

Jan. 12, 1971

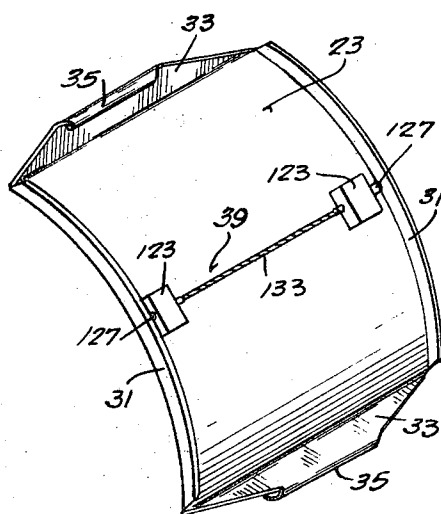
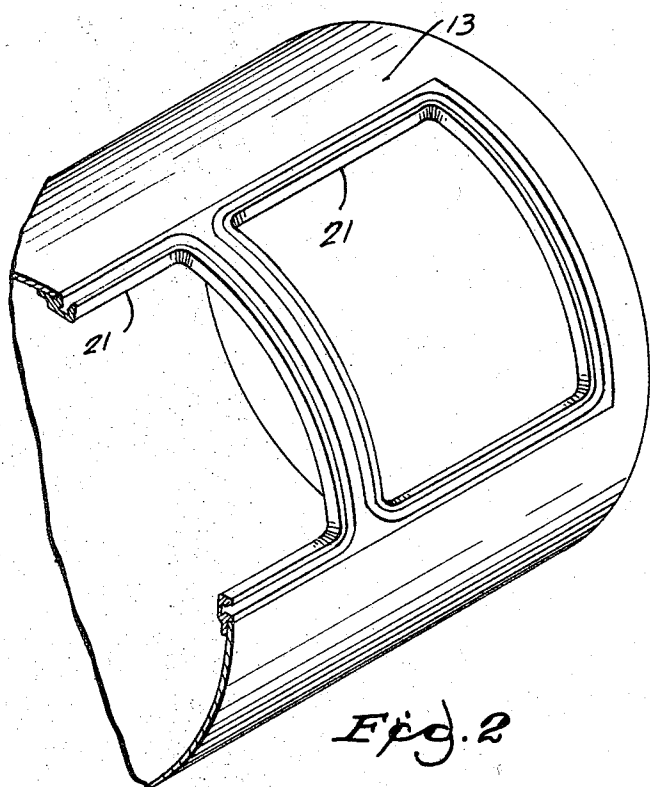
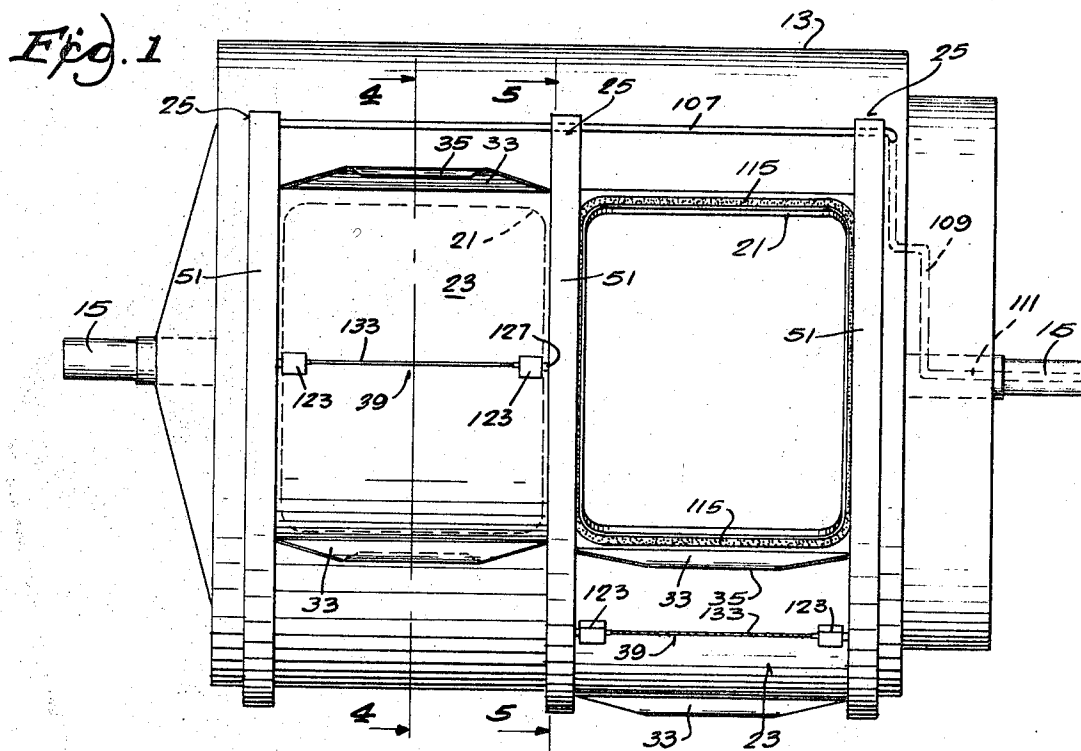
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3,553,982

WASHING MACHINE

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5 Sheets-Sheet 1



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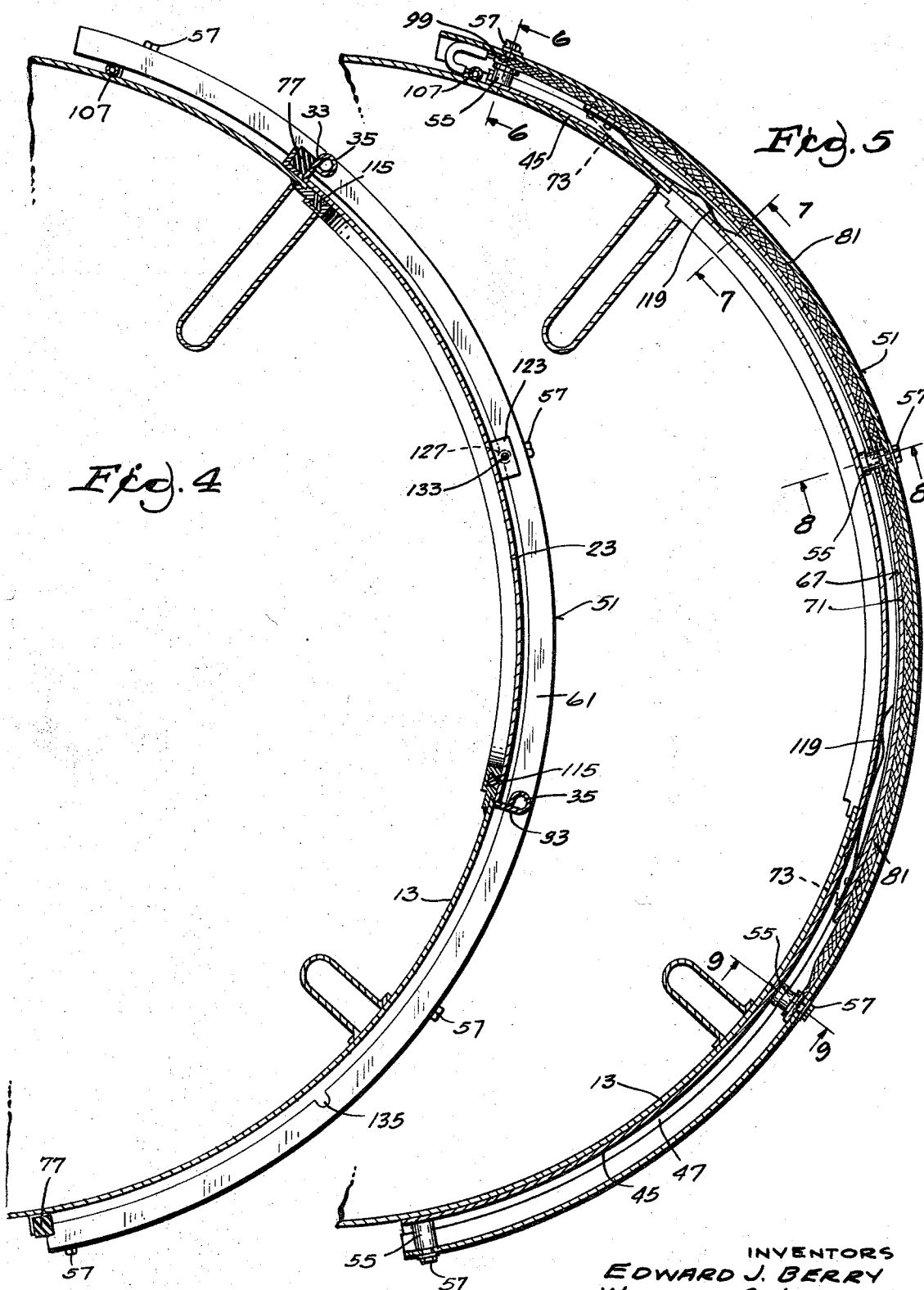
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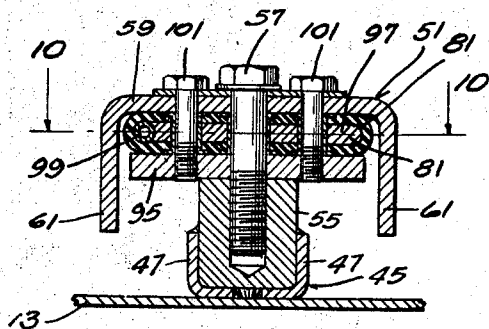


Fig. 6

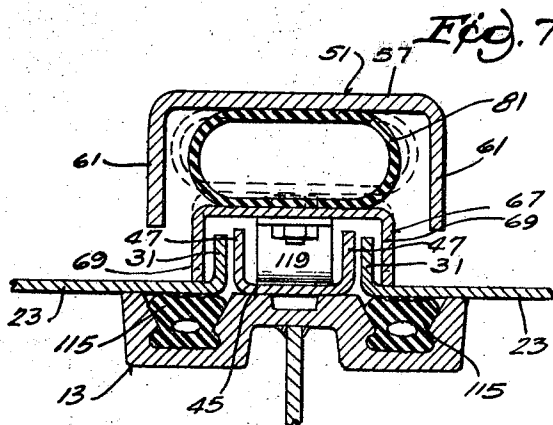
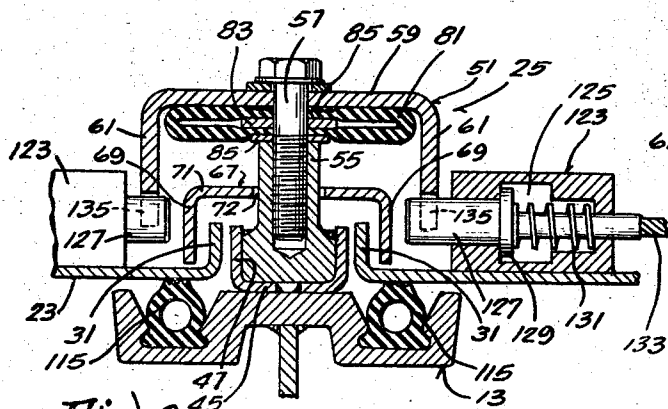


Fig. 7



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3,553,982

WASHING MACHINE

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11 Claims

ABSTRACT OF THE DISCLOSURE

Disclosed herein is a washing machine comprising a cylindrical shell having an arcuate surface with an access opening therein, together with means on the shell for guiding door movement to and from a position in covering relation to said opening and for releasably sealing the door with the shell when the door is in the covering position. The releasable sealing means includes expansible means for urging the door into sealing engagement with the shell and a sealing member on one of the door and the shell and extends at least partially peripherally around the access opening for fluid tight engagement between the shell and the door in response to expansion of the expansible means consequent to receipt therein of a pressure fluid.

BACKGROUND OF THE INVENTION

The invention relates generally to washing machines and to door constructions. More particularly, the invention relates to door constructions for washing machines having rotary cylindrical shells.

Washing machines having rotary cylindrical shells which receive fabrics to be washed have long been known. One requirement of such machines is that the doors which afford access to the interior of the shell for purposes of loading and unloading should be capable of ease of opening and closing and of providing a fluid tight seal even under conditions of relatively elevated temperatures and over an extended repetitive cycle of rotary operations.

SUMMARY OF THE INVENTION

One of the objects of the invention is the provision of a door construction for a rotatable cylindrical shell-type of washer, which door construction includes a fluid operated means for effecting a reliable, fluid tight seal between the shell and the door when the door is in covering relation to an access opening in the shell.

A further object of the invention is the provision of a door which travels on an arcuate path in close proximity of the outer surface of a washing machine shell during movement from and to a door position in covering relation to an access opening.

Still further, another object of the invention is the provision, in a cylindrical shell type of washer, of a door travel guiding structure which additionally serves as part of a fluid operated system for releasably sealing the door to the shell when the door is in covering relation to the access opening.

Still another object of the invention is the provision of a fluid operated door sealing arrangement which is reliably effective notwithstanding rotation or other movement of the body upon which the door is mounted.

A still further object of the invention is the provision of an improved door structure for a rotary, cylindrical type of washer which is economical and easy to manufacture and which will provide a long and useful life.

Other objects and advantages of the invention will become known by reference to the following description and the accompanying drawings in which:

FIG. 1 is a perspective view of one embodiment of a

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shell-type washer with two access openings, with associated doors, one door being in closed position and the other door being in open position.

FIG. 2 is a fragmentary perspective view of a portion of the shell showing the openings.

FIG. 3 is a perspective view of one of the doors for the washer shown in FIG. 1.

FIG. 4 is an enlarged sectional view taken along line 4—4 of FIG. 1 with the door in covering relation to the access opening.

FIG. 5 is an enlarged cylindrical view taken along line 5—5 of FIG. 1.

FIG. 6 is an enlarged sectional view taken along line 6—6 of FIG. 5.

FIG. 7 is an enlarged sectional view taken along line 7—7 of FIG. 5.

FIG. 8 is an enlarged sectional view taken along line 8—8 of FIG. 5.

FIG. 9 is an enlarged sectional view taken along line 9—9 of FIG. 5.

FIG. 10 is an enlarged, partially broken away and sectional view taken along line 10—10 of FIG. 6 and showing the arrangement for supplying the door construction with pressure air.

Shown in FIG. 1 is a washing machine comprising a washing chamber which, in the illustrated construction, is in the form of a cylindrical shell 13 having an oppositely extending pair of trunnions 15 which can be suitably mounted in any convenient arrangement so as to provide for rotation of the shell upon its lengthwise axis. Arrangements for mounting such shells 13 are well-known and need not be further disclosed herein.

The shell 13 includes two adjacently located access openings 21, each access opening being generally of identical construction and being provided with a door or cover 23 movable relative to a position in covering relation to the associated access opening.

In accordance with the invention, each door 23 is provided with (see FIG. 1) means 25 for guiding door movement to and from covering position with respect to the associated access opening 21 and for releasably sealing the door 23 with the shell 13 when the door is in covering relation to the associated access opening.

Each door 23 comprises an arcuate segment of a cylinder having a first pair of radially outwardly extending flanges 31 extending from the side edges of the door and a second pair of radially outwardly extending flanges 33 extending from the end edges of the door. The end flanges 33 each include a lip 35 which enables easy gripping of the door and displacement of the door relative to its closing position. Carried on the door (see FIGS. 1 and 3) are components of a door locking means 39 which will be described in greater detail.

The invention contemplates door movement relative to an access-opening-closing position in directions either axially of the shell or circumferentially of the shell. In the particular disclosed construction, the doors 23 are carried for circumferential movement by the before mentioned guiding and sealing means. While various arrangements can be employed in the disclosed construction, the combined sealing and guiding means includes along each of the side edges of each access opening 21, and as shown in FIGS. 6 through 10, a circumferentially extending outwardly open guide channel or member 45 having opposed flanges or legs 47. The adjacent flanges 47 of the guide channels on each side of any particular access opening 21 are spaced at an axial distance greater than the axial distance between the door side flanges 31 so as to permit location of the door 23 between the spaced guide channels 45 associated with such access opening. Each guide channel 45 extends (see FIG. 5) beyond the circumferential ends of the associated access opening 21 and

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beyond one of the circumferential ends of the associated access opening for a sufficient distance so as to provide guidance for movement of the associated door 23 to an open or storage position clear of the access opening.

The combined guiding and sealing means also includes, for each door 23, a pair of retainer elements, members, or channels 51 which extend circumferentially of the shell 13 beyond the circumferential end of the associated access opening 21 and beyond one circumferential end of the associated access opening for a sufficient distance so as to provide guidance for associated door movement to an open or storage position clear of the access opening and for approximately the same distance as the guide channels 45.

The retainer elements 51 are fixed to the shell 13 by a series of spaced supports 55 and associated studs 57 and are generally shaped with a web 59 and with opposed legs or flange 61 extending radially inwardly toward the shell 13 from the web 59. The adjacent legs 61 of each associated pair of axially spaced retaining elements 51 are located at an axial distance between the side flanges 31 of the door 23 so that the door side flanges 31 extend radially outwardly at positions axially outwardly of the spaced legs 61. This inter-leaved relation assists in retaining the door 23 in assembled relation to the shell 13 while also affording the desired door movement.

Also forming a part of the guiding and sealing means on each side of each access opening 21 is (see FIGS. 7 and 8) an intermediate member or channel 67 which has legs or flanges 69 extending radially inwardly and which has a web 71 apertured at 72 (see FIG. 8) as necessary to permit passage of the supports 55 to which the associated retainer channel or element 51 is secured. The intermediate channel 67 extends circumferentially from just beyond each of the circumferential ends of the access opening 21 for a short distance. At the ends adjacent to the storage position, the flanges 69 of the intermediate channels are gradually reduced in height as shown at 73 in FIG. 5 so as to facilitate entrance of the door 23 between the shell 13 and the radial inner edges of the intermediate flanges 69 consequent to movement of the door 23 from the storage position to the covering position.

In this latter regard, the adjacent flanges 69 of the intermediate channels 67 on opposite sides of any particular access opening 21 are axially spaced at a distance less than the axial distance of the door side flanges 31 but at a distance greater than the axial spacing of the adjacent flanges or legs 61 of the axially spaced retainer channels or elements 51. Thus, the door side flanges 31 are inter-leaved with the flanges 69 of the intermediate channels 67. As a consequence, the door side flanges 31 are guided during door movement proximate to the covering position between the inner guide channel or member 45 and the intermediate channel or member 67 and when the door 23 is proximate to the closed position the door side flanges 31 are guided between the inner guide channel or member 45 and the retainer channel or element 51.

It is to be noted that the apertures 72 in the web 71 of the intermediate channel 67 are of such size so as to permit movement of the intermediate channel 67 radially relative to the shell 13 and between the shell 13 and the retainer channel or element 51. Adjacent to each of the ends of the guiding and sealing means 24 are (see FIG. 4) transverse bumpers 77 of rubber or other like material to limit possible travel of the door 23 and to assist in locating the door 23 for locking action of the door locking means 39. The guiding and sealing means further includes, for purposes of sealing, an expansible means located between the intermediate channel 67 and the retainer channel or element 51, together with conduit means connecting the expansible means with a suitable source of pressure fluid, such as air.

While various arrangements can be employed in the disclosed construction, the expansible means comprises,

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along each axially spaced side of each access opening 21, a length of flexible or collapsible hose 81, as for instance fire hose, which is located between the movable intermediate channel 67 and the fixed retainer channel or element 51. In the areas adjacent to the supports 55 to which the retainer channel or element 51 is secured, the hose 81 is apertured (See FIG. 8) to permit passage of the studs 57. In addition, each stud which passes through the hose, at positions intermediate the hose ends, also passes through an inner spacer 83 located within the hose 81 to prevent total collapse and assure fluid passage past the stud 57 and through a pair of washers 85 respectively engaged with the outer surfaces of the hose 81 to prevent fluid escape as a consequence of the projection of the stud through the hose.

Each hose 81 extends from shortly beyond each of the circumferential ends of the associated access opening 21 and is suitably closed or sealed at each end. In this regard, as shown in FIG. 9, at one end, a clamping member 91 is secured in opposed relation to the web 59 of the retainer channel or element 51 by a pair of screws 93 which pass through the hose 81 and which clamp together opposing surfaces of the hose 81 so as to prevent fluid escape. At the other end of the hose, as shown in FIG. 6, a similar clamping member 95 is employed and there is provided, within the hose 81, a spacer 97 which includes a nipple 99 still to be described. The clamping member 95 is secured to the web 59 with the spacer 97 and hose 81 therebetween so as to obtain a fluid-tight closure by a pair of screws 101.

The conduit means can take various forms and includes, for each hose, the just mentioned nipple 99 which is connected to one end of the hose 81 (see FIGS. 1 and 10) and to a header 107 which runs axially along the outer surface of the shell 13 to provide a common immediate source of pressure fluid for all of the hoses 81. In turn, the header 107 is connected (see FIG. 1) to a radial conduit 109 which terminates in an axial bore 111 in one of the trunnions. Exteriorly of the rotatable support for the washer 11, the bore 111 includes a portion communicating with a conduit system (not shown) connected to an air compressor or other suitable source of pressure fluid. Valve means (not shown) are provided at any suitable location in the conduit means so as to control the flow of pressure fluid to the hoses 81 and to afford bleeding of the pressure fluid from the hoses 81, as desired.

In order to assure against leakage when the door 23 is in covering position against the shell 13, either the door 23 and/or the shell 13 is provided with a sealing member or gaskets 115 which extends peripherally around the access openings 21 and which normally project slightly from the retaining surface.

In the disclosed construction, each gasket or sealing member 115 is located in the shell 13 and extends entirely peripherally around the associated access opening 21. The gasket 115 could extend partially in the shell 13 and partially in the door 23. It is believed that at least some of the advantages of the invention can be obtained without the use of the gasket.

As is evident from the foregoing description, entry into the hoses 81 of pressure fluid results in expansion of the hoses 81 (see FIG. 7) with resultant intermediate channel movement away from the retainer channel or element 51 and toward shell 13, thus causing engagement of the inner ends of the intermediate channel flanges 69 with the associated door 23 and thereby causing the door 23 to be urged against the shell 13 and to sealingly engage the gasket or sealing member 115 between the door 23 and the shell 13 and thereby prevent leakage or loss of fluid. Upon release of the pressure in the hoses 81 (as shown in FIG. 8) intermediate channel 67 and the doors 23 are free to move radially outwardly from the shell 13 and the door 23 is then free to travel along the guide means to the open position.

Preferably, there is also included means for normally

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biasing the intermediate channel 67 toward the retainer channel or element 51 which means is overpowered consequent to introduction of pressure fluid into the hoses 81. While various arrangements can be employed, the disclosed construction includes (see FIGS. 5 and 7) one or more leaf springs 119 acting between the guide channels 45 and the intermediate channels 67 to urge the intermediate channels 67 toward the retainer channel or element 51. Upon such radial outward movement of the intermediate channel 67, the door 23 is free to move radially outwardly of the shell 13 and to then move circumferentially of the shell to the open position.

The before mentioned locking means 39 cooperates with the door guiding and sealing means 25 and includes, on each door 23, a pair of axially spaced and aligned support blocks 123 adjacent to the door side flanges 31. Extending axially outwardly from cavities 125 within the support blocks 123 are respective dowels or pins 127 each having a head 129 which engages one ends of a biasing spring 131. The other end of each spring 131 is engaged with an inner wall of the associated support block 123 so as to urge the associated pin 127 axially outwardly. The oppositely extending pins 127 of each door 23 are connected to a common cable 133 so that, upon pulling of the cable away from the door, both pins 127 are retracted from their outwardly extending positions.

The pins are of such length so that, when fully extended, the pins are enterable into appropriate notches 135 (see FIGS. 4 and 8) which are located in the retainer element flanges 61 to define the closed and open positions. More particularly, each leg or flange 61 of the retainer channel or element 51 includes two notches, one of which is located to releasably hold the associated door 23 in generally covering relation to the access opening and the other of which is located to hold the door in the storage or open position. The notches 135 preferably open radially inwardly so as to permit some radial movement of the door when the pins 127, in their extended positions, are received in the notches 135.

It is noted that the guiding and sealing means has been disclosed as including channel shaped members. While this construction is particularly desirable and has special advantages in connection with axially adjacently located access openings so as to cooperate with a pair of adjacent axially located doors, it is not essential that channel shaped members be employed. Specifically in connection with the sealing and guiding means at the ends of the shell 13, L-shaped members having a single extending leg could be employed. Still other modifications of the disclosed construction are well within the scope of the invention. Various of the features of the invention are set forth in the appended claims.

What is claimed is:

1. A washing machine comprising a washing chamber having an opening therein, a door, means on said chamber cooperating with said door for guiding door movement to and from a position in covering relation to said opening, and means on said chamber and on said door for releasably sealing said door with said chamber when said door is in said covering position, said door sealing means including on one of said chamber and said door a sealing member extending, when said door is in said covering relation to said opening, at least partially peripherally around said opening, and expansible means connectable to a source of pressure fluid for urging said door toward said chamber so as to releasably sealingly engage said sealing member against the other of said door and said chamber.

2. A machine in accordance with claim 1 including means on said door cooperating with said guiding means for releasably locking said door in said covering position and when said door is in an open position spaced from said covering position.

3. A washing machine comprising a washing chamber having an opening therein, a door, means on said cham-

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ber cooperating with said door for guiding door movement to and from a position in covering relation to said opening and means on said chamber and on said door for releasably sealing said door with said chamber when said door is in said covering position, said guiding and sealing means including a first fixed member carried on said chamber, a second member located between said chamber and said fixed member for movement toward and away from said chamber and being adapted to engage said door in response to movement toward said chamber, and an expansible means located between said first member and said second member.

4. A machine in accordance with claim 3 including means for releasably displacing said second member toward said first member when said expansible means is collapsed.

5. A washing machine comprising a cylindrical shell having an arcuate surface with an opening therein, means mounting said shell for rotation, a door mounted on said shell and slideably movable to and from a position in covering relation to said opening, means on said shell for releasably sealing said door with said shell when said door is in covering relation to said opening and including expansible means for urging said door into sealing engagement with said shell, and means for connecting said expansible means to a source of pressure fluid notwithstanding rotation of said shell.

6. A washing machine in accordance with claim 5 wherein said sealing means includes on one of said shell and said door a sealing member extending, when said door is in said covering relation to said opening, at least partially peripherally around said opening to provide fluid tight engagement between said shell and said door when said door is urged into sealing engagement with said shell.

7. A machine in accordance with claim 5 including means on said door and on said shell for releasably locking said door in said covering position and when said door is in an open position spaced from said covering position.

8. A washing machine comprising a cylindrical shell having an arcuate surface with an opening therein, a door mounted on said shell and slideably movable to and from a position in covering relation to said opening, and means on said shell for releasably sealing said door with said shell when said door is in covering relation to said opening and including expansible means adapted to be connected to a source of pressure fluid, said sealing means including a first fixed member carried on said shell, a second member located between said shell and said fixed member with said expansible means located between said fixed member and said second member, said second member being movable radially toward and away from said shell and being adapted to engage said door in response to movement toward said shell.

9. A machine in accordance with claim 8 including means for releasably displacing said second member toward said first member when said expansible means is collapsed.

10. The combination of a chamber having an opening therein, a first fixed member carried on said chamber, a second member located between said chamber and said fixed member for movement radially toward and away from said chamber and having a radially inwardly extending leg, a door having a margin extending between said chamber and the inner end of said leg of said second member, said door having a flange extending radially outwardly from said margin axially outwardly of said opening with respect to said second member leg, said door being guided by said second member for movement relative to a position in covering relation to said opening, a sealing member on one of said chamber and said door, said sealing member extending, when said door is in said covering relation to said opening, at least partially peripherally around said opening for fluid tight engagement

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between said chamber and said door, an expansible means located between said first member and said second member and adapted for connection to a source of pressure fluid for urging said second member radially inwardly in response to the application of pressure fluid therein, thereby to displace said door radially inwardly to effect engagement of said sealing member in fluid tight relationship between said door and said chamber, and means for releasably displacing said second member toward said first member when said expansible means is collapsed, whereby to free said door for movement relative to said covering position.

11. A washing machine comprising a cylindrical shell having an arcuate surface with an opening therein, a first fixed member carried on said shell, a second member located between said shell and said fixed member for movement radially toward and away from said shell and having a radially inwardly extending leg, an arcuate door having a curved margin extending between said shell and the inner end of said leg of said second member, said door having a flange extending radially outwardly from said margin axially outwardly of said opening with respect to said second member leg, said door being guided by said second member for movement relative to a position in

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covering relation to said opening, a sealing member on one of said shell and said door, said sealing member extending, when said door is in said covering relation to said opening, at least partially peripherally around said opening for fluid tight engagement between said shell and said door, an expansible means located between said first member and said second member and adapted to be connected to a source of pressure fluid for urging said second member radially inwardly in response to the application of pressure fluid therein, thereby to displace said door radially inwardly to effect engagement of said sealing member in fluid tight relationship between said door and said shell, and means for releasably displacing said second member toward said first member when said expansible means is collapsed, whereby to free said door for movement relative to said covering position.

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