Nov. 17, 1964 L. P. SULLIVAN ETAL 3,157,307

PRESSURIZED DOOR FOR DRY CLEANING MACHINES AND THE LIKE

Filed Nov. 7, 1962 2 Sheets-Sheet 1

FIG. 1

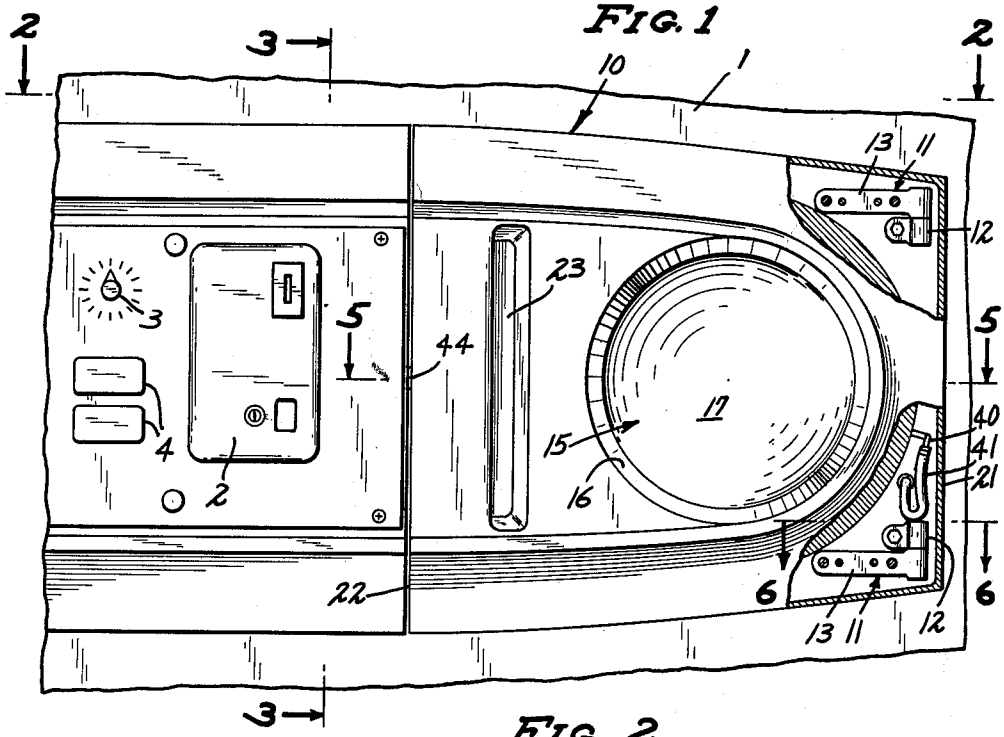


FIG. 2

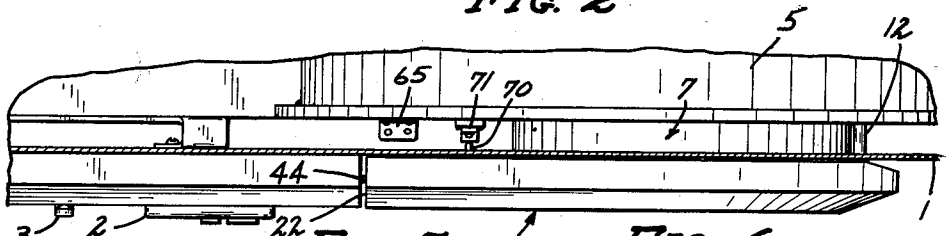


FIG. 7

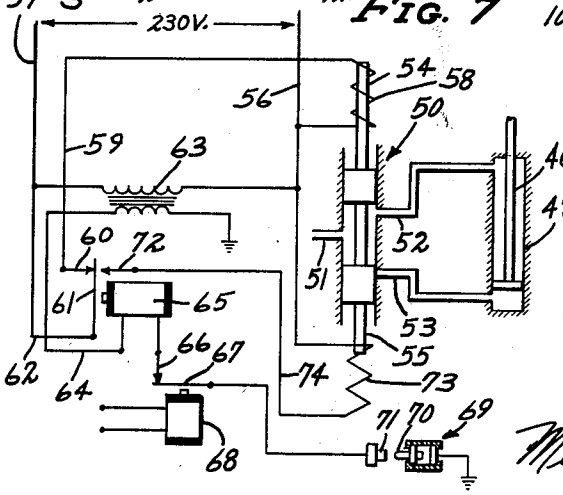
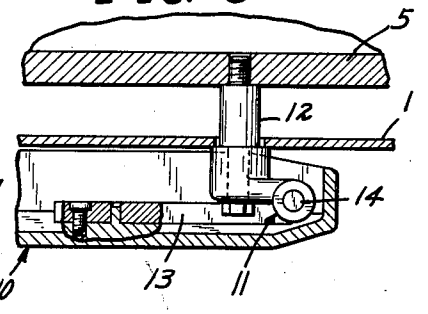


FIG. 6



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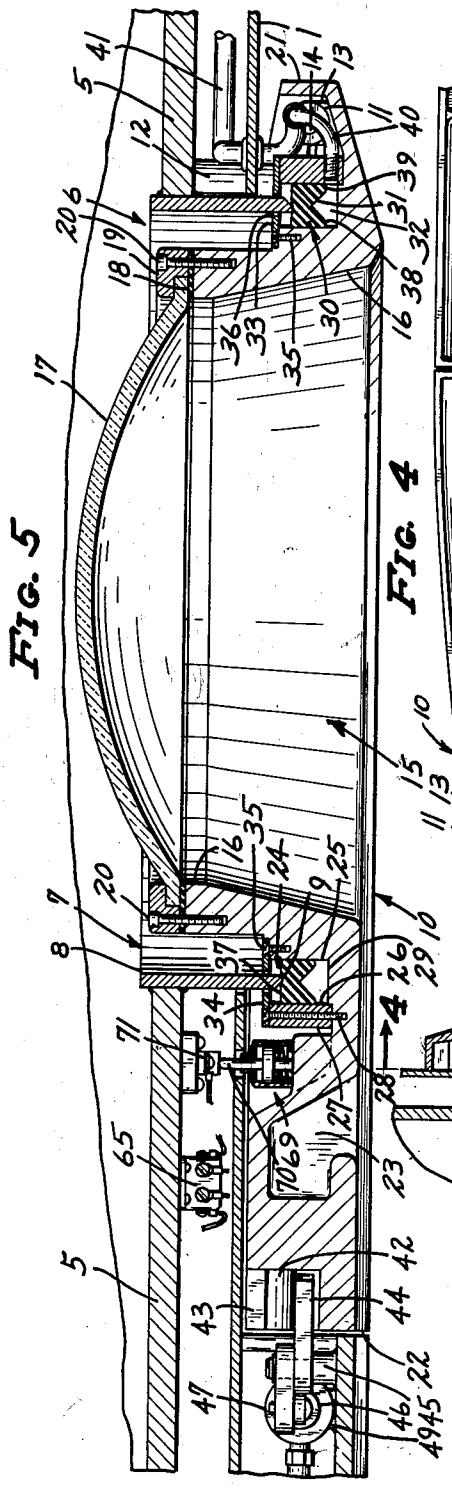


FIG. 5

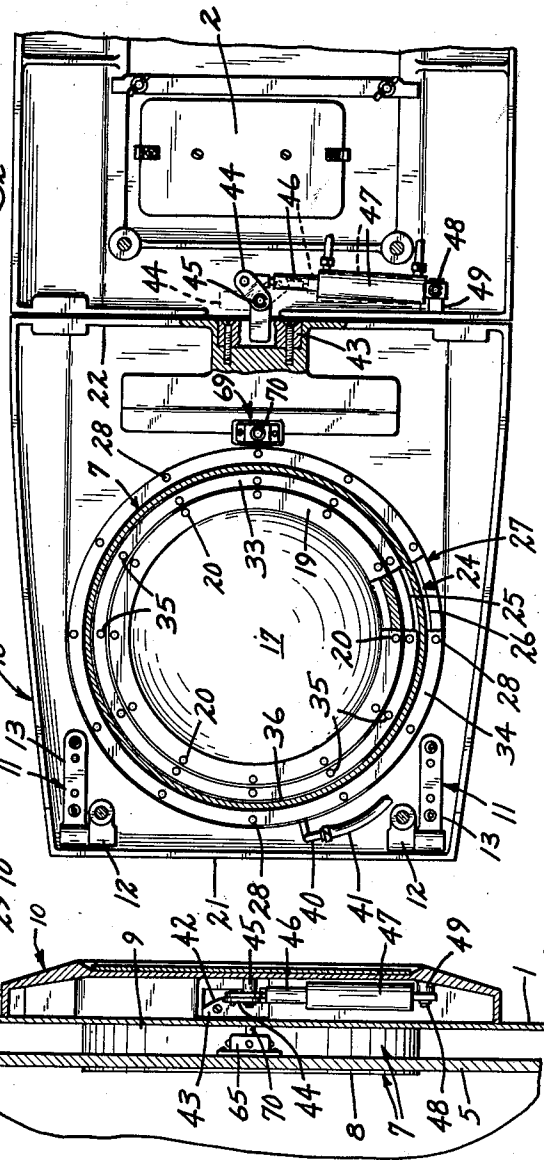


FIG. 4

FIG. 3

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PRESSURIZED DOOR FOR DRY CLEANING MACHINES AND THE LIKE

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2 Claims. (Cl. 220—46)

This invention relates generally to dry cleaning equipment and machinery, and more particularly it relates to an improvement in pressurized doors for dry cleaning machines and the like.

Generally speaking, dry cleaning machines of the general class described herein usually comprise a tumbling chamber defined by a generally rigid housing structure and in which the door-equipped opening for the tumbling chamber is framed by a generally annular flange.

Dry cleaning machines of the type disclosed herein normally use cleaning fluids which are volatile, and it has therefore been a particular problem to devise a door construction for the tumbling chamber opening which will maintain a constant seal around the opening at all times when the door is in its closed position. This problem is of particular significance with respect to self-service dry cleaning machines since the doors therefor are frequently opened and closed by inexperienced and untrained operators. Another consideration is that due to the necessity for providing a machine design which may be economically manufactured at a competitive level of cost, it is desirable to construct the machines with a minimum of precision grinding or machining on the annular flange which defines the tumbling chamber opening.

With the above in mind, an important object of this invention is the provision of a pressurized door for dry cleaning machines and the like which is constructed so as to provide a constant seal around the tumbling chamber opening at all times when the door is in its closed position.

Another object of this invention is the provision of a pressurized door for dry cleaning machines and the like which is constructed so as to be generally automatically actuated to its sealing condition whenever the door is moved to its closed position.

Another object of this invention is the provision of a pressurized door for dry cleaning machines and the like which is constructed in such manner as to provide an efficient and effective seal for the tumbling chamber opening without the necessity for precision grinding and machining of the annular flange which defines the tumbling chamber opening.

A still further object of this invention resides in the provision of a pressurized door for dry cleaning machines and the like which is constructed so as to remain operative and provide effective sealing throughout long periods of continued use and with a minimum of servicing attention.

Other objects of this invention reside in the provision of a pressurized door for dry cleaning machines and the like which is designed so as to permit the manufacture thereof at a relatively low level of cost, and which is also strong and durable in construction.

The above and still further objects and advantages of this invention will become apparent from a consideration of the following detailed specification, appended claims and attached drawings.

Referring to the drawings, wherein like reference characters indicate like parts or elements throughout the several views:

FIG. 1 is a view in front elevation of a dry cleaning machine or the like and showing the door construction

in accordance with this invention, some portions being broken away, and some portions being shown in section;

FIG. 2 is a view in section taken on the line 2—2 of FIG. 1;

FIG. 3 is a view in section taken on the line 3—3 of FIG. 1, some parts being broken away;

FIG. 4 is a sectional view taken on the line 4—4 of FIG. 3, some parts being broken away;

FIG. 5 is an enlarged view in section taken on the line 5—5 of FIG. 1;

FIG. 6 is a detail view in section taken on the line 6—6 of FIG. 1; and

FIG. 7 is a diagram showing the electrical circuit and associated mechanism for the door latch.

Referring to the drawings, and particularly FIG. 1 thereof, the generally front portion of a dry cleaning machine or the like is shown therein. Dry cleaning machines of the type to which this invention generally relates are often mounted in a vertical wall surface with the majority of the machine disposed behind the wall surface or a vertical trim plate, represented by the reference numeral 1 in the drawings. With this arrangement, the generally front portion of the dry cleaning machine is disposed generally flush with or in generally vertical alignment with the vertical trim plate 1. Dry cleaning machines, particularly the self-service type, are often disposed or mounted in pairs with a control panel therebetween, and referring to FIG. 1, the generally front portion of one dry cleaning machine is shown therein, together with a portion of the control panel. The control panel includes a coin-operated metering device 2, a timer mechanism 3, and indicating lights 4.

The dry cleaning machine comprises a generally rigid housing 5 which may be formed of any suitable sheet material or the like, and the housing 5 defines an inner tumbling chamber and also has an opening 6 for the tumbling chamber. The opening 6 for the tumbling chamber of the dry cleaning machine is framed by an annular generally cylindrical flange 7. The flange 7 is secured generally adjacent its inner portion 8 to the housing 5 whereby the outer portion 9 of the flange 7 projects outwardly of the housing 5, as shown particularly in FIG. 5.

This invention particularly relates to a novel door construction for the opening 6 of the dry cleaning machines, and the dry cleaning machine therefor further comprises a door, represented generally by the reference numeral 10. The door 10 is mounted adjacent the opening 6 of the tumbling chamber by suitable means whereby to provide pivotal swinging movements of the door 10 between an open condition and a closed condition. The door 10 is mounted to the housing 5 by means of a pair of suitable vertically spaced hinges 11. The hinges 11 each comprise an inner portion 12 which projects through the trim plate 1 and is rigidly secured to the housing 5, and an outer portion 13 rigidly secured to the door 10, as shown particularly in FIG. 6. The inner and outer portions 12, 13 of each of the hinges 11 are pivotally connected by a suitable pintle rod 14.

The particular construction of the door body might be of several forms, but as shown particularly in FIGS. 1 and 5, the door body is formed, such as by molding from a suitable material, to define a generally centrally located circular recess 15 which extends inwardly toward the tumbling chamber of the dry cleaning machine and which is at least partially defined by an inwardly extending cylindrical portion 16. The circular recess 15 is covered with an inwardly extending concave window disc 17. The window disc 17 is secured at its peripheral edge portion to the cylindrical portion 16 of the door 10 by means of a gasket ring 18, a retainer ring 19, and a plurality of suitable cap screws 20. As shown particu-

larly in FIGS. 1 and 4, the door **10** is formed with tapered upper and lower edge portions, a vertical hinged edge portion **21**, and a free edge portion **22** disposed in general parallelism with the hinged edge portion **21**. The door **10** is formed to define a handle recess **23** disposed in closely spaced relationship to the free edge portion **22** of the door **10**.

In order to provide means for maintaining an effective seal between the door **10** and the opening **6** to the tumbling chamber of the dry cleaning machine, the hingedly connected door **10** for the dry cleaning machine is constructed in a novel manner as will be disclosed hereinafter. The door **10** is formed to define an inwardly opening annular recess **24** which opens in the direction of the flange **7** and is disposed so as to be generally aligned therewith when the door **10** is in its closed condition. The radially inner side wall portion **25** of the annular recess **24** is defined by the cylindrical portion **16** of the door **10**, and the radially outer side wall portion **26** is defined by a cylindrical ring **27** secured to the door body by means of a plurality of machine screws **28** or other suitable fasteners. An inner surface of the door body forms a wall portion of the annular recess **24**, said wall portion being referred to herein as a bottom wall portion **29**.

The above-noted novel pressurized sealing means for the door **10** further comprises an annular compressible sealing member **30** received in the annular recess **24** of the door **10**. The sealing member **30** may be formed of any suitable compressible and resilient material, an example being neoprene. The compressible sealing member **30** is disposed within the annular recess **24** with one side portion **31** thereof disposed in spaced relationship to the bottom wall portion **29** of the annular recess **24** so as to define an annular pressure chamber **32** behind the compressible sealing member **30**. The sealing member **30** is held within the annular recess **24** by means of an inner retainer ring **33** and an outer retainer ring **34**, the former of which is secured by suitable machine screws **35** to the body of the door **10** and the latter of which is secured by the machine screws **28** to the cylindrical ring **27**. The inner and outer retainer rings **33**, **34** are disposed and arranged so as to define an annular passage **36** leading into the annular recess **24**, said annular passage **36** also being aligned with the outer portion **9** of the flange **7** so as to receive the same when the door **10** is moved to its closed condition.

The sealing member **30** is further arranged and positioned within the annular recess **24** so that the opposite or rear side portion **37** of said sealing member **30** is disposed so as to engage a beveled end portion of the flange **7** when the door **10** is in its closed condition, as shown particularly in FIG. 5. It will be noted with particular reference to FIG. 5 that said one side portion **31** of the sealing member **30** is formed so that the sealing member **30** is generally cross-sectionally V-shaped and defines opposed generally annular inner and outer sealing lips **38**, **39**, respectively. The inner sealing lip **38** is positioned so as to engage the inner side wall portion **25** of the annular recess **24**, and the outer sealing lip **39** is arranged so as to engage the outer side wall portion **26** of the annular recess **24**.

In order to provide means for forcing the sealing member **30** against the beveled outer portion **9** of the flange **7** when the door **10** is in its closed condition, means for introducing fluid under pressure into the annular pressure chamber **32** is provided in accordance with this invention. Such means comprises a tubular coupling **40** connected through a suitably positioned opening in the cylindrical ring **27** adjacent the side thereof disposed adjacent to the hinged edge portion **21** of the door **10**, said tubular coupling **40** being connected with a flexible conduit **41**. The flexible conduit **41** is then connected by a suitable conduit to a compressor, not shown, which supplies fluid under pressure to the pressure chamber **32**. The compressor, not shown, may be controlled by suitable control means so as to actuate the compressor when the dry cleaning machine is in operation. When fluid under pressure is introduced into the pressure chamber **32**, the sealing lips **38**, **39** of the sealing member **30** are forced against the respective side wall portions **25**, **26** of the annular recess **24**, and the rear side portion **37** of the sealing member **30** is forced against the beveled outer portion **9** of the flange **7** when the door **10** is moved to its closed condition. It may be desirable to control the above-noted compressor, not shown, so that the same will be actuated whenever the dry cleaning machine is in operation. In this way, the seal will always be effected between the door **10** and the flange **7** whenever the door **10** is latched in its closed condition, and when the door **10** is unlatched, the pressure behind the sealing member **30** will cause an outward swinging movement of the door **10**.

In order to provide efficient means for releasably retaining the door **10** in its closed condition, a latch mechanism is provided in accordance with this invention. Such latch means or mechanism comprises a cam surface **42** defined by a cam bar **43** secured to the door **10** adjacent the free edge portion **22** thereof. The latch mechanism further comprises a latch bar **44** in the form of a bell-crank pivotally mounted on a stud **45** rigidly secured to the dry cleaning machine, as shown particularly in FIGS. 4 and 5. The pivotal latch bar **44** is pivotally connected to the piston rod **46** of a two-way fluid pressure operated cylinder **47** which is pivotally mounted, as at **48**, on a projecting stud **49** secured to the housing **5** of the dry cleaning machine. By reference to FIGS. 4 and 7, it will be noted that when fluid under pressure is introduced on the side of the piston so as to extend the piston rod **46**, the latch bar **44** will be moved into engagement with its cooperating cam surface **42**, as shown by full lines in FIG. 4, so as to securely latch the door **10** and effect a seal between the resilient sealing member **30** and the flange **7**. Further, when fluid under pressure is introduced to the other side of the piston so as to retract the piston rod **46**, the latch bar **44** will be moved to its dotted line position shown in FIG. 4 whereby the door **10** will be forced open because of the pressure against the flange **7** by the resilient sealing member **30**.

In order to control the desired movement of the two-way fluid pressure operated cylinder **47**, a multi-position solenoid valve **50** is provided, the same being diagrammatically shown in FIG. 7. The solenoid valve **50** is of conventional construction, and comprises a fluid inlet **51**, and outlet ports **52**, **53**. The output port **52** is connected by suitable conduit means to the retracting chamber of the cylinder **47**, and the outlet port **53** is similarly connected by suitable conduit means to the extending chamber of the cylinder **47**. The solenoid valve **50** includes a core rod having opposite end portions **54**, **55**. Referring to FIG. 7, the position of the solenoid valve **50** as shown therein, together with the circuit condition as shown therein, is such as to expose the outlet port **52** and retract the piston rod **46** to an open condition of the latch bar **44**. As shown in said FIG. 7, a source of current is provided across a lead wire **56** and a common wire **57**. A solenoid coil **58** for the end core rod **54** is connected between the lead wire **56** and the common wire **57**, the circuit for the solenoid coil **58** being completed by a lead wire **59**, an open-latch relay contact **60**, a movable relay arm **61**, and a lead wire **62**.

In order to obtain suitable current for operation of a low voltage relay ground circuit, a step-down transformer **63** is interposed between the lead wire **56** and the common wire **57**. The secondary of the step-down transformer **63** is connected by a lead wire **64** in series with a relay **65** which is further connected to a contact **66** and a movable arm **67** of a normally closed relay **68**. A series connection between the movable arm **67** of the relay **68** and a door-actuated switch **69** completes the circuit to

ground, as shown particularly in FIG. 7. The door-actuated switch 69 is mounted on the door 10 so as to ground the same, as shown particularly in FIG. 5. The switch 69 includes a spring biased plunger 70 and a striker plate 71 whereby when the door 10 is moved to its closed position, the contact made by the switch 69 will energize the relay 65 and move the relay arm 61 to engagement with a relay contact 72 of the relay 65 whereby to de-energize the solenoid coil 58 and also energize the solenoid coil 73 for the core rod end portion 55, the solenoid coil 73 of course being interposed in series between the relay contact 72 and the parent lead wire 56 by means of a lead wire 74, as shown particularly in FIG. 7. With this arrangement, it will be noted that when the door is moved to its closed condition so as to close the switch 69 and thereby energize the solenoid coil 58, the solenoid valve outlet port 52 will be closed and the outlet port 53 will be opened so as to extend the piston rod 46 of the cylinder 47 and thereby close the latch bar 44 and securely latch the door 10.

In order to provide means for automatically unlatching the latch bar 44 and open the door 10 when the normal machine cycle has terminated, the normally closed relay 68 is suitably connected with other control mechanism, not shown, such as a timing mechanism for the machine cycle, and when the cycle is terminated, the relay 68 is energized so as to break the contact between the movable relay arm 67 and the relay contact 66. This action obviously interrupts the circuit to the relay 65 and thereby causes a return of the movable relay arm 61 to the contact 60, whereby to de-energize the solenoid coil 73 and energize the solenoid coil 58. This returns the solenoid valve 50 to its position shown in FIG. 7, and the door 10 is forced open by the pressure exerted on the flange 7 by the pressurized sealing member 30.

This invention has been thoroughly tested and found to be completely satisfactory for the accomplishment of the above objects; and while we have shown and described above a preferred embodiment thereof in which the principles of the present invention have been incorporated, we wish it to be specifically understood that the same may be modified without departure from the scope and spirit of the appended claims.

What we claim is:

1. In a dry cleaning machine or the like having a tumbling chamber and also having an opening for the tumbling chamber which is framed by a generally annular flange:

(*a*) a door for the opening of said tumbling chamber,

(*b*) means mounting said door adjacent said opening for pivotal swinging movements between an open condition and a closed condition,

(*c*) an annular recess defined by said door and opening in the direction of said annular flange and disposed so as to be generally aligned therewith when the door is in its closed condition, said annular recess having inner and outer side wall portions and also having a bottom wall portion,

(*d*) a generally annular compressible sealing member received in the annular recess of said door with one portion thereof disposed in spaced relationship to the bottom wall portion of said annular recess so as to

define an annular pressure chamber behind said sealing member and with another side portion of said sealing member disposed so as to engage said annular flange when said door is in its closed condition, said one side portion of said sealing member being generally cross-sectionally V-shaped and defining opposed generally annular inner and outer sealing lips each of which is disposed in engagement with a different one of the opposed side wall portions of said annular recess.

(*e*) means for introducing fluid under pressure into the annular pressure chamber defined behind said sealing member so as to force said annular sealing lips against the side wall portions of said annular recess and also releasably compress said sealing member against said annular flange when said door is in its closed condition, and

(*f*) latch means for releasably retaining said door in its closed condition.

2. In a dry cleaning machine or the like:

(*a*) a generally rigid housing which has a tumbling chamber and which also has an opening for the tumbling chamber, said opening being framed by a generally annular flange,

(*b*) a door for the opening of said tumbling chamber,

(*c*) means mounting said door adjacent said opening for pivotal swinging movements between an open condition and a closed condition,

(*d*) an annular recess defined by said door and opening in the direction of said annular flange and disposed so as to be generally aligned therewith when the door is in its closed condition, said annular recess having inner and outer side wall portions and also having a bottom wall portion,

(*e*) a generally annular compressible sealing member received in the annular recess of said door with one side portion thereof disposed in spaced relationship to the bottom wall portion of said annular recess so as to define an annular pressure chamber behind said sealing member and with another side portion of said sealing member disposed so as to engage said annular flange when said door is in its closed condition, said one side portion of said sealing member being generally cross-sectionally V-shaped and defining opposed generally annular inner and outer sealing lips each of which is disposed in engagement with a different one of the opposed sidewall portions of said annular recess,

(*f*) means for introducing fluid under pressure into the annular pressure chamber defined behind said sealing member so as to force said annular sealing lips against the side wall portions of said annular recess and also releasably compress said sealing member against said annular flange when said door is in its closed condition, and

(*g*) latch means for releasably retaining said door in its closed condition.

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