametrically opposite to Figure 9 in Figure 2. Figure 11 also shows the arrangement for conveying water through the bearing pin into the water pipe which terminates near the upper journal as shown in Figure 4.

Figure 12 is a front elevational view of Figure 11.

Figure 13 is a horizontal cross-sectional view of the washing compartments only, showing a fraction of the pinion shaft 102, the outline of the machine compartment 79, the frame, the frame connection and its bearing, as well as the two trunnions of the tumbler, and the water and hot air supply mechanism.

Figure 14 is a vertical cross-sectional view taken at right angles to Figure 13, showing the frame, the complete tumbler and its driving mechanism, the reservoir, the two water tanks and the gas burners, all enclosed in the casing. The driving mechanism housing is partly omitted.

Referring in detail to the drawings, the numeral 1 indicates the front wall of the tumbler housing which is a box-like casing (Figure 1). This casing (Figure 1) has a bottom 2 (Figure 3), a rear wall 3 (Figure 2), and a cover 4 provided with hinges 5 so that the same may be lifted upward to expose the tumbler mechanism and the reservoir contained in the casing. The casing is also enclosed by the side wall 6 and the dividing wall 7 (Figures 2, 3, and 5). To the left

of the tumbler housing (Figures 2, 3, and 5) the casing is further enclosed by the floor 8, the dividing wall 7, outside wall 9, rear wall 10 (Figure 1), top 11, and front wall 12 (Figures 1 and 2) containing a hinged door 13, the compartment thus formed containing the motor and its mechanism. The tumbler housing walls 1, 3, 6, and 7 have mounted thereon intermediate their length, an L-shaped rail 14 (Figure 5) upon the horizontal flange of which a ledge 15 of an inverted bowl-shaped reservoir 16 is mounted. On the front wall 1 (Figure 2), on the inside of the casing in the region of the rail 14, a cup-shaped member 17 is secured to a head 18 which is located in the same region as the member 17 but on the outside of the front wall 1. Diametrically opposite and mounted on the inside of the rear wall 3 (Figure 2) of the tumbler casing, a second cup-shaped member 19 is firmly anchored thereon. The member 17 and the head 18 as well as the member 19 are provided with an internal bore in which register the rotatable bearing pins 20 and 21 and the handle member 22, respectively (Figures 9 and 11). The rotatable pins 20 and 21 are an integral part of the U-shaped connection members 23 and 24 (Figures 13, 9, 10, 11, and 12) to which are firmly anchored the two halves 25 and 26 of a continuous or girt-like frame member 27 substantially square in outline. Connecting the handle member 22 rotatable in head 18, and the bearing pin 20 rotatable in the member 17 (Figure 9) by means of a tongue and groove 28 on handle member 22 and bearing pin 20, respectively, and a bolt 28, it is now possible to tilt the frame 27 (Figure 2) by means of the handle 22. This tilting of the frame 27 is mechanically restricted to an arc of 90 degrees by limit stops 29*a* and 29*b* (Figure 10). The two halves 25 and 26 of the frame 27 are provided with bearings 30 and 31, respectively (Figures 2, 4, and 7) for a rotatable tumbler barrel 32 which is perforated over its entire expanse as indicated by the numeral 33. The bearing 30 consists of a ball bearing 34 placed into the combination ball bearing and gear housing 35 which in turn is firmly anchored to the half 25 of the frame 27 (Figures 4 and 13). The bearing 31 (Figure 7) consists of a combination ball bearing 36 placed into the combination ball bearing housing 37 which again is firmly anchored to the half 26 of the frame 27. The combination ball bearing housing or cap 37 is provided with an inlet 38 to receive a hot air pipe 39, and a water pipe 40 to receive a water pipe 41 (Figures 7 and 8). The rotatable tumbler 32 is provided with a perforated hollow shaft 42 (Figures 2, 4, and 7) whose solid end 43 passes through the ball bearing 34 and the combination ball bearing and gear housing 35, also through a spiral gear 44 (Figure 4) firmly secured to the solid shaft end 43, and terminates in one half 45 of a jaw coupling. This half 45 engages and disengages with the other half 46 of a jaw coupling which is slidably mounted on a pinion shaft, described below. The other end 47 of the shaft 42 is hollow itself (Figure 7) in order to provide a passage for the partly perforated water pipe 40 and the passage of hot air. This hollow shaft end terminates in the combination ball bearing 36. Water enters by means of a water pipe 48 (Figures 11 and 12) which penetrates the rear wall 3 of the tumbler housing and terminates in the restricted internal bore 49 of the rotatable bearing pin 21. Outside the bearing area of the pin 21 (Figure 11) and extending into and terminating in the restricted internal bore 49, the pin 21 has a bore 50. Firmly secured in the bore 50 (Figure 11) is the water pipe 41 which passes around the half 26 of the frame 27 and is firmly secured to the water pipe 40 (Figures 7, 8, and 13). The latter penetrates (Figure 7) the combination ball bearing housing 37 and is firmly anchored thereto, then follows the center axle of the shaft end 47 and the center axle of the shaft 42, and terminates in the solid shaft end 43 of the hollow shaft 42 (Figure 4) where it is sealed.

The water pipe 40 is perforated over its length inside the hollow shaft 42 (Figure 2) only. Hot air flows from a conventional hot air unit 51 (Figures 3 and 5) located in the motor mechanism housing, by means of a hot air pipe 52. This pipe passes through the wall 7 and through the side of the bowl-shaped reservoir 16 located in that region. When the frame 27 and with it the tumbler 32 are in vertical or upright position, (Figure 5), as described below, the pipe 52 contacts with the hot air pipe 39. The latter runs parallel with the pipe 41 (Figure 2) and its end is connected to the hot air inlet 38 of the housing 37 (Figures 7 and 8), thereby conveying hot air through the perforated hollow shaft 42 into the tumbler 32 (Figure 2). As shown and described up to this point, the frame 27 can be tilted through an arc of 90 degrees, the tumbler 32 being rotatable inside the frame 27, and water can freely enter into the tumbler 32 and the reservoir during these movements, and hot air can enter the tumbler 32 during rotation and rest on the latter when the frame 27 is in horizontal position.

In order to impart centrifugal rotation at high speed to the tumbler 32, a mechanism is provided which is releasably coupled to a motor 53. A flexible shaft casing end 54 is firmly anchored to the combination housing 35 (Figures 3 and 5). This shaft casing and the shaft 55 follow the half 25 of the frame 27, penetrate the reservoir 16 in the region of the front wall 1, and terminate in the flexible shaft casing end 56 which is firmly anchored to the free-wheeling clutch housing 57 (Figures 3 and 5). On the rotating end 58 (Figure 4) of the flexible shaft 55, a pinion or spiral gear 59 is mounted which meshes with the spiral gear 44 which in turn is firmly anchored to the solid shaft end 43. The other rotating end of the shaft 55 is securely anchored to one part of the free-wheeling clutch 60 located in the housing 57 (Figures 3 and 5).

A drain pipe 61 is firmly anchored to the side near the bottom of the reservoir 16 in the region of the front wall 1, whose other end terminates on the inside of the front wall 1 (Figure 3) and is securely anchored to the flange 62. The latter has securely anchored to it the end of another drain pipe 63 which conveys through a valve 64 the liquid from the reservoir 16 to a source of disposal not shown. In order to freely and at any time inspect the liquid from the reservoir 16, two openings of the same size and shape as the two drain pipes 61 and 63 are provided in the front wall 1 of the tumbler housing, these openings facing the said pipe ends anchored to the flange 62. Both pipes 61 and 63 communicate by means of a glass or transparent connection member 65 (Figure 1) whose ledge is securely anchored to the flange 62 by means of bolts which penetrate the front wall 1. Mounted above the bottom 2 of the tumbler casing and secured thereto, are two water supply tanks 66 and 67

(Figure 3). The water enters the tank 66 by means of pipe 68, overflows into the tank 67 by means of the pipe 69, and is further forced under pressure into the bearing pin 21 by means of pipe 48 (Figure 11). A gas pipe 70 connected to a gas supply main not shown, supplies the gas burner 71 (Figure 3) to heat the contents of the reservoir 16, and the pipe 70 also supplies the two gas burners 72 and 73. The latter heat the contents of the tanks 66 and 67, respectively. The three burners 71, 72, and 73 are controlled by valves 74 located in recesses 75 (Figure 3) in the front wall 1.

A level indicator gauge 76 is mounted upon the front wall 1 (Figures 1 and 2) and communicates with the reservoir 16. The tumbler 32 is provided with a plurality of doors 77 to serve as many sections therein, the doors 77 being hingedly mounted on the tumbler 32 and adapted to be closed by latches 78 (Figure 5). Adjacent the dividing wall 7, the motor mechanism compartment 79 is formed by the floor 8, the wall 7, outside wall 9, rear wall 10, top 11 and front wall 12, the latter containing the hinged door 13 (Figures 1, 3, and 5). In this compartment the mechanism for oscillating the tumbler 32, the motor 53 for driving the mechanism, and the flexible shaft 55 for centrifugally rotating the tumbler 32, are mounted as a unit. This unit in turn is firmly anchored to the dividing wall 7 and the outside wall 9 by means of fasteners 80 (Figure 3). The unit consists of side plates 81 and 82, spacer plates 83 and 84, and the combination spacer plate and split collar bearings 85. A reversible electric motor 53 is firmly anchored to the spacer plate 84, and an insulating plate 86 is secured to the motor (Figures 5 and 6), the plate 86 having three contact points 87, 88, and 89 and a switch lever 90, thus providing a reversing switch to energize the motor 53 in either direction. The motor 53 whose shaft extends to both sides has mounted on the end facing the side plate 81 a free-wheeling clutch 91 which serves at the same time as a spur gear (Figures 3 and 6). The motor shaft end carrying the clutch 91 is also supported by the bearing 92 (Figure 3) firmly anchored to the plate 81. The spur gear of the clutch 91 meshes with the gear 93, having its bearing on the pivot 94 anchored to the plate 81. The spur gear 93 drives the spur gear 95 which is secured to the axle of a standard speed reducer 96 anchored to the spacer plate 83. The speed reducer axle, having secured thereto the spur gear 95, is also supported by the bearing 97 anchored to the plate 81. To the other axle of the speed reducer 96 (Figures 3 and 6) a circular disk 98 is secured having a pivot 99 engaging the arm and rack bar 100. The upper face of the rack bar 100 is provided with teeth which mesh with the pinion gear 101 anchored to the pinion shaft 102 having its bearing between the split collars 85. The lower face of the rack bar 100 slides in the guide piece 103 which has its bearing on the shaft 102 and is allowed to swing freely thereon. The shaft 102 has on its extension, which penetrates the cone 104 (Figure 4) and thereby gets its location in the tumbler housing, a double key way on which one half 46 of the jaw-coupling is allowed to slide. This sliding movement of the half 46 is controlled by a fork 105 which receives on its lower ends the pivots 106 (Figure 4) of a ring 107 in a groove in the half 46 of the jaw-coupling. The fork itself is supported in a lug 108 anchored to the element 85, and has in its end a hole to receive a spring 109 which on its other end is also secured to the element 85.

As seen in Figures 2 and 3, the switch lever 90 is held in one position by a spring 110 and a rod 111 secured to the plate 81. In this position the switch lever 90 connects the contact points 87 and 89, which gives the motor 53 (connected to a power source not shown) a counter-clockwise direction of rotation, thus giving oscillating motion, as above set forth, to the half 46 of the jaw-coupling. This half 46 (Figure 4), through the arrangement of the spring 109, fork 105, and ring 107, is kept firmly interlocked with the other half 45 of the jaw-coupling, which is anchored to the axle of the tumbler 32. To the fork 105 is fastened a steel wire cable 112 (Figures 2 and 3) which passes around a roller 113 secured to the wall 7 and terminates in a handle 114 located outside the front wall 12 (Figures 1 and 2) and is slidable therein. By means of this handle 114 the interlocking and unlocking of the mechanism and the frame 27, including the tumbler 32, are controlled.

As further seen in Figures 3 and 5, the switch lever 90 has also secured to it the end of a steel wire cable 115 which is guided around a roller 116 and over a roller 117 both secured to the wall 7, passes through this wall 7, and has its end secured to a lug 118 anchored in the frame 27. Thus, pulling the handle 114 (Figure 2) disengages the halves 45—46 of the jaw-coupling and leaves the frame 27 and the tumbler 32 free to be rotated into vertical position by means of the handle member 22. This will automatically change the position of the switch lever 90, and the lever will then contact on points 88 and 89 (Figure 5) which will result in reversing the direction of rotation of the motor 53. As indicated above, this will result in free-wheeling of the gear clutch 91 and in engaging of the motor axle with the flexible shaft 55 through the clutch 60.

Obviously, modifications in form and structure may be made without departing from the spirit and scope of the invention as defined in the claims.

I claim:

1. In a washing machine, a casing having a substantially bowl-shaped reservoir mounted therein, said casing having oppositely disposed bearings mounted thereon on a horizontal axis extending from the front to the rear of said casing, a rigid frame having oppositely disposed trunnions rotatable in said bearings, said frame being normally upright and of substantially greater depth than the depth of said reservoir and normally having the upper portion thereof projecting above the mouth of said reservoir and the lower portion contained within said reservoir, a tumbler rotatably mounted within said frame and being girted by said frame, said tumbler also being normally upright in said reservoir and having an axial shaft extending therethrough at right angles to said horizontal axis of said casing bearings in the same plane as said frame, said frame having oppositely disposed bearings supporting said shaft, a gear mounted at one end of said shaft for rotating said tumbler, means for rotating said gear, means for tilting said frame and tumbler through a 90 degree arc from the upright to the horizontal position, a horizontal shaft lying in the same plane as and at right angles to said bearing axis, interlocking means partly on the end of each of said shafts adapted to releasably interlock said shafts, means for shifting said horizontal shaft

end into or out of engagement with said axial shaft end after said frame and tumbler have been tilted to horizontal position, means for oscillating said horizontal shaft to oscillate said tumbler in horizontal position, said tumbler shaft being hollow and perforated, a perforated tube axially mounted within and spaced from said hollow shaft, one end of said hollow shaft and tube being closed, a cap surmounting the other end thereof and mounted on said frame, said cap having a water inlet pipe joined to said tube, said cap enclosing an air chamber opening into said hollow shaft about said pipe and having a hot air inlet thereinto.

2. In a washing machine, a casing having a reservoir therein, said casing having oppositely disposed bearings mounted thereon on a horizontal axis extending from the front to the rear of said casing, a rigid frame having trunnions rotatable in said bearings about said horizontal axis, a tumbler mounted within said frame, said frame and tumbler being normally upright in said reservoir, said tumbler having an axial shaft extending therethrough at right angles to said horizontal axis of said casing bearings in the same plane as said frame, said frame having oppositely disposed bearings supporting said shaft, means for rotating said tumbler shaft, a horizontal shaft lying in the same plane as and at right angles to said horizontal axis of said casing bearings, interlocking means partly on the end of each of said shafts, means for tilting said frame and tumbler from the upright to the horizontal position, means for shifting said horizontal shaft end into or out of engagement with said axial shaft end after said frame and tumbler have been tilted to horizontal position, means for oscillating said horizontal shaft to oscillate said tumbler in horizontal position, said tumbler shaft being hollow and perforated, a perforated tube axially mounted within and spaced from said hollow shaft, one end of said hollow shaft and tube being closed, a cap surmounting the other end thereof and mounted on said frame, said cap having a water inlet pipe joined to said tube, said cap enclosing an air chamber opening into said hollow shaft about said pipe and having a hot air inlet thereinto.

3. In a washing machine, a casing having a reservoir therein, said casing having oppositely disposed bearings mounted thereon on a horizontal axis extending from the front to the rear of said casing, a frame having trunnions rotatable in said bearings about said horizontal axis, a tumbler mounted within said frame, said frame and tumbler being normally upright in said reservoir, said tumbler having an axial shaft extending therethrough at right angles to said horizontal axis in the same plane as said frame, said frame having oppositely disposed bearings receiving the ends of said tumbler shaft, means for rotating said tumbler shaft, means for tilting said frame and tumbler from the upright to the horizontal position, means for oscillating said tumbler shaft in horizontal position, said tumbler shaft being hollow and perforated, a perforated tube axially mounted within and spaced from said hollow shaft, one end of said hollow shaft and tube being closed, a cap surmounting the other end thereof and mounted on said frame, said cap having a water inlet pipe joined to said tube, said cap enclosing an air chamber opening into said hollow shaft about said pipe and having a hot air inlet thereinto.

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