Dec. 11, 1962 F. W. GRANTHAM 3,067,986

LAUNDRY APPARATUS

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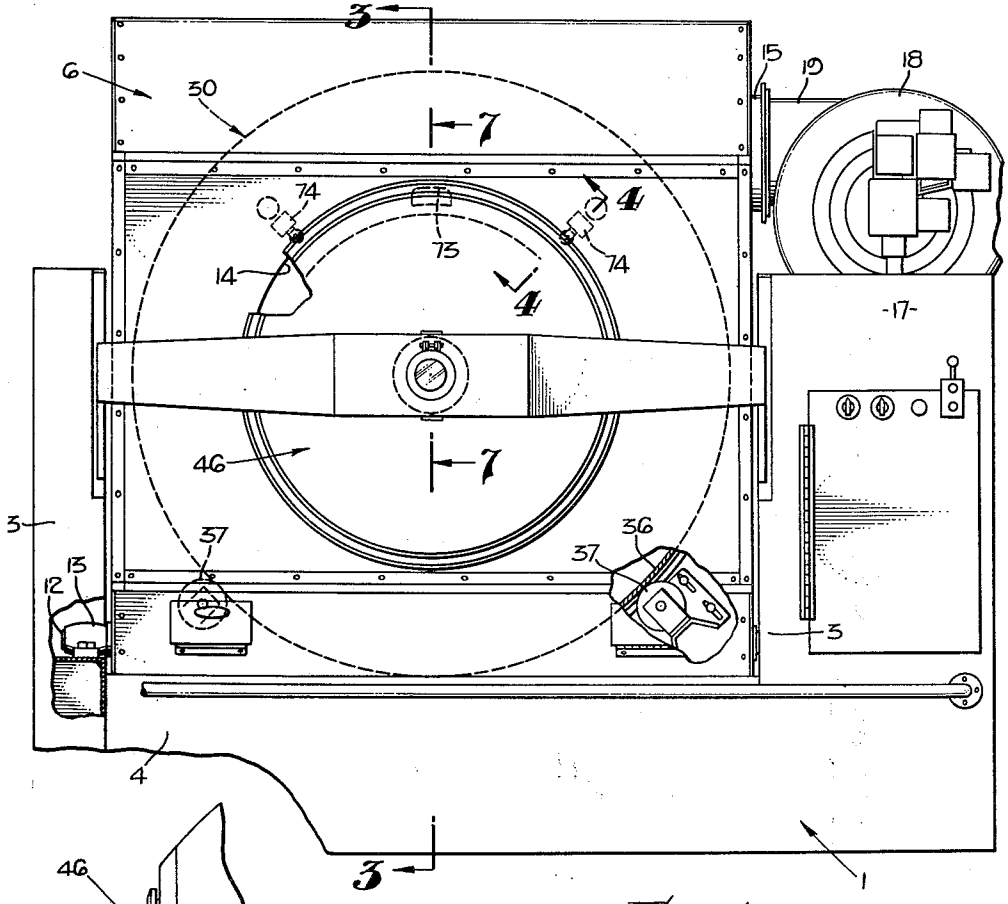


FIG. 1.

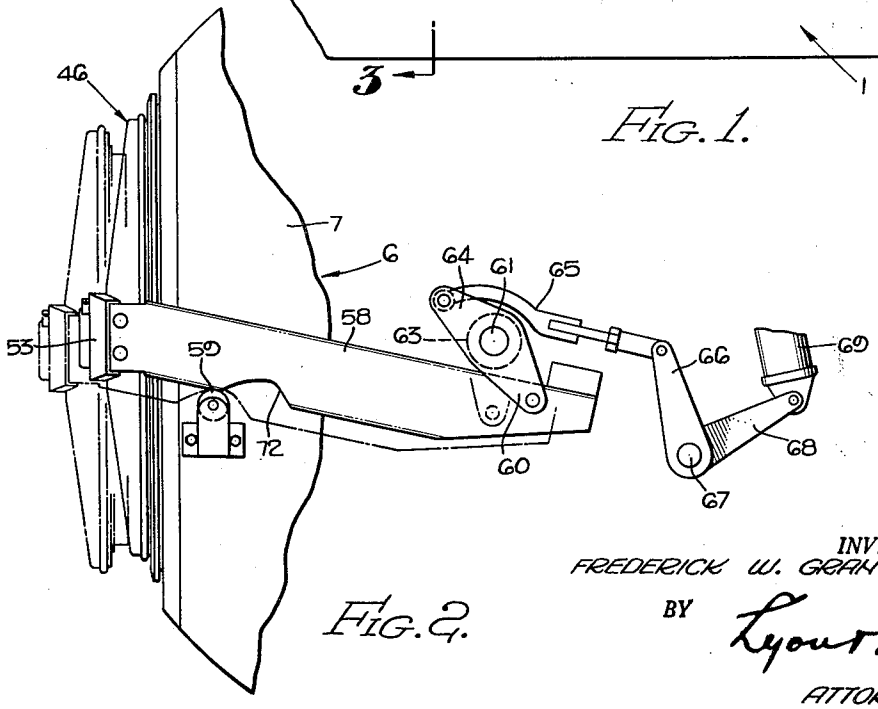


FIG. 2.

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LAUNDRY APPARATUS

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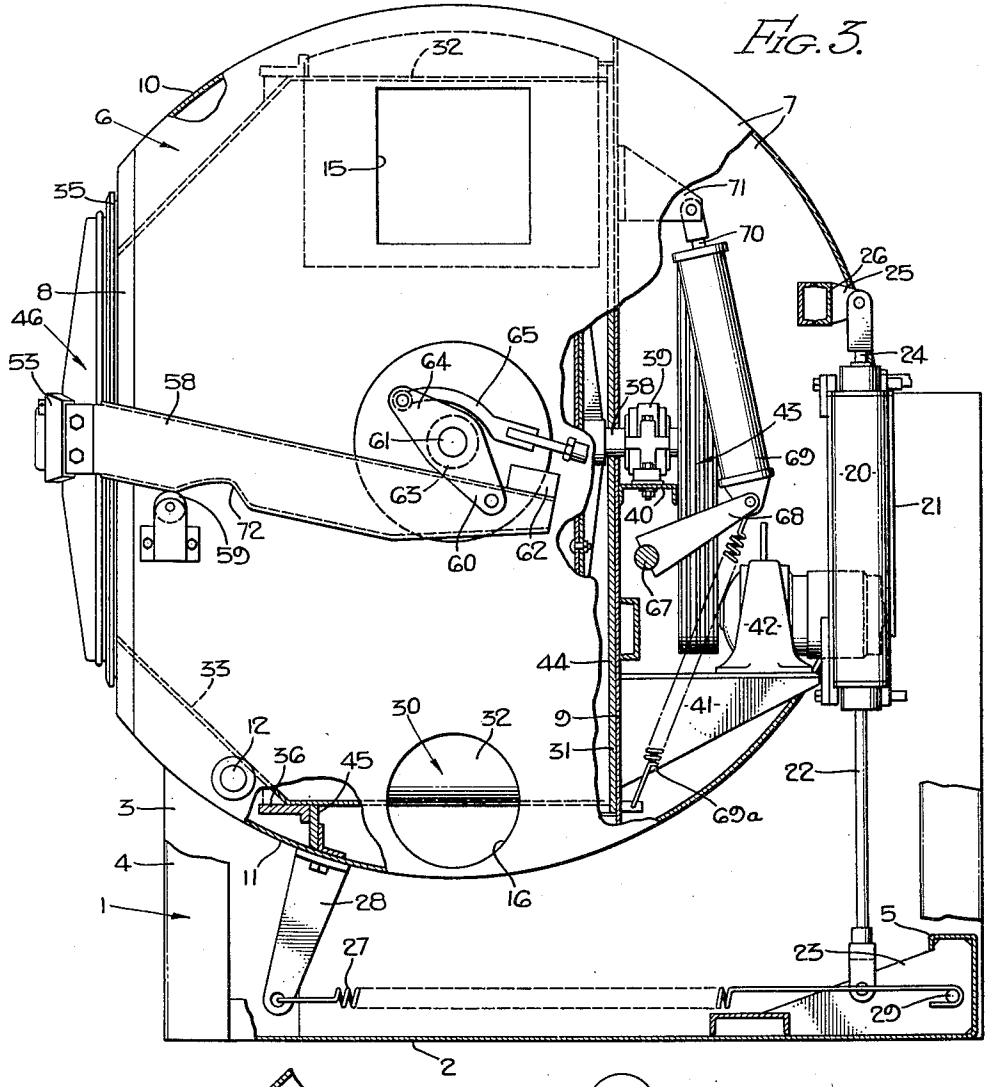
FIG. 3.



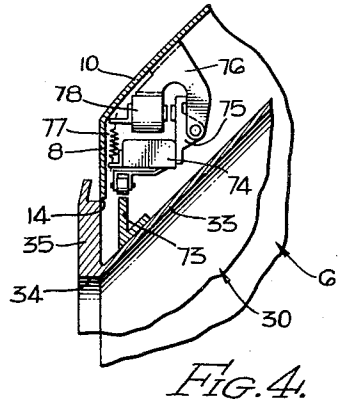




FIG. 4.

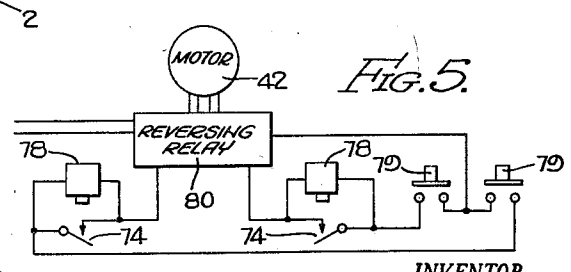



FIG. 5.

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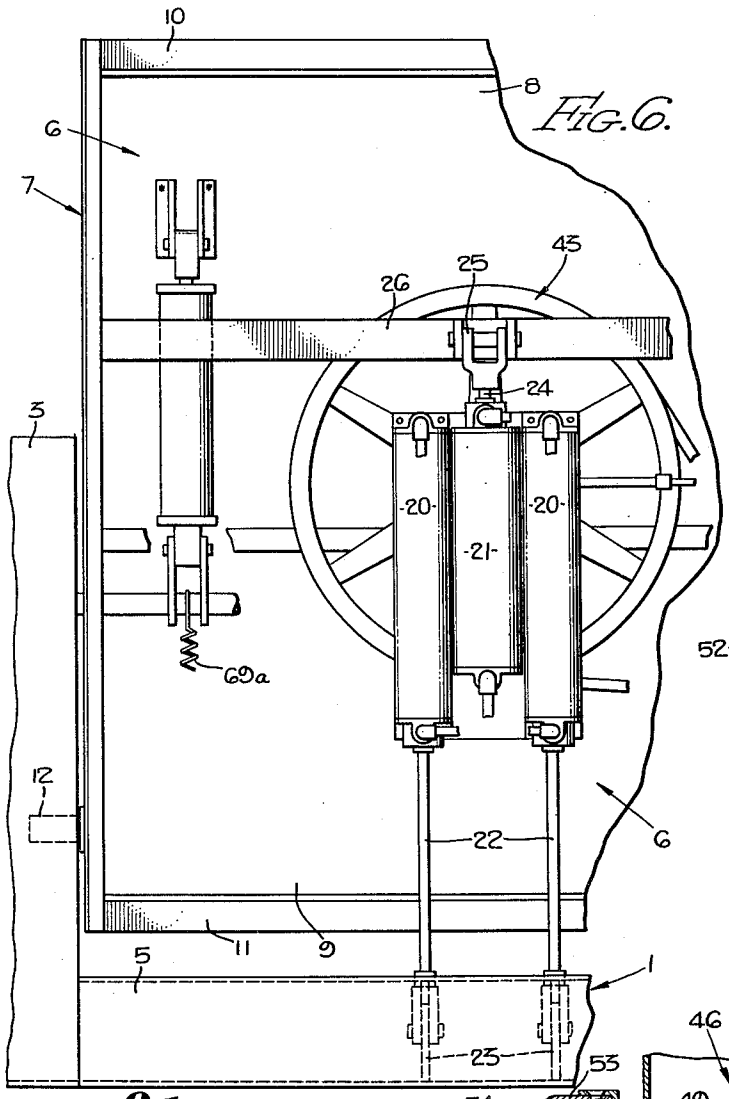


FIG. 6.

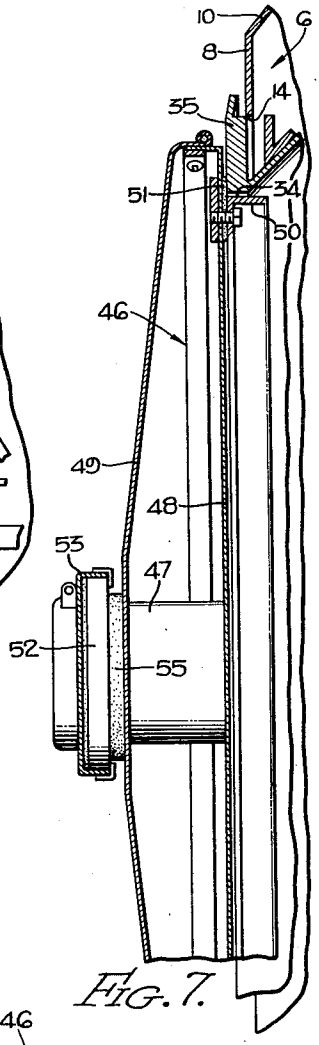


FIG. 7.

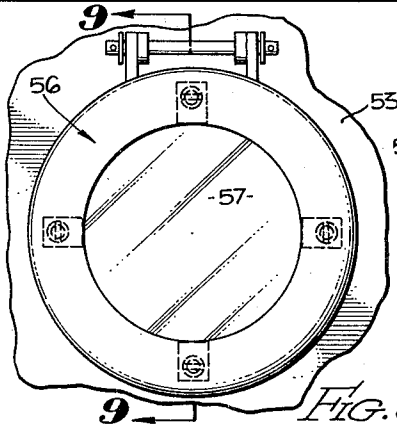


FIG. 8.

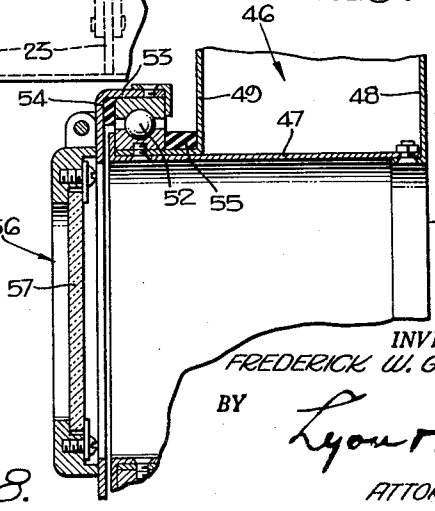


FIG. 9.

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FIG. 10.

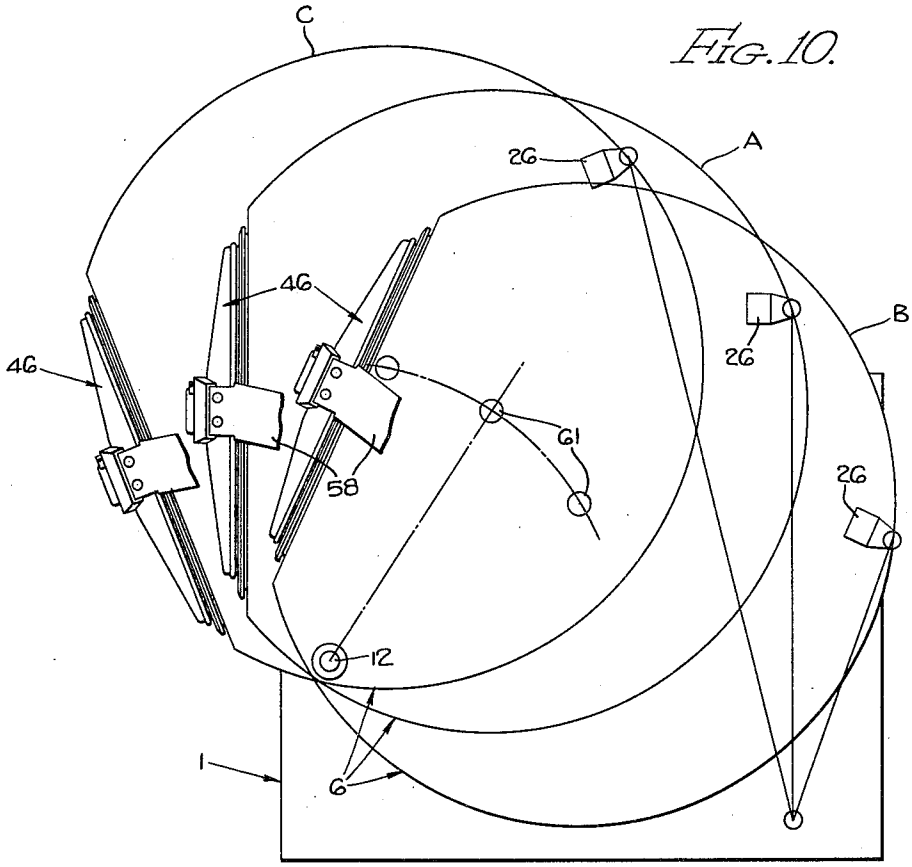
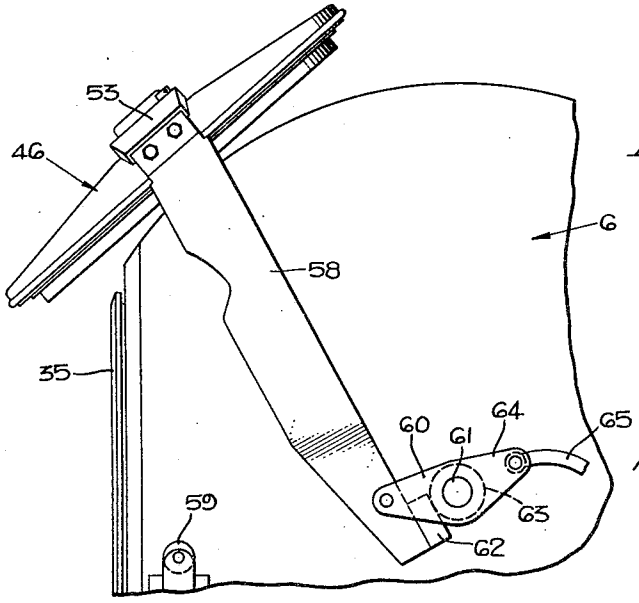



FIG. 11.

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LAUNDRY APPARATUS

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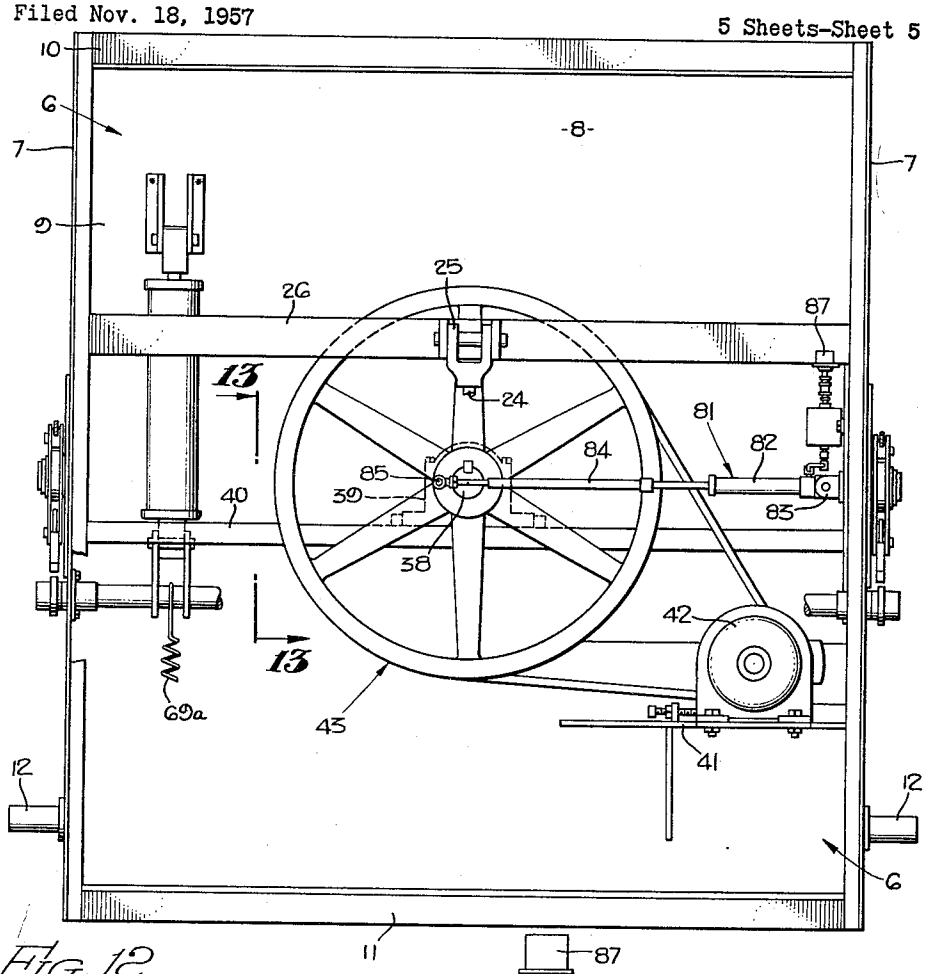


FIG. 12.

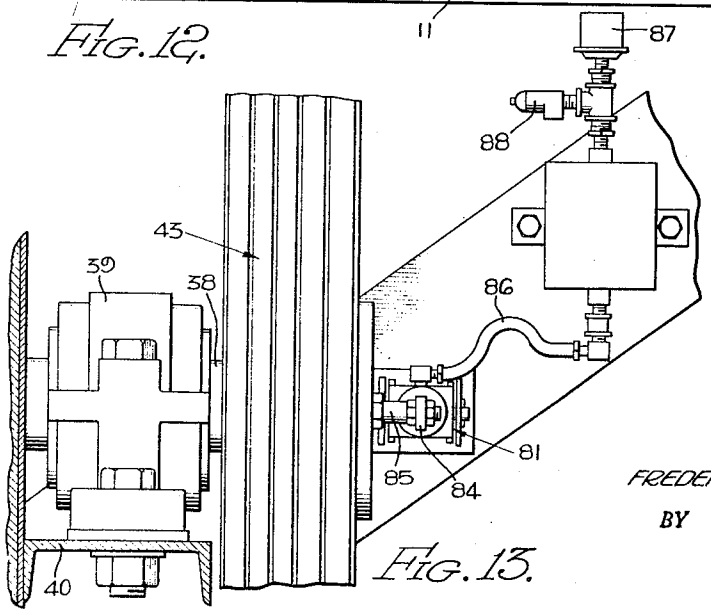


FIG. 13.

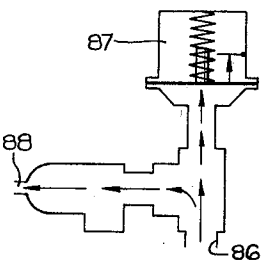


FIG. 14.

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United States Patent Office

3,067,986
Patented Dec. 11, 1962



# 3,067,986
# LAUNDRY APPARATUS

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Filed Nov. 18, 1957, Ser. No. 697,109
1 Claim. (Cl. 259—3)

This invention relates to laundry apparatus, more particularly to laundry driers of the tumbler type. Included in the objects of this invention are:

First to provide a laundry drier which incorporates a novel access door and operating mechanism, wherein the door occupies an open position closely overlying the laundry drier housing and moves essentially edgewise between its open and closed position so that the door does not at any time project materially into aisle space in front of the housing.

Second, to provide a laundry drier which includes an outer housing structure and an inner rotatable basket structure, the housing structure being so arranged that it pivots about an axis located below the axis of rotation of the basket and adjacent the forward or front side of the housing; the housing having an intermediate position in which the drying operation takes place, an upper, forwardly and downwardly tilted position for discharge of its contents, and a lower, rearward and upwardly tilted position for reception of clothes to be dried, the loading and unloading positions being so arranged that loads may be supplied to or removed from the drier in a minimum of time, either manually or by conveyors or other mechanical handling machines.

Third, to provide a laundry drier wherein the margins of the loading and unloading opening of the drier basket protrude beyond the housing so that danger of snagging or catching the clothes between the housing and the basket is eliminated, and wherein the door closing the basket opening rotates therewith so that all surfaces of the basket when closed rotate with the load.

Fourth, to provide a laundry machine of this class which, though particularly adapted for use as a laundry drier, may be adapted for use as a washing machine.

Fifth, to provide in a laundry drier a means whereby the contents may be inspected and hand sampled while the machine is in operation.

Sixth, to provide a laundry drier wherein the drier basket may be oscillated while the contents are being unloaded so as to separate the clothes and facilitate the unloading operation.

With the above and other objects in view, as may appear hereinafter, reference is directed to the accompanying drawings in which:

FIGURE 1 is a fragmentary front view of the laundry apparatus shown arranged as a drier;

FIG. 2 is an enlarged fragmentary view, showing particularly the door operating mechanism and indicating its initial movement by broken lines;

FIG. 3 is a partial sectional, partial side view of the apparatus taken substantially along the line 3—3 of FIG. 1;

FIG. 4 is a fragmentary sectional view through 4—4 of FIG. 1 showing one of the oscillating switches employed in the course of unloading the apparatus;

FIG. 5 is a fragmentary wiring diagram associated with the oscillating switches;

FIG. 6 is a fragmentary rear view of the apparatus;



FIG. 7 is an enlarged fragmentary sectional view taken through 7—7 of FIG. 1;

FIG. 8 is a further enlarged fragmentary elevational view of the door showing particularly the inspection window;

FIG. 9 is a fragmentary sectional view through 9—9 of FIG. 8 showing particularly the bearing mounting for the door;

FIG. 10 is a fragmentary, substantially diagrammatical view illustrating the three positions occupied by the laundry apparatus, namely, the loading, operating, and discharging positions thereof;

FIG. 11 is a fragmentary side view of the apparatus, showing the manner in which the door moves clear of the mouth of the basket structure for purposes of loading and unloading;

FIG. 12 is a rear view of the apparatus;

FIG. 13 is an enlarged fragmentary view taken through 13—13 of FIG. 12, showing particularly the safety device employed to shut off the apparatus in the event that the basket structure therein fails to rotate;

FIG. 14 is a diagrammatical view illustrating the mode of operation of the safety device.

The laundry apparatus includes a base frame 1 comprising a bottom 2, end wall structures 3, a front wall 4, and a back wall 5. The bottom is rectangular in plan, and the end walls project above the level of the front and back walls 4 and 5.

Mounted within the base frame 1 is a housing structure 6 which includes semicircular end plates 7, a flat front wall 8, a flat back wall 9, and semicylindrical top and bottom walls 10 and 11. The end plates 7 project rearwardly of the back wall 9 and form therewith a compartment for an operating mechanism to be described hereinafter.

The housing structure 6 is supported relative to the base frame 1 by a journal shaft 12 extending between bearings 13 supported in the end wall structure 3 of the base frame 1. The axis of the journal shaft 12 is located adjacent the bottom wall 11 of the housing structure 6 and as near the front wall 4 of the base frame 1 as possible. The front wall 8 is provided with a large aperture 14 which receives the mouth of a basket structure to be described hereinafter. One of the end plates 7 is provided with a hot air inlet 15 near the upper portion of the housing structure 6 and a hot air outlet 16 near the lower portion thereof.

Disposed outwardly of the corresponding end wall structure 3 of the base frame 1 is a cabinet 17 which houses the various controls for the apparatus as well as air ducts, not shown. Mounted on top of the cabinet 17 is a heater and blower unit 18 having a discharge duct 19 which is adapted to communicate with the hot air inlet 15 when the apparatus is in its operating position. The arrangement for the circulation of hot air into and out of the apparatus is more fully described in Patent 2,643,463, issued June 30, 1953.

The housing structure 6 is tilted about the axis of the journal shaft 12 by means of a pair of cylinders 20 and a single cylinder 21. The three cylinders are secured together with their axes parallel to form a single unit. The pair of cylinders 20 are directed downwardly and are provided with piston rods 22 which extend downwardly and are pivotally anchored to bracket plates 23 secured between the bottom and back walls of the base frame 1.

The cylinder 21 which is interposed between the pair of cylinders 20 extends upwardly and is provided with an upwardly directed piston rod 24 which is pivotally anchored to a bracket 25 secured to a cross bar 26 extending between the end plates 7 of the housing structure 6.

When the rods 22 associated with the cylinders 20 are extended and the rod 24 associated with the cylinder 21 is retracted, the housing structure 6 is in its intermediate or operating position indicated by A in FIG. 10. When the piston rods 22 are retracted, the housing structure 6 is tilted backwardly about the journal shaft 12 to its retracted or loading position B in which the front wall of the housing structure is tilted upwardly. When both the piston rods 22 and 24 are extended, the housing structure 6 is tilted forward to its unloading position C in which the front wall 8 is tilted downward. Suitable control means for the pistons, not shown, are housed in the cabinet 17.

By reason of the fact that the axis of the journal shaft 12 is offset from the center of gravity of the housing structure 6, it is preferred to provide springs 27 connected by arms 28 to the underside of the housing structure and connected by anchor pins 29 to the back wall 5 of the base frame 1. The springs 27 exert a torque in a counterclockwise direction as viewed in FIG. 3.

Mounted within the housing structure 6 is a basket structure 30 which includes a back wall 31, a cylindrical section 32 joined thereto, and a frusto-conical forward section 33 terminating in a mouth 34 which registers with the aperture 14. The mouth 34 is provided with an annular lip 35 which projects through and overlies the outer side of the margin of the aperture 14. The cylindrical section 32 is preferably perforated, whereas the frusto-conical section 33 is preferably without perforations. Suitable conventional agitator ribs, or the like, not shown, may be provided within the basket structure, as shown in the aforementioned Patent 2,643,463.

The basket structure 30 is supported in part by an annular track 36 located at the juncture of the cylindrical and conical portions 32 and 33 of the basket structure. The track 36 rotates on a pair of rollers 37 suitably supported from the bottom wall 11 of the housing structure 6. Support of the basket structure 30 is completed by a central shaft 38 extending rearwardly from the back wall 31 of the basket structure through the back wall 9 of the housing structure 6. The shaft 38 is supported by a bearing 39 mounted on a beam 40 extending across the rear side of the back wall 9.

Suitably supported from the back wall 9 and the rearwardly projecting portion of one of the end plates 7 is a shelf 41 on which is mounted a motor 42, preferably a gear motor. The motor is connected by a belt and pulley drive 43 to the shaft 38, a large pulley being mounted on the shaft 38 to further reduce the rotation speed of the shaft.

The back wall 9 of the housing structure 6 is preferably covered by a pad 44 of heat-insulating material. The cylindrical section 32 projects slightly beyond the back wall 31 and bears against the insulation pad 44, and ultimately wears a groove therein so as to minimize circulation of hot air between the back wall 31 of the basket structure 30 and the back wall 9 of the housing structure 6. A partition 45 of insulated material apertured to receive the cylindrical section 32 may be interposed between the forward extremity of the cylindrical section and the surrounding housing structure 6.

The mouth 34 of the basket structure 30 is closed by a door structure 46 which includes a tubular hub 47 which supports a rearward plate 48 and forward plate 49. Both plates are circular and are joined together at their peripheral margins. The rearward plate is provided with an annular guide flange 50 which is dimensioned to fit freely within the mouth 34. The rearward plate extends radially beyond the flange 50 to overlie the annular lip 35. A gasket 51 of heat-insulating material is clamped between the flange 50 and rearward plate 48 so as to seal against the annular lip 35.

The hub 47 projects forwardly of the forward plate 49 and carries a bearing 52, preferably a ball bearing. The bearing 52 is adapted to be mounted at the central portion of a cross bar 53. Yieldable positioning rings 54 and 55 are interposed between the bearing 52, and cross bar 53, and the forward plate 49, respectively, so that the door structure 46 is capable of tilting slightly relative to the cross bar 53. The cross bar 53 is provided with an aperture which aligns with the opening through the tubular hub 47, and is normally covered by a hinged inspection window 56 having a transparent panel 57. The tubular hub 47 is of sufficient diameter to permit insertion of one's hand so that a touch test of the contents of the basket may be made.

The cross bar 53 is joined at its extremities to side arms 58 which form with the cross bar 53 a U-shaped yoke. The side arms 58 extend along the end plates 7 of the housing structure 6. The side arms 58 are supported, when the door structure 46 is approximately aligned with the mouth 34, on a pair of rollers 59 carried by each end plate 7 adjacent the front wall 8. The side arms 58 extend backwardly therefrom and are pivotally connected near their extremities to lever arms 60 which are mounted on stub shafts 61 extending outwardly from the end plates 7. The stub shafts 61 preferably coincide with the transverse axis of the housing structure 6.

Rearwardly of the pivotal connections between the side arms 58 and lever arms 60 the side arms 58 are provided with the abutment pads 62 at their upper sides. The relationship of the lever arms 60 to the side arms 58 and abutment pads 62 is such that when the lever arms 60 are rotated clockwise from the solid line position in FIG. 2 the yoke moves the door structure 46 substantially axially away from the mouth 34 until the guide flange 50 clears the mouth 34 and annular lip 35. Continued rotation of the lever arms 60 causes the abutment pads 62 to engage under hubs 63 which mount the lever arms 60 on the shafts 61, so that the yoke and door structure 46 pivots about the axis of the stub shafts 61 as shown in FIG. 11. The door structure 46 thus moves substantially edgewise along a path closely adjacent the housing structure 6 to a position overlying the top wall 10.

Rotation of the lever arms 60 is accomplished by means of arms 64 integral with the lever arms 60 to which are attached rearwardly extending adjustable links 65 that are in turn connected to lever arms 66 secured to a cross shaft 67 extending between the end plates 7 rearwardly of the back wall 9 of the housing structure 6. Also secured to the cross shaft 67 is a pair of drive arms 68 which are pivotally connected to one end of a cylinder 69. A spring 69*a* may extend between the extremities of the arms 68 and the bottom of the rear wall 9 to partially counterbalance the door structure 46. A piston rod 70 extends from the other end of the cylinder 69 and is pivotally connected to a bracket 71 secured to the back wall 9 of the housing structure 6.

Extension of the piston rod 70 causes the door structure 46 to move from its closed position shown by solid lines in FIG. 2 through the intermediate broken line position shown in FIG. 2 to a final position beyond the solid line position shown in FIG. 11. In order to closely approximate a straight line or auxiliary movement during its final closing movement or its initial opening movement, the under sides of the side arms 58 may be provided with cam recesses 72 cooperating with the rollers 59.

It is desirable when unloading the basket structure 30 to rock or oscillate it. This may be accomplished by means shown particularly in FIG. 4 and 5 and indicated by dotted lines in FIG. 1.

Suitably mounted on the conical portion of the housing structure 6, near the front wall 8 of the housing structure, is a trip lug 73. Suitably supported within the

housing structure 6, at a desirable arcuate distance either side of a central axis, is a pair of switches 74. These switches are preferably mounted on lever arms 75 supported by brackets 76 secured to the top wall 10 of the housing. A spring 77 normally holds each switch 74 clear of engagement by the trip lug 73. However, each bracket 76 supports a solenoid 78 so arranged as to tilt the corresponding lever arm 75 and move the corresponding switch 74 into position for engagement by the trip lug 73. The switches 74 are normally closed and each trip lug 73 is in series with a corresponding manual push button switch 79. The solenoids 78 are parallel connected with the switches 74.

The switches 74 are electrically connected with a reversing relay 80 which controls the motor 42. When one of the push button switches 79 is closed, the basket structure 30 rotates until the trip lug 73 opens the corresponding switch 74. When the other push button switch 79 is closed, the basket structure 30 rotates in the opposite direction until the other switch 74 is open. By pressing alternately on the push buttons 79 the operator may oscillate the basket structure.

It is essential that the circulation of hot air within the housing structure 6 and through the basket structure 30 be turned off in the event that the basket should cease to rotate for any reason or rotate below a preset speed. The means for accomplishing this result in FIGS. 12, 13, and 14 is a small air pump 81 which includes a cylinder 82 pivotally supported by a bracket 83 to the rearwardly extending portion of one of the end plates 7. The pump 81 also includes a connecting rod 84 which is journalled on a crank pin 85 mounted at the end of the shaft 38; for example, on the hub portion of the large pulley wheel which forms a part of the belt and pulley drive 43.

The pump 81 supplies air to air line 86 and accumulates pressure therein which holds a pressure switch 87 closed as long as the air pressure is above a preset minimum. The air pressure may be controlled by a suitable bleed valve 88 having a port dimensioned to permit escape of a portion of the air during rotation of the basket structure 30. Should the rotation fall below a predetermined minimum or cease, then the bleed valve 88 relieves the pressure in the air line 86 and permits the pressure switch 87 to open. The pressure switch 87 is suitably connected by a conventional electric circuit to the blower or to the burner associated therewith.

Operation of the laundry apparatus is as follows:

The construction as shown is intended primarily as a drier, although features of the apparatus are adaptable to washing machines.

When the housing structure 6 is in its normal or position A, shown in FIG. 10 and also shown in FIGS. 1 and 3, the air inlet and outlet apertures 15 and 16 are in registry with the appropriate ducts of the air supply system, which not only includes blowers for the purpose of circulation but also a suitable heating means such as a gas-operated burner. For the purposes of this invention, the air supply means may be considered as conventional, and as indicated previously may be of the type represented in Patent No. 2,643,463. When the housing 6 is in its intermediate or operating position A, the basket structure 30 is located so that hot air passing through the housing structure 6 may circulate through the basket structure to dry the contents.

In order to load the basket structure 30, the housing structure 6 is tilted to the position B shown in FIG. 10 by operation of the cylinders 20. In this position the mouth 34 is tilted upward. For purposes of loading, the door structure 46 is moved edgewise clear of the mouth 34 beyond the position shown in FIG. 11. By reason of the fact that the mouth 34 is directed upwardly, the load intended for the basket structure 30 may be readily fed by gravity from an overhead conveyor system, not shown, or may be manually fed from the front side of the housing. It will be noted that the axis of the journal shaft 12 is close to the lower extremity of the mouth 34 so that the elevation of the mouth does not change substantially as the housing structure 6 is tilted. Thus the mouth 34, when in its load-receiving position, is not appreciably elevated and therefore minimizes the height to which the load must be raised for entry into the basket structure 30.

After the basket structure 30 has been loaded with clothes, or other articles to be dried, the housing structure 6 is tilted to its intermediate or operating position A by extension of the piston rods 22. The basket structure is then rotated by operation of the motor 42. On completion of the drying cycle, the cylinder 21 and piston rod 24 are operated to tilt the housing structure forwardly to the unloading position C shown in FIG. 10. First, however, the door structure 46 is moved clear of the mouth 34. It will be noted that the door structure first moves axially until free of the mouth 34, and then moves edgewise in a path close to the surface of the housing structure 6 to an out-of-the-way position at the top thereof, so that the door in its open position does not obstruct the aisle in front of the apparatus and in no manner interferes with either the loading or unloading operation.

The unloading operation may take place while the housing structure 6 is moving from the position A to the position C. During this movement the lower margin of the mouth 34 is displaced only a slight distance due to the location of the journal shaft 12, so that it is not necessary to move the receptacle for the contents of the basket structure 30 while the housing structure is being tilted. Also it will be noted that the low position of the mouth 34 may be maintained sufficiently above floor level so that the contents of the basket may be discharged by gravity into a receptacle or carrier.

During the unloading operation, the basket structure 30 may be rotated to facilitate removal of the clothes or other contents. However, it is preferred to oscillate the basket structure only as needed to facilitate outflow of the clothes. This is accomplished by manually closing first one and then the other of the push button switches 79, or by use of a conventional timing switch to accomplish the same operation automatically. After the contents have been unloaded, the housing structure 6 is tilted to its opposite extreme position B for reception of another load, and the cycle is then repeated.

It will be observed that the inlet 15 and outlet 16 are in registry with the hot air supply system only when the housing structure 6 is in its intermediate or operating position A. Conventional manual or automatic controls are provided, such as shown in the aforementioned Patent 2,643,463, shutting off the source of heat and the blowers when the housing structure 6 is in its loading or unloading position; therefore, the fact that the inlet and outlet are out of registry with the supply system at these times is immaterial.

While a particular embodiment of this invention has been shown and described, it is not intended to limit the same to the exact details of the construction set forth, and it embraces such changes, modifications, and equivalents of the parts and their formation and arrangement as come within the purview of the appended claim.

What is claimed is:

A laundry apparatus, comprising: a basket structure having an axis of rotation and a loading and unloading mouth coaxial therewith; a housing structure enclosing and rotatably supporting said basket structure, said housing structure including end walls and having a front wall apertured to expose said mouth; a yoke frame including arms pivotally connected to the end walls of said housing and a cross bar extending across said front wall; means incorporated in the connection between said yoke frame and housing structure to effect limited movement of said cross bar substantially along the axis of rotation of said basket structure; a tubular hub carried rotatably by said cross bar; a door mounted on said hub, said door being movable by said yoke frame axially to and from sealing

engagement with said mouth and laterally to and from a position laterally clear of said mouth; said tubular hub forming a hand hole available during rotation of said basket structure for hand sampling of the contents thereof.

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