

Oct. 16, 1962

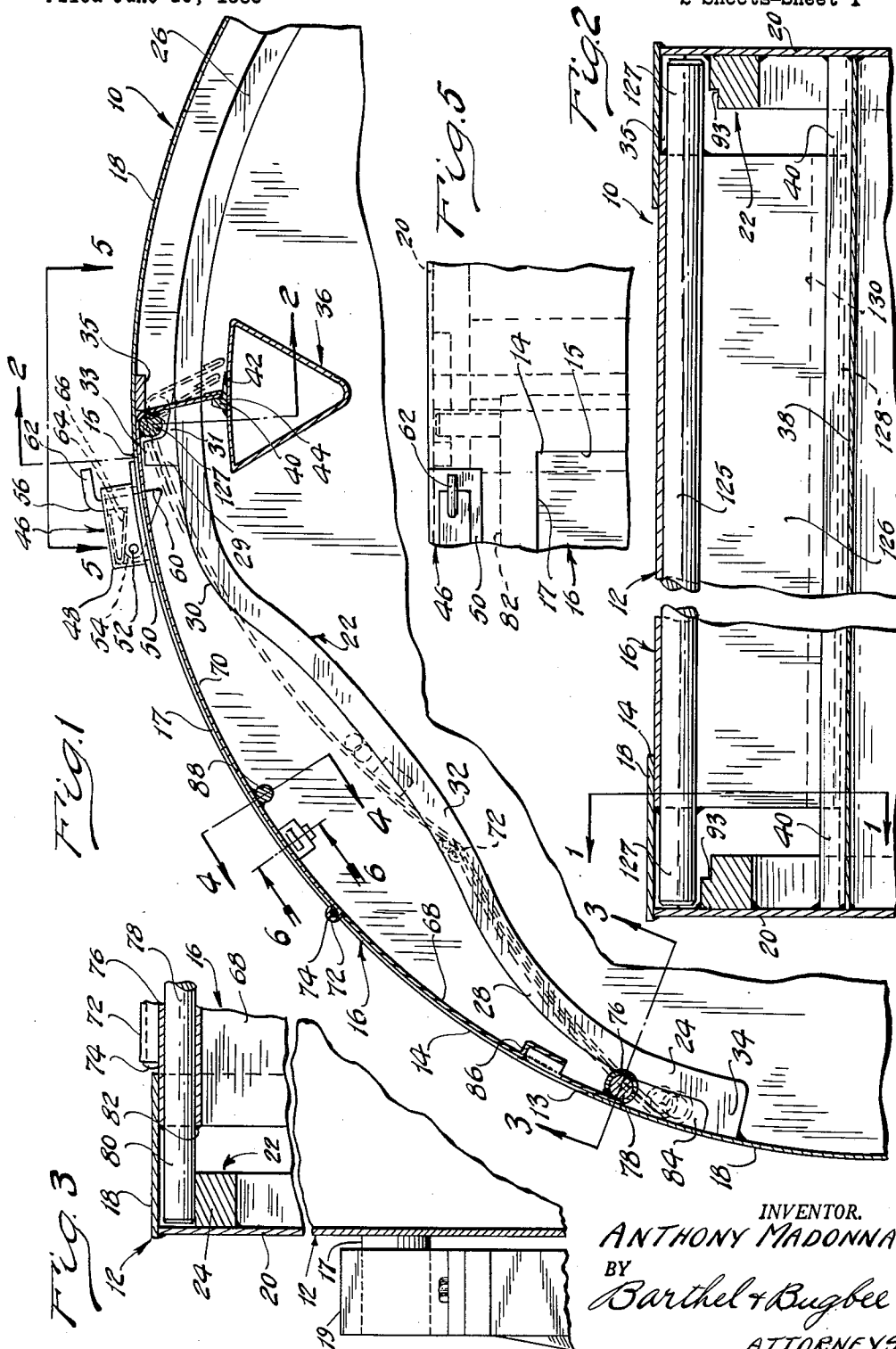
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3,058,331

SLIDING DOOR CONSTRUCTION FOR CYLINDRICAL CONTAINERS

Filed June 10, 1959

2 Sheets-Sheet 1



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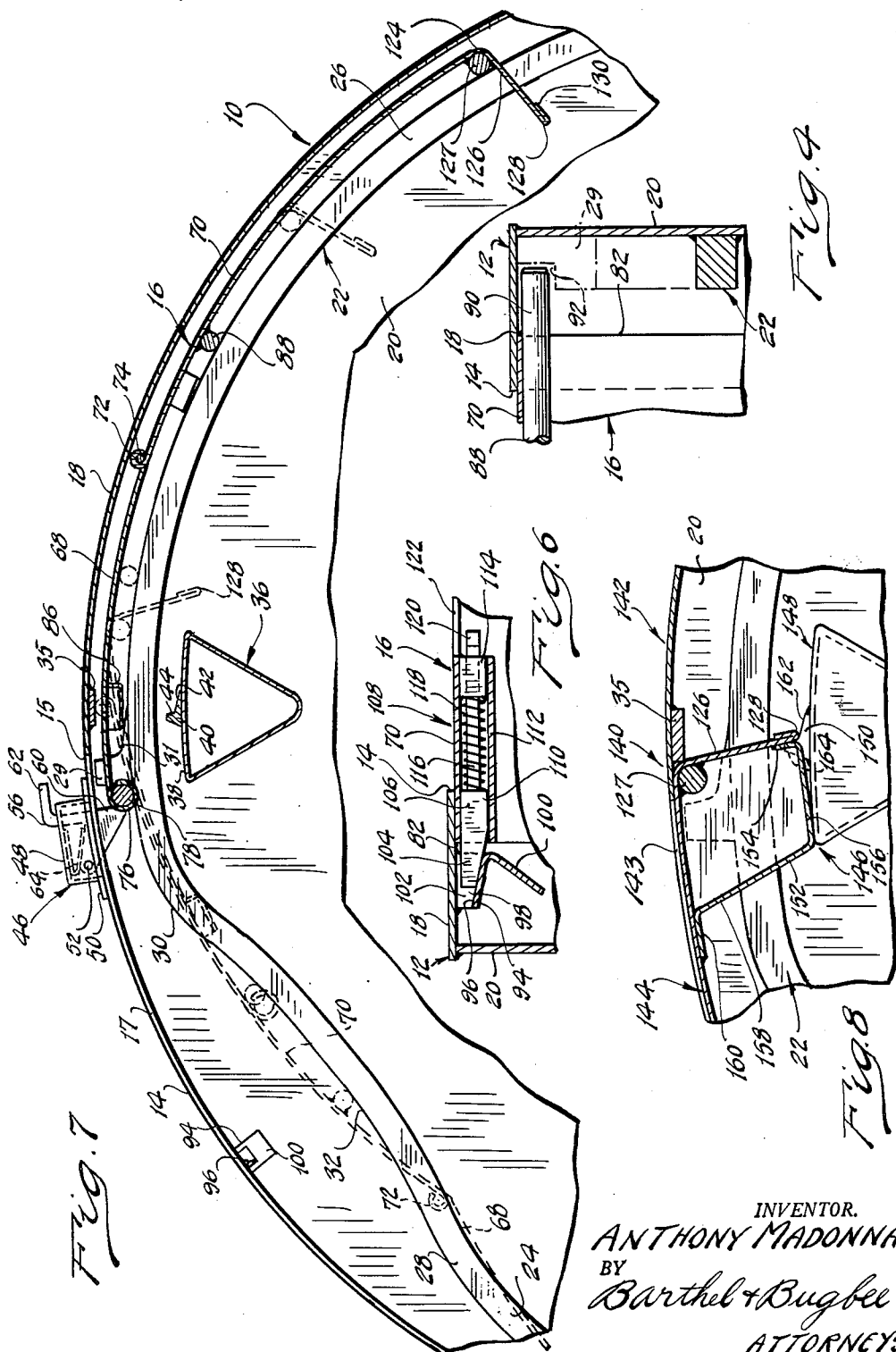
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1

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SLIDING DOOR CONSTRUCTION FOR
CYLINDRICAL CONTAINERSAnthony Madonna, 1340 N. Franklin Ave.,
Dearborn, Mich.Filed June 10, 1959, Ser. No. 819,339
9 Claims. (Cl. 68—139)

This invention relates to closures for cylindrical receptacles and, in particular, to doors for rotary laundry machine drums.

One object of this invention is to provide a laundry machine drum door for a rotary drum laundry machine which is quickly and easily moved out of the drum aperture or doorway which it closes to a location beside that aperture, while at the same time remaining in close proximity to the drum wall, so that it does not collide with the clothing inside the drum during its opening or closing motion.

Another object is to provide a laundry machine drum door of the foregoing character which is brought into closing relationship with the doorway by a cam action which tightly and securely closes the doorway, this cam action performing its work while the door is being moved between its open and closed positions.

Another object is to provide a laundry machine drum door of the foregoing character which is held in its closed position at the top of the drum by a latch, and at the bottom of the drum by the weight of the clothing when the drum is rotated, without requiring the latch to sustain more than the weight of the door and its component parts.

Another object is to provide a laundry machine drum door of the foregoing character wherein the door engages its supporting guide rails solely at the end portions of its supporting rods, thereby greatly reducing friction and eliminating the need for the grease or tallow previously used as a lubricant and ineffective under modern conditions because dissolved by modern detergents.

Another object is to provide a laundry machine drum door of the foregoing character wherein the door is constructed in two parts which are hinged to one another in such a manner as to enable the door sections to fold only slightly relatively to one another with a large obtuse angle therebetween, thereby avoiding the acute-angled folding of prior folding doors which collided with the clothing inside the drum and consequently restricted the amount of clothing which could be satisfactorily loaded into the drum.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings, wherein:

FIGURE 1 is a fragmentary side elevation, partly in vertical cross-section, through one end portion of a laundry machine drum with the door in its closed position and shown in dotted lines in its folded condition, the section being taken along the line 1—1 in FIGURE 2;

FIGURE 2 is a fragmentary vertical longitudinal section taken along the line 2—2 in FIGURE 1, showing the camming guide rails and the door edge flange;

FIGURE 3 is an inclined, nearly horizontal fragmentary longitudinal section taken along the line 3—3 in FIGURE 1, looking upward, and showing the rotary drum-driving shaft and shaft bearing in which it rotates, with the drum portion between the shaft and the drum periphery omitted to conserve space;

FIGURE 4 is an inclined, nearly vertical longitudinal section taken along the line 4—4 in FIGURE 1, looking slightly downward;

FIGURE 5 is a fragmentary top plan view looking in the direction of the line 5—5 in FIGURE 1, showing the hold-open latch;

2

FIGURE 6 is an inclined fragmentary vertical longitudinal section taken along the line 6—6 in FIGURE 1, looking upward;

FIGURE 7 is a view similar to FIGURE 1, but with the door shown in solid lines in its open position, and in dotted lines in different intermediate positions; and

FIGURE 8 is a fragmentary vertical cross-section, similar to FIGURE 1, but showing a modification of the invention having a hollow baffle section mounted on and slidable as a unit with the door.

Referring to the drawings in detail, FIGURES 2 and 7 show the upper portion of a laundry machine, generally designated 10, as including a drum or container 12 having an approximately rectangular aperture or doorway 14 closed by an arcuately sliding door, generally designated 16, from the closed position of FIGURE 1 to the open position of FIGURE 7 and vice versa. The drum 12 is rotatably mounted upon a central shaft 17 which in turn is rotatably supported in upstanding bearing brackets 19 resting upon the floor or other suitable supporting structure. These supporting and bearing arrangements are beyond the scope of the present invention and are well known to those skilled in the laundry machine art.

The drum 12 consists of a hollow cylindrical wall 18 containing the doorway or aperture 14 closed by the door 16 and opposite end plates or disc-shaped heads 20 (FIGURE 2) welded or otherwise secured to the opposite ends of the cylinder 18. The doorway 14 has forward and rearward side edges 13 and 15 and opposite end edges 17. Secured to each of the heads 20 is a cam guide rail, generally designated 22, for guiding the door 16 in its travel between its open and closed positions as well as performing a camming action described below in connection with the operation of the invention. Each guide rail consists of convexly arcuate rearward and forward end portions 24 and 26 (FIGURE 7) spaced circumferentially apart from one another, with convex humps or turning points 28 and 30 connected to one another by an intermediate arcuate concave rail portion 32 extending between the turning points or humps 28 and 30. Each of the cam guide rails 22 adjacent the rearward doorway side edge 15 is provided with a cam portion 29 having a ramp 31 and an upstanding stop rib 33. Each rail 22 is connected at its opposite ends to the inner surface of the drum 18 by a radial arm portion or strut 34, only one of which is shown (FIGURE 1). From a comparison of FIGURES 1 and 7 it will be seen that the forward end portion 26 of the camming guide rail 22 is circumferentially much longer than either the rearward arcuate portion 24 or intermediate arcuate portion 32. A thin stop bar 35 is welded or otherwise secured to the inside of the cylinder 18 to the right of the cam portion 29, to admit door-supporting rod ends therebetween, as described below.

The drum 12 is ordinarily provided with circumferentially-spaced longitudinally-extending baffles 36 preferably of hollow approximately triangular cross-section with an arcuate outer wall 38, one of which carries a cam rib 40 welded or otherwise secured thereto. The baffle 36 carrying the cam rib 40 is located in proximity to the rearward side edge 15 of the doorway or aperture 14 and is in the form of a bar with an inclined cam ramp 42 and a forward upstanding stop rib 44.

Mounted on the cylinder 18 near one end plate or head 20 is a stop latch, generally designated 46, which serves the function of holding the door 16 in its open position (FIGURE 7). The stop latch 46 consists of an inverted box-shaped housing 48 with a surrounding flange 50 welded or otherwise secured to the cylinder 18 (FIGURE 5). The housing 48 is drilled horizontally to receive

a pivot pin 52 upon the intermediate portion of which within the housing 48 is pivotally mounted the end portion 54 of a latch lever 56. The latch lever 56 has a V-shaped intermediate latch portion 60 projecting inwardly through a suitable slot (not shown) in the cylinder 18 into the path of the door 16, as described below, and has an upstanding inverted L-shaped handle. The latch portion 60 of the latch lever 56 is urged downwardly by a hairpin spring 64 of V-shaped form seated against the housing 48 and bearing against the upper edge 66 of the intermediate portion 60 of the latch lever 56.

The door 16 (FIGURES 1, 2 and 7) is of rectangular outline and arcuate cross-section slightly greater in length and width than the doorway or aperture 17 so that it overlaps the doorway 17 in its position underlying the latter (FIGURE 5). The door 16 consists of sections 68 and 70 pivoted to one another by a hinge 72 such as a piano hinge through which a pivot rod or hinge rod 74 passes. The rearward section 68 terminates at its rearward edge in a hollow cylindrical rearward edge portion 76 containing a rearward cross rod 78 (FIGURE 3), the opposite ends 80 of which project laterally beyond the side edges 82 of the door 16 and engage the upper surfaces of the guide rails 22 which, as previously stated, are welded to the heads or end discs 20 of the drum or container 12. The rearward portion 24 of each guide rail 22 closely approaches the cylinder 18 so as to form a pocket 84 adjacent the radial arm portion 34 slightly greater in width than the diameter of the rod end 80 (FIGURE 3). A hand hold or hand grip portion 86 is recessed into the rearward door section 68 below the level of the surrounding portion thereof.

The larger section 70 of the door 16 is provided with a cross rod 88 spaced a short distance away from the hinge rod 74 but disposed parallel therewith and welded or otherwise secured to the inner surface of the door section 70. Like the cross rod 78, the opposite ends 90 of the intermediate cross rod 88 project beyond the side edges 82 of the door 16 (FIGURE 4) and likewise engage the guide rails 22. The end portions 90 of the cross rod 86, however, are shorter than the rearward cross rod 80 so as to pass between the cam portions 29, shown in dotted lines in the upper right-hand corner of FIGURE 4, and rabbeted as at 92 to permit passage of the ends 90 past the cam portions 29. The guiding cam rails 22 are similarly rabbeted at 93 (FIGURE 2) for the same purpose.

Mounted on the inside of the cylinder 18 near the opposite ends 20 of the drum 12 (FIGURE 6) and secured thereto as by welding is a door lock bolt keeper 94 having an inclined bottom wall 96 spaced away from the cylinder 18 by parallel opposite side walls 98 and provided with an inwardly-extending oblique lock bolt deflector portion 100 directed toward the adjacent head 20. Received within the tapered pocket 102 is the correspondingly-tapered nose portion 104 of the lock bolt 106 of a door lock, generally designated 108. There are two of these door locks 108, one adjacent each of the side edges 82 arranged opposite one another. Each bolt 106 has a parallel-sided rearward portion 110 slidably mounted within a latch housing 112 which is secured to the underside of the door 16, as by welding, and at its inner end contains an apertured guide block 114 also welded or otherwise secured thereto. Slidably mounted in the guide block 114 is a latch-operating rod 116 surrounded by a coil spring 118 which normally urges the tapered top 104 of the latch bolt 106 into the pocket 102 of the keeper 94. The latch-operating rod 116 terminates in a cross bar handle 120. An opening 122 in the door 16 adjacent the handle 120 gives access to the handle 120.

The forward edge 124 of the forward section 70 of the door 16 comprises an almost right-angled bend within which is welded or otherwise secured a forward cross rod

125 with opposite ends 127 (FIGURE 2). The door 16 continues in an inwardly-inclined cam follower flange 126 (FIGURE 7), the inner edge 128 of which is doubled back on itself as at 130 and is adapted to engage and climb the ramp 42 of the cam rib 40 and to come to rest against the upstanding stop rib 44 thereof, as explained below in connection with the operation of the invention.

The modified laundry machine, generally designated 140, shown in FIGURE 8, is generally similar to the laundry machine 10 of FIGURES 1 to 7 inclusive, and similar parts accordingly bear the same reference numerals. In the laundry machine 140, however, the drum 142 has a doorway 143 closed by a sliding door 144. Also provided is a baffle, generally designated 146, which is divided into three pieces, two of which, generally designated 148, are short end pieces projecting only slightly into the interior of the drum 142 a sufficient distance to carry the cam blocks 150. Each cam block 150 resembles a short section of the cam rib 40 which terminates nearer the adjacent head 20 than the side edge 17 of the doorway 14. The gap between the end baffle parts 148 is spanned or filled in by an intermediate baffle part 152 having an upturned forward flange 154 on the forward edge of the inner wall 156 which is braced by an inclined rearward wall 158 which in turn terminates in a flange 160. The flanges 154 and 160 are welded or otherwise suitably secured to the inside of the door 144 and to the inwardly-inclined cam follower flange 126 respectively. The cam follower flange 126 as before has an inner edge 128 adapted to climb the ramp 162 and come to rest against the upstanding stop portions 164 of the cam blocks 150 corresponding to the ramp 42 and stop rib 44 of FIGURES 1 and 7, and serving similar functions.

In the operation of either the laundry machine 10 or the modified laundry machine 140, let it be assumed that the drum 12 has been rotated to place the door 16 at the top thereof and that the door 16 or 144 is in its closed position shown in FIGURES 1 and 8, respectively. To open the door 16 or 144, so as to insert or remove clothing or other articles to be washed through the doorway 14, the operator inserts his hands through the hand holes 122 (FIGURE 6) near the opposite edges 82 of the forward door section 70 and pulls the door lock handles 120 toward one another so as to withdraw the tapered nose portions 104 out of the pockets 102 of the lock keepers 94, at the same time pressing downward upon the handles 120 or adjacent portions of the door 16 with the palms of the hands to "break" the door 16 at its hinge 72 and push the door sections 68 and 70 and the hinge 72 downward toward the cam guide rails 22, as shown in dotted lines in FIGURES 1 and 7. The operator then inserts his fingers in the recessed hand holds 86 of the rearward door section 68 and pulls tangentially thereon in a clockwise direction (FIGURES 1 and 7). This action causes the flange edge 128 of the forward door flange 126 to descend the cam ramp 42 or 162 while at the same time the outwardly-projecting ends 127 of the forward cross rod 125 descend the ramps 31 of the cam portions 29 of the guide rails 22 and pass beneath the stop bar 35, which is sufficiently thin to permit this (FIGURE 1).

As the operator continues to pull to the right upon the door 16 by his fingers against the recessed hand holds 86, the door 16 slides to the right into the open position shown in FIGURE 7, with the outwardly-projecting ends 80, 90 and 127 of the cross rods 78, 88 and 125 respectively riding along the approximately concentric forward arcuate portions 26 of the cam guide rails 22. When the door 16 reaches its open position (FIGURE 7), the projecting ends 80 of the rearward cross rod 78 ride under the latch portions 60 of the latch levers 56, pushing these upward against the thrust of the hairpin springs 64 until the rod ends 80 encounter the upstanding stop portions 29 of the cam guide rails 22, whereupon the hairpin springs 64

5

force the latch portions 60 of the latch levers 56 downwardly behind the rearward rod ends 80, holding the door 16 in its open position (FIGURE 7).

To close the door 16 and hence close the doorway or aperture 14, the operator follows the reverse procedure by lifting upward upon the handle 62 of the latch lever 56 of the latch 46 while he reaches underneath with his fingers of his other hand and grasps the rearward edge portion 76 of the door 16 (FIGURE 7) and pulls it to the left. The door then follows the path along the tops of the guide rails 22, coming to rest in the dotted line position shown in FIGURE 1 with the intermediate cross rod 88 engaging the concave intermediate portions 32 of the cam guide rails 22. The door is now in its "broken" position at the hinge 72.

The operator now reaches through the doorway 14 into the hand holds 122 (FIGURE 6) and grasps the door lock handles 120 and pulls the door upward. By this action, the deflector portions 100 of the latch keepers 94 (FIGURE 6) perform a camming action to retract the nose portions 82 of the latch bolts 106 while compressing the springs 118. When the nose portions 104 of the bolts 106 reach the tops of the deflector portions 100, the tapered nose portions are pushed into the tapered keeper pockets 102 by the compression springs 118, and come to rest in their locking positions (FIGURE 6). The door 16 is now in its fully closed position with its intermediate cross rod ends 90 (FIGURE 4) resting against the inner surface of the cylinder 18 adjacent the doorway 14 as a stop.

For the sake of simplicity the door edge flange 126 is shown as made in one piece. In actual practice it is made in two overlapping pieces, one of which is slotted, and interconnected by bolts or other fasteners. This provides an accurate adjustment for the edge 128 relatively to the cam 40 or 150. It will also be evident that a similar adjustment is obtainable by raising or lowering the cam 40 or 150 relatively to the edge 128.

It will also be evident that the concave cam portions 32 of the guide rails 22 enable the door 16 to move inwardly away from the cylinder 18 during its opening motion. This prevents the jamming of the door in its guideways, as has occurred in prior doors by their becoming deformed after an extended period of operation by the effect of the weight and centrifugal force of the clothing being washed.

It will also be evident that the hinged door sections 68 and 70 possess a toggle action as the hinge 72 passes across a line joining their forward and rearward edges in moving between the guide rails 22 and cylinder 18 during opening and closing motion.

The drum 12 is ordinarily the perforated inner drum of the laundry machine, rotating within an outer solid drum, not shown, and omitted together with the perforations of the cylinder 18, to simplify the showing and avoid confusion as to the extent and boundaries of the doorway 14.

In the accompanying claims, the term "main cam portion" refers to the guide rail portions 28, 30 and 32, the term "auxiliary cam" refers to the cam 40 or 150, and the term "cam stop" refers to the cam portion 29.

What I claim is:

1. In a laundry machine a drum-supporting structure, a hollow drum structure rotatably mounted in said drum-supporting structure, said drum structure including a hollow generally cylindrical longitudinal wall having a doorway therein and a pair of transverse walls secured to said longitudinal wall in axially-spaced relationship defining with said transverse walls a generally cylindrical chamber, a pair of generally arcuate door guide members mounted within said chambers, said guide members being connected to the inner side of said drum structure adjacent and on opposite sides of said doorway in radially-spaced relationship with said longitudinal wall, a door structure of arcuate cross-section circumferentially

6

slidably mounted on said door guide members inside said chamber for travel therealong between doorway-closing and doorway-opening positions and cam means mounted within said drum structure for urging said door structure outwardly into closing relationship with said doorway upon arrival adjacent said doorway.

2. A laundry machine according to claim 1, wherein said cam means is constructed and arranged to be responsive to the travel of said door structure toward said doorway for urging said door structure outward into closing relationship with said doorway.

3. A laundry machine, according to claim 1, wherein a longitudinally-extending support is mounted within said cylinder in radially-spaced relationship thereto, and wherein said cam means is connected to said support.

4. A laundry machine, according to claim 1, wherein a longitudinally-extending clothing baffle is mounted within said cylinder and includes a plurality of sections, one of said sections carrying said cam means and another of said sections being secured to and traveling with said door structure.

5. A laundry machine, according to claim 2, wherein said urging means also includes main cam portions connected to said guide members and an auxiliary cam spaced away from said main cam portions and separately engaging and urging said door structure outwardly, wherein there is also provided a cam stop spaced apart from said auxiliary cam and cooperating therewith in forcing said door structure against said drum structure during closing travel of said door structure.

6. In a laundry machine a drum-supporting structure, a hollow drum structure rotatably mounted in said drum-supporting structure, said drum structure including a hollow generally-cylindrical longitudinal wall having a doorway therein and a pair of transverse walls secured to said longitudinal wall in axially-spaced relationship defining with said transverse walls a generally cylindrical chamber, a pair of generally arcuate door guide members mounted within said chamber, said guide members being connected to the inner side of said drum structure adjacent and on opposite sides of said doorway in radially-spaced relationship with said longitudinal wall, and a door structure of arcuate cross-section circumferentially slidably mounted on said door guide member inside said chamber for travel therealong between doorway-closing and doorway-opening position, said door structure being composed of a plurality of sections and a hinge pivotally interconnecting said sections, said door structure having circumferentially-spaced door-supporting portions at opposite edges thereof slidably engaging said guide members, said guide members adjacent said doorway having dipped portions which are dipped toward the center of said drum structure, said dipped portions enabling folding of said door sections at said hinge toward the center of said drum structure.

7. A laundry machine, according to claim 6, wherein said dipped portions effect movement of said hinge toward and away from said doorway across a line interconnecting the circumferentially-spaced opposite edges of said door structure whereby to provide a toggle action of the sections of said door structure relatively to said doorway and guide members.

8. A laundry machine, according to claim 6, wherein cam means is mounted within said drum structure for urging said door sections outward into closing relationship with said doorway in response to its arrival adjacent said doorway.

9. A laundry machine, according to claim 8, wherein said urging means also includes main cam portions connected to said guide members and an auxiliary cam spaced away from said main cam portions and separately engaging and urging said door structure outwardly, wherein a cam stop is spaced apart from said auxiliary cam means and cooperates therewith in forcing said door

structure against said drum structure during closing
travel of said door structure relatively to said doorway.

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