June 27, 1967 P. B. GEIGER ETAL 3,328,062

LATCH MECHANISM

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FIG-1

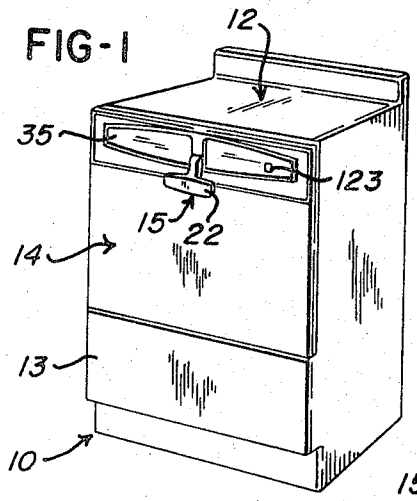

FIG-2

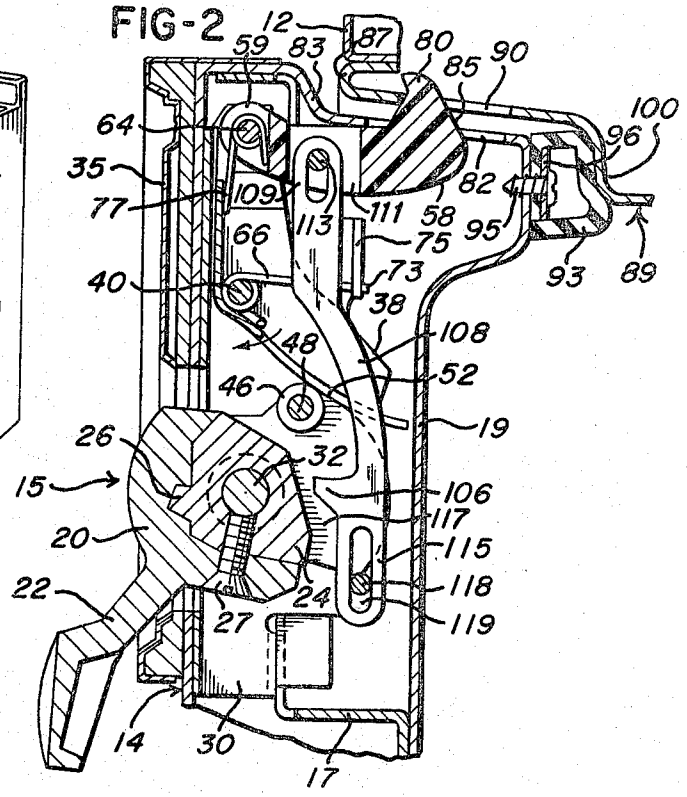

FIG-3

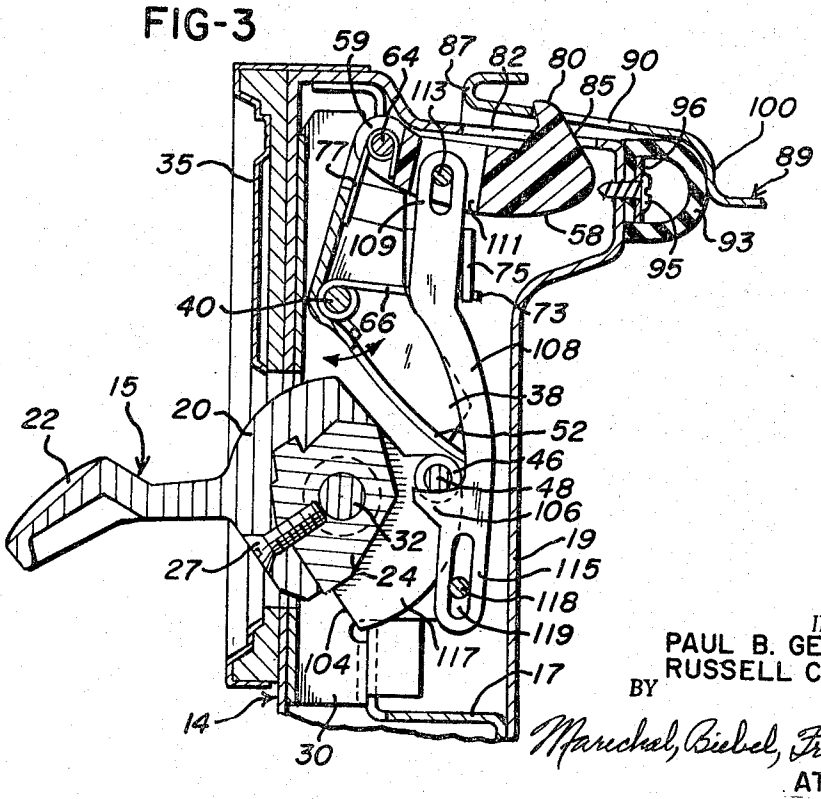

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FIG-4

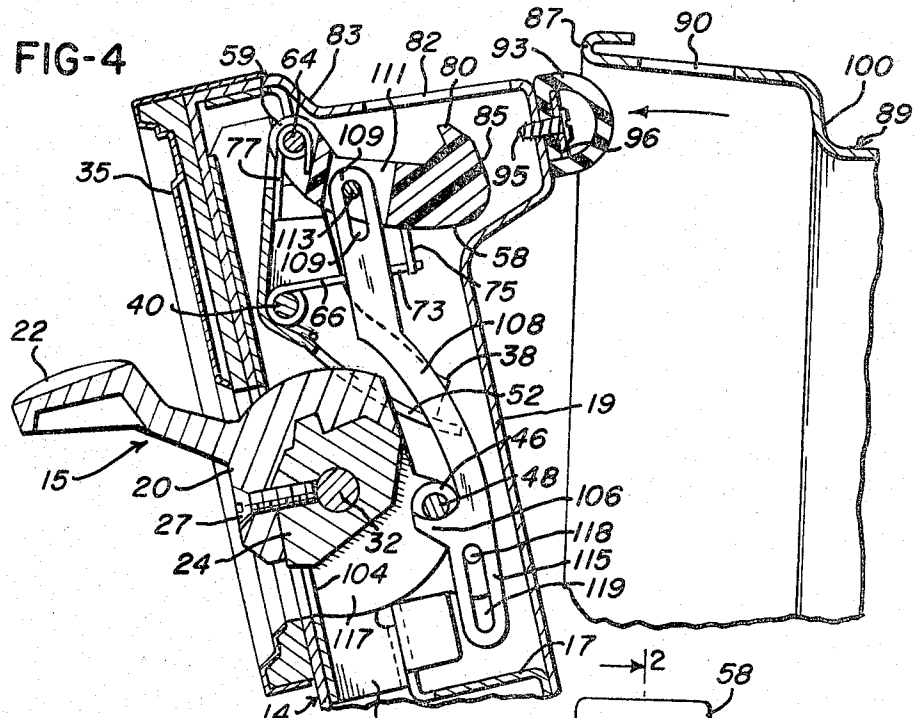


FIG-5

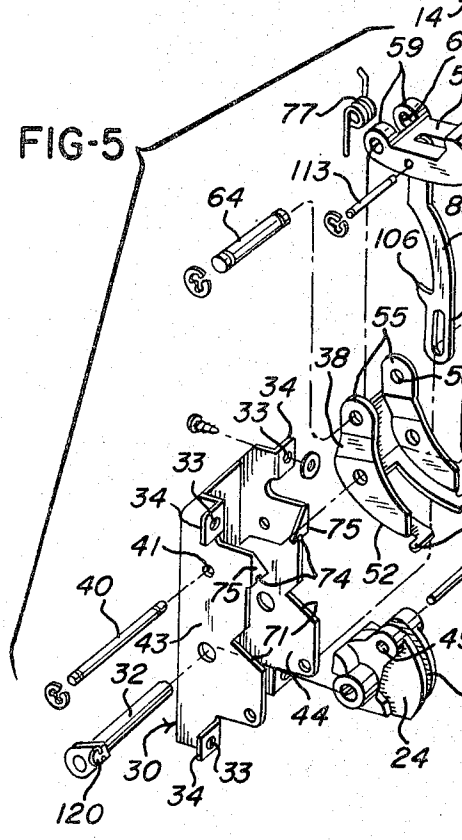
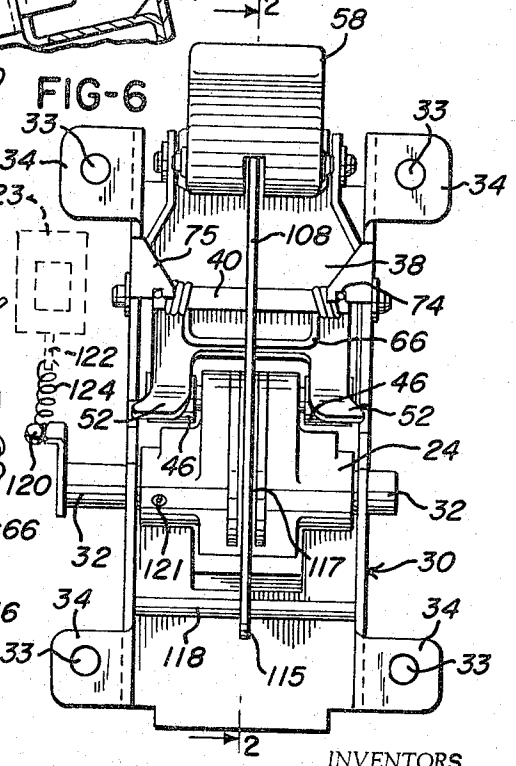


FIG-6



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LATCH MECHANISM

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5 Claims. (Cl. 292—123)

This invention relates to a latch mechanism for a washing machine such as a dishwashing machine, and more particularly, to a latch mechanism for retaining the door of a front loading type dishwashing machine and for compressing a resilient seal spaced between the door and the tank defining the cleansing chamber to prevent the escape of steam and the cleansing spray.

Specifically, the present invention is directed to a latch mechanism for a front loading dishwashing machine having a door operable between a vertical closed position and a horizontal open position. Commonly, a resilient seal strip formed from a rubber or vinyl material is fastened around either the inside of the door or the forward portion of the tank and is adapted to be compressed upon closing of the door to seal the door tightly with the tank for preventing the escape of steam produced by the hot water employed and the cleansing liquid which is sprayed throughout the chamber during the operation of the machine.

It has been found desirable to provide a latch for locking the door to the tank which is actuated by natural movements of the hand and which will also draw the door tightly against the tank to compress the resilient seal in response to a relative light manual force applied to the handle of the latch. Furthermore, it has been found desirable to provide a latch mechanism having a step actuation whereby the first movement in unlocking the latch is operable to actuate a switch to open the electrical circuits leading to the motors for the timer and the power spray system, but does not permit the door to be opened until a further movement of the latch mechanism is made. This two-step movement or operation from a locked position to a neutral position and then to an open position has also been found desirable to eliminate substantially the chances for accidentally opening of the door during operation of the spray system whereby the cleansing spray is directed out of the cleansing chamber onto the floor or the operator.

Accordingly, one primary object of the present invention is to provide a novel latch for a dishwashing machine wherein the latch is opened by the natural operation of lifting a projecting handle, but if an excessive force is employed on the handle it would not open the door and break the liquid tight seal but instead, would tend to hold the door closed.

As another object, the present invention provides a latch mechanism as described above, wherein the closing of the latch can be accomplished by substantially a constant force acting downwardly on the projecting handle which produces an increasing clamping force between the door and the tank for uniformly compressing the seal.

It is also an object of the present invention to provide a latch for a front loading dishwashing machine, as described above, wherein the latch mechanism is operable between a closed position and a neutral position to release the compression of the seal and to open the electrical circuits for the motors of the timer and power spray system, and is further operable from the neutral position to an open position wherein the latch disengages to permit opening of the door.

Another object of the present invention is to provide a latch for a front loading dishwashing machine, as described above, wherein the latch mechanism is adapted

to be fitted to the door as a subassembly thus providing for convenient and economical assembly of the latch.

Other objects and advantages of the invention will be apparent from the following description, the accompanying drawings and the appended claims.

In the drawings:

FIG. 1 is a perspective view of a front loading type dishwashing machine which is provided with a latch mechanism constructed in accordance with the invention;

FIG. 2 is an enlarged elevational sectional view of the latch mechanism mounted within the dishwasher door and showing the latch mechanism as viewed along the line 2—2 of FIG. 6, in the locked position whereby the resilient seal is compressed to form a liquid tight seal between the door and the tank;

FIG. 3 is another enlarged elevational section view of the latch mechanism employed on the machine of FIG. 1 and showing the latch mechanism in the neutral or intermediate position;

FIGURE 4 is a third enlarged elevational section view of the latch mechanism formed according to the invention and showing the mechanism in the open position with the door slightly open;

FIG. 5 is an exploded view of the latch mechanism illustrating the assembled relationship of the components; and

FIG. 6 is a rear elevational view of the latch mechanism according to the invention.

In the drawings, which illustrate a preferred embodiment of the present invention, FIG. 1 shows a front loading type dishwashing machine including generally, a cabinet **10** having a top **12** and front lower panel **13**. Access to the dishwasher is provided by the door **14** which is suitably hinged at the bottom to permit the door to move from the vertical closed position shown in FIG. 1 to a horizontal open position. The latch **15** according to the present invention is supported within the door by a frame member **17** (FIG. 2) connected to the inner door panel **19** at the top center portion of the door, as shown in FIG. 1.

A handle member **20** including a T-shaped handle **22** and a cam member **24** connected rigidly together by the round stud **26** and the screw **27**, is pivotally mounted to a channel type support bracket **30** by a pin **32** providing a horizontal axis of rotation for the handle member **20**. The support bracket **30**, in turn, is removably secured to the frame member **17** of the door **14** by a suitable screw extending through the holes **33** formed in each of the four tabs **34**. As shown in FIG. 1, the T-shaped handle **22** projects outwardly through an opening formed in the decorative trim plate **35** extending across the upper portion of the door **14**. The handle portion **20** is adapted to pivot about the pin **32** from the downwardly extending closed position (FIG. 2) to an outwardly extending neutral position (FIG. 3) where the door is released from the sealed position of FIG. 2, to a slightly higher position as shown in FIG. 4 enabling the door to be opened to a horizontal position. Pivotally mounted to the bracket **30** directly above the handle portion **20** is a rocker member **38** which is retained by the pin **40** extending through the holes **41** (FIG. 5) formed within the sides **43** and **44** of the support bracket **30**.

Mounted on each side of the cam member **24** eccentric to the axis of rotation, is a roller **46** which is supported by the pin **48** extending through the opening **49** formed within the cam member. As the cam member **24** is rotated by the vertical movement of the handle **22**, the rollers **46** are adapted to engage the pair of curved cam surfaces **52** formed along the underneath side of the rocker member **38** causing the rocker member to pivot about the pin **40**. Extending from the top portion of the rocker member **38**

are a pair of ears 55 (FIG. 5) having aligned openings 56. which are adapted to pivotally support a catch member 58 having ears 59 defining aligned openings 62. As illustrated in FIG. 5, the ears 59 of the catch member 58 are mounted between the ears 55 of the rocker member 38 and are adapted to receive the pin 64.

A torsion spring 66 (FIG. 2) is mounted on the pin 40 and serves to bias the rocker member 38 in a clockwise direction so that when the latch mechanism is in a neutral position, the tabs 69 (FIG. 5) extending from the rocker member 38, are adapted to engage the edges 71 of the support bracket 30 to provide a stop against further clockwise rotation of the rocker member 38. Thus, when assembled, the ends 73 of the torsion spring 66 are retained within the notches 74 formed in the underneath edge of the tabs 75 extending inwardly from the sides 43 and 44 of the support bracket 30.

In a similar manner, the coil type torsion spring 77 (FIG. 2) mounted on the pin 64 and between the ears 59 (FIG. 5) of the catch member 58, serves to bias the catch member 58 in an upward counterclockwise direction causing the engaging portion 80 to extend through the opening 82 formed within the top edge portion 83 of the inner door panel 19.

When the door is moved from an open to a closed position, the leading cam surface 85 (FIG. 3) of the catch member 58 extends through the opening 82 and engages the rounded forward edge 87 of the cleansing tank 89 causing the catch member 58 to pivot downwardly or clockwise. As the door 14 is closed further, the projecting portion 80 of the catch member snaps upwardly through the strike opening 90 formed within the top forward portion of the tank 89. As shown in FIG. 3, the opening 90 in the tank 89 and the catch member 58 are so spaced that at the position of the door when the portion 80 snaps into the opening 90, the resilient seal 93 which is fastened around the edge of the inner panel 19 by a series of screws 95 extending through a clamping plate 96, touches the seat portion 100 of the tank 89.

To close the door further and compress the seal 93, the handle 22 is pushed downwardly thereby rotating the handle member 20 counterclockwise causing the rollers 46 to engage the cam surfaces 52 and thereby rotate the rocker member 38 in a counterclockwise direction. In rotating counterclockwise, the rocker member 38 carries with it the catch member 58. However, since the portion 80 is received within the opening 90, the catch member 58 remains substantially stationary and the rocker member 38 pivots about the pin 64 causing the door 14 to move towards the tank 89 as a result of the connection between the rocker member 38 and the support bracket 30 by the pin 40.

As the rollers 46 move up the cam surfaces 52 of the rocker member 38 from the neutral position shown in FIG. 3 towards the locked position of FIG. 2, it can be seen that as a result of the increasing leverage, the counterclockwise torque produced on the rocker member 38 increases substantially even though the counterclockwise torque on the handle member 20 is substantially constant. Without this increasing leverage produced by the latch mechanism, it would require an undesirable increasing force on the handle 22 to compress the seal uniformly around the door to the deformed configuration as shown in FIG. 2.

To retain the handle member 20 in its downward locked position as shown in FIG. 2, the rollers 46 are adapted to pass slightly over center on the curved cam surface 52 whereby the clockwise torque on the rocker member 38 produced by the spring 66 and the pull on the catch member 58 produces a counterclockwise torque on the handle member 20. Thus, when the handle member 20 is rotated clockwise manually to the neutral position shown in FIG. 3, the rollers 46 pass back over center whereby the torsion spring 66 forces the handle member 20 in a clockwise direction until the tabs 69 (FIG. 5) extending from the rocker member 38 engage the edge portion 71 of the support bracket 30. At this point, the counterclockwise torque produced by the weight of the handle 22 is sufficient to retain the handle portion 20 in the position shown in FIG. 3.

When it is desired to open the door 14 of the dishwashing machine, the handle 22 is lifted causing the handle member 20 to rotate clockwise from the neutral position of FIG. 3 to the position shown in FIG. 4 until the surface 104 of the cam member 24 (FIG. 4) engages the support bracket 30 to form a stop. During this movement, the center portion of the pin 48 engages the finger 106 extending from the link member 108 having an upper portion 109 which extends through a slot 111 formed within the catch member 58 and is connected thereto by the pin 113. The lower portion 115 of the link member 108 is guided within a groove 117 (FIG. 5) formed within the cam member 24 and also by the pin 118 extending through the slot 119 formed within the lower portion of the link member 108. Thus, when the pin 48 engages the finger 106, the link member 108 rotates the catch member 58 clockwise to disengage the projecting portion 80 from the opening 90 formed within the tank 89. As soon as the upward manual force is released on the handle 22, the handle member 20 rotates counterclockwise back to its neutral position shown in FIG. 3. This is caused both by the weight of the handle 22 assisted by the upward force on the finger 106 caused by the relatively light counterclockwise torque on the catch member 58 produced by the torsion spring 77.

To provide an interlock for the electrical system of the dishwashing machine so that the operation of the cycle can be interrupted by any desired spot within the cycle, a lever 120 is rigidly mounted to the end of the pin 32 which, in turn, is secured by a suitable pin 121 (FIG. 6) to the cam member 24 for rotation therewith. When the handle member 20 is rotated clockwise from the locked position of FIG. 2 to the neutral position of FIG. 3, the lever 120 rotates with the handle member 20. By means of a suitable linkage including a tension spring 121, the end of the lever 120 is connected to the cancel bar 122 of a push button control switch, schematically illustrated at 123, which is also mounted within the door 14 having an exposed push button (FIG. 1). The rotary movement of the lever 120 to the neutral position cancels the buttons and opens the switch so that the electrical circuit to the motors for the timer and the wash system are opened. When it is desired for the operation of the cycle to resume, the push button switch 123 is again manually closed and thereby completing the electrical circuits.

From the above description and the drawings, it becomes apparent that the latch mechanism according to the invention provides several advantages. For example, if the operator inadvertently lifts the handle 22 from the locked position of FIG. 2 directly to the completely unlocked position of FIG. 4, the upward force on the handle 22 tends to urge the door 14 closed rather than opening the door. As a result, the operator is unlikely to break the contact between the resilient seal 93 and the seat portion 100 before the spray system stops. By natural operation of the latch, however, only a light upward force will normally be applied to the handle 22 which causes the rollers 46 to pass over center and the handle member 20 to be rotated to the neutral position of FIG. 3. In this position, the catch member 58 is still engaged within the opening 90 and the resilient seal 93 is still in contact with the seat 100 around the edge of the door 14. Then, as mentioned above, to open the door, it is necessary to lift the handle 22 by a further amount until the handle reaches the position of FIG. 4. The handle 22 is then pulled outwardly causing the door 14 to move to its horizontal open position.

Another important advantage of the latch is the relatively light downward force required on the handle 22 to close the door 14 until the seal 93 is compressed at

all places where it is in contact with the seat portion **100**. This results from the increasing leverage which is produced when the handle **22** is pushed downwardly until the rollers **46** pass across the center of the cam surfaces **52** formed on the rocker member **38**. Also, by mounting the latch in the top center of the door **14**, the pull exerted by the latch member **58** between the door **14** and the tank **89**, results in a substantially uniform compression of the resilient seal **93** extending between the door **14** and the seat portion **100** of the tank **89**.

While the form of apparatus herein described constitutes a preferred embodiment of the invention, it is to be understood that the invention is not limited to this precise form of apparatus, and that changes may be made therein without departing from the scope of the invention which is defined in the appended claims.

We claim:

1. A latch mechanism for a washing machine having a cleansing tank and a door operable between a vertical closed position and a horizontal open position and having a resilient seal adapted to be compressed between the door in the closed position and the tank for preventing the escape of the cleansing spray, said latch mechanism comprising, a support bracket adapted to be mounted on the door, a rocker member pivotally mounted on said support bracket, a catch member adapted to project from the top edge of the door to engage strike means connected to the tank, means for pivotally mounting said catch member to said rocker member a predetermined distance from the pivotal axis of said rocker member, a handle member pivotally mounted on said support bracket and having a portion adapted to extend outwardly from the front side of said door and adapted to be moved manually in a generally vertical direction causing said handle member to rotate between a locked position and an open position, spring means for biasing said rocker member to said neutral position, cam means associated with said handle member for pivoting said rocker member by applying an increasing torque to said rocker member in response to a substantially constant torque applied to said handle member by a generally vertical force on said handle portion causing said catch member to draw the door tightly against the tank with an increasing force for uniformly compressing the seal, and means extending between said catch member and said handle member for withdrawing said catch member from the strike means when said handle member is rotated from said locked position to said open position.

2. A latch mechanism for a washing machine having a cleansing tank and a door operable between a vertical closed position and a horizontal open position and having a resilient seal adapted to be compressed between the door in the closed position and the tank for preventing the escape of the cleansing spray, said latch mechanism comprising a support bracket adapted to be removably mounted on the door, a rocker member pivotally mounted on said support bracket and having a cam surface formed thereon, a catch member formed from a plastic material and adapted to project from the top edge of the door to engage a strike opening from within the tank, means for pivotally mounting said catch member to said rocker member a predetermined distance from the pivotal axis of said rocker member, a handle member pivotally mounted on said support means and having a detachable handle portion adapted to extend outwardly from the front side of said door and adapted to be moved manually in a generally vertical direction causing said handle member to rotate between a locked position and an open position, spring means for biasing said rocker member to said neutral position, roller means mounted on said handle member for pivoting said rocker member by engaging said cam surface on said rocker member to produce an increasing torque on said rocker member in response to a substantially constant torque applied to said handle member by a generally vertical force on said handle portion causing said catch member to draw the door tightly against the tank with an increasing force for uniformly compressing the seal, and linkage means extending between said catch member and said handle member for withdrawing said catch member from the strike means when said handle member is rotated from the locked position to the open position.

3. A latch mechanism for a washing machine including a cleansing tank having a front opening, a door pivotally connected to said tank adjacent the lower edge of said opening and movable between a vertical closed position across said opening and a horizontal open position, strike means on said tank at the upper edge of said opening, and a resilient seal adapted to be compressed between the door and the tank; said latch mechanism comprising support means adapted to be mounted on said door, a handle member including a portion adapted to extend outwardly from said door, means pivotally mounting said handle member on said support means for closing and opening movement of said portion toward and away from the door about an axis adapted to extend generally parallel to the pivot axis of the door, a rocker member mounted on said support means for pivotable movement on an axis extending generally parallel to the pivot axis of said handle, a catch member mounted on said rocker member for pivotable movement on an axis extending generally parallel to the pivot axis of said rocker member and including a projecting portion adapted to extend from said door for engaging said strike means, means operable by opening movement of said handle member for retracting said catch member from said strike means, and means connected to said handle member for pivoting said rocker member in response to complete closing movement of said handle member for causing said catch member to draw said door tightly against said seal.

4. A latch mechanism as defined in claim **3** wherein said means for pivoting said rocker member comprises a curved cam surface formed on said rocker member, and roller means mounted on said handle member for engaging said curved cam surface of said rocker member.

5. A latch mechanism as defined in claim **3** wherein said retracting means for said catch member includes a link pivotally connected to said catch member and means on said link adapted to be engaged by said handle member during opening movement thereof, and spring means extending between said catch member and said rocker member for biasing said portion of said catch member outwardly of said door.

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