Aug. 16, 1960 A. F. WIDIGEN 2,949,208

WASHING MACHINE DOOR

Filed May 13, 1957 2 Sheets-Sheet 1

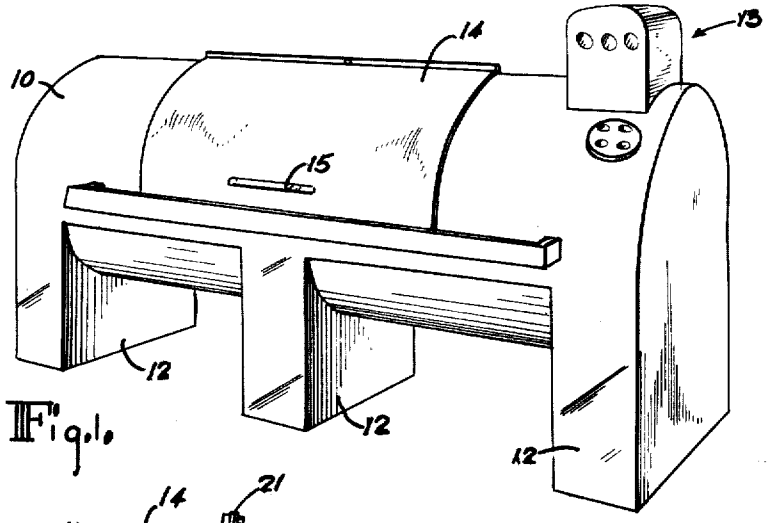


Fig. 1.

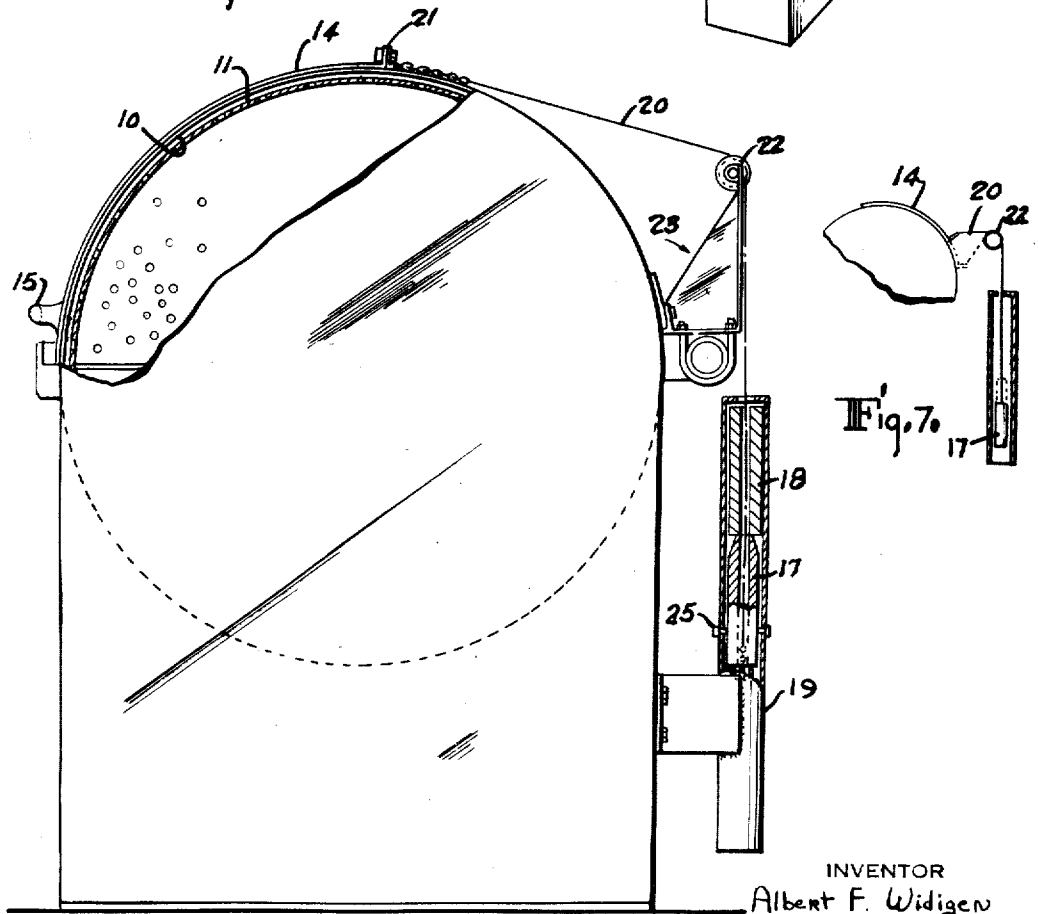


Fig. 2.

Fig. 7.

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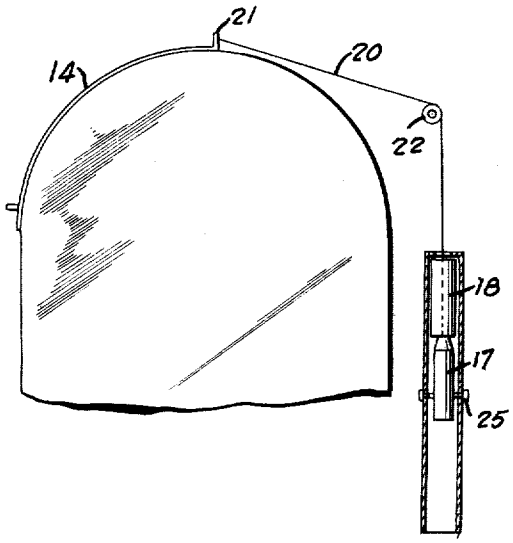


Fig. 3.

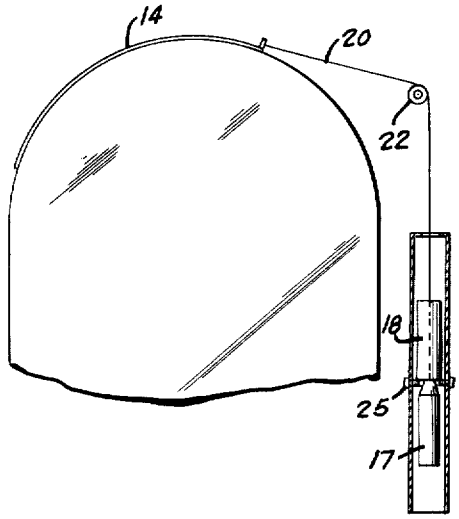


Fig. 4.

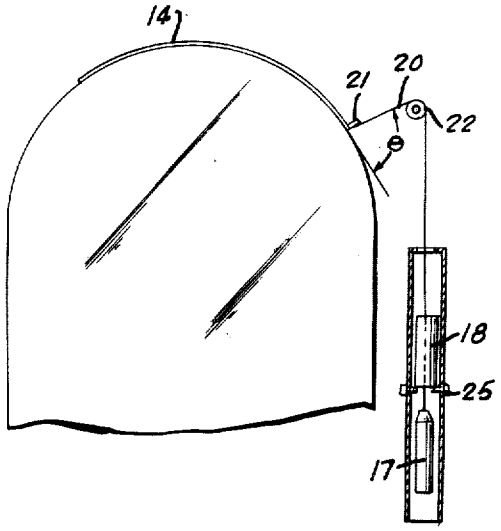


Fig. 5.

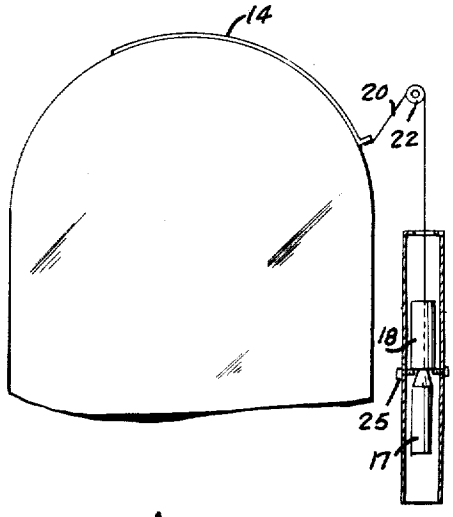


Fig. 6.

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WASHING MACHINE DOOR

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4 Claims. (Cl. 220—41)

This invention relates to commercial washing machines and particularly to a counterbalance arrangement for the circumferentially slidable door of such a washing machine.

In large commercial washing machines utilizing doors which are circumferentially slidable on the outer casing of the machine, the doors are often very heavy and resist movement by the operator due to their weight and their inertia.

It is an object of this invention to provide means for assisting the operator in the opening and closing of such a door.

It is a further object of this invention to provide means for resisting the movement of the door at the end of an opening or closing operation.

It is still another object of this invention to provide a double weight arrangement to assist the operator in the original opening movement of the door and a single weight arrangement to assist the operator in another portion of the opening movement.

The counterbalance arrangement provided according to this invention includes a vertically movable weight connected to a portion adjacent one end of the door. The connecting means travel over guide means positioned relative to the weight and the door, so that when the door is moved in one direction the weight moves downwardly until said one end of the door reaches a predetermined point on the washer, and then moves upwardly in response to further movement of the door in said one direction.

According to a further aspect of this invention, a second weight having an aperture therethrough is mounted on the connecting means between the guide means and said one end of the door. A stop is provided for the second weight which engages it after a predetermined degree of downward movement thereof to prevent further downward movement when the said one end of the door reaches a predetermined point on the washer. This results in both weights moving together during one portion of movement of the door and the first weight moving alone during another portion of said movement.

These and other objects, features and advantages of the invention will become apparent from the following detailed description and drawings which are merely exemplary.

In the drawings:

Fig. 1 is a perspective view of a commercial washing machine in which the counterbalance arrangement of the invention may be utilized;

Fig. 2 is a side view of the washing machine of Fig. 1 showing the double weight counterbalance arrangement, with parts broken away for clarity;

Figs. 3, 4, 5 and 6 are schematic views showing the elements of the counterbalance arrangement in various operating positions;

Fig. 3 showing the parts in their closed door position;

Fig. 4 showing the upper weight in its stopped position;

Fig. 5 showing the lower weight in its lowermost position;

Fig. 6 showing the elements in their open door position; and

Fig. 7 is a schematic view of another form of the invention.

As appears from Figs. 1 and 2, the counterbalance arrangement of the invention is used with a conventional commercial type washing or cleaning machine having a cylindrical casing **10** within which a cylinder **11** rotates on a horizontal axis, the cylinder being perforated to permit the free passage therethrough of washing fluid as is familiar to those skilled in the art. The machine may be supported on legs **12** and is provided with means, not shown, for the usual operation thereof, including power means for rotating, reversing and inching the cylinder, and also means for the introduction and dispersion of supplies, all of which means may be conventional. The machine may also include control means shown at **13** for controlling the operations thereof. A circumferentially slidable door **14** having a handle or gripping portion **15** is provided for closing a material filling and discharging opening in the casing.

In order to assist the operator in closing and opening the door, which is very heavy, a counterbalance arrangement is provided, shown generally as **16** in Fig. 2. The arrangement includes a lower weight **17** and an upper weight **18** which may be mounted within a guide cylinder **19**. Lower weight **17** is connected to a chain or cord **20** at one end thereof, the other end of said chain or cord being connected adjacent to the rearward end of door **14**. Door **14** may be provided with a flange portion **21** to facilitate the connection of the wire or rope connecting means **20**. The connecting means passes over a pulley wheel or guide means **22** which is rotatably mounted on suitable mounting means, shown schematically at **23** in Fig. 2. The outer diameter of the upper weight **18** is approximately the same as the inner diameter of cylinder **19**, and is vertically slidable therein. A bore **24** is provided in this weight so that the connecting means **20** may pass therethrough and engage the lower weight. Stop means **25** are provided at a predetermined point in the cylinder for engaging the lower end of the upper weight to prevent downward movement of this weight past the stop means. The lower weight **17** has a diameter small enough to permit it to freely pass by stop means **25**, so that it may travel downwardly beyond said stop means.

Guide means **22** is positioned relative to the cylinder so that the distance between end **21** of the door and guide means **22** is at a minimum before the door is in its fully open position.

OPERATION

The operation of the counterbalance arrangement of the invention will be described with relation to Figs. 4, 5 and 6. Fig. 3 shows the door in its closed position with both weights **17** and **18** tending to urge door **14** in a clockwise direction toward open position. The weights **17** and **18** are chosen so that their combined weight is not sufficient to overcome the counterclockwise force exerted by the weight of door **14**.

Opening

When the door is opened it moves from the Fig. 3 position to the Fig. 6 position and various forces either aid or resist the clockwise movement of the door at various steps during the opening, in the manner to be described hereinafter.

As the door is moved from the Fig. 3 to Fig. 4 position both weights **17** and **18** assist the operator in this clockwise movement. At a predetermined point in travel, as

selected by the positioning of stop means **25**, the bottom of weight **18** engages the stop means and rests thereon so that it may not continue any further downwardly.

As the door moves from its Fig. 4 to its Fig. 5 position the clockwise movement of the door is assisted by weight **17** acting alone. It has been found that in this portion of the travel, due to the prior movement of the door and its inertia, less weight is needed to assist the operator than is needed in the Fig. 3 to Fig. 4 movement. When the door is in its Fig. 5 position the weight **17** is in its lowermost position. The angle θ, as seen in Fig. 5, is 90°.

In order to slow the clockwise movement of the door as it approaches full open position, the position of guide means **22** is selected so that connecting means **20** passes through a position coincident with a radial line extending from the axis of rotation of the door and in a plane perpendicular to said axis of rotation, said position being before the full open position of the door. Thus, as the door moves from its Fig. 5 to Fig. 6 position, this distance increases, pulling weight **17** upwardly, said weight resisting the movement of the door in counterclockwise direction, and preventing the slamming of said door when it reaches full open position.

From the above description it is apparent that the counterbalance arrangement of the invention assists the operator in moving the door in a clockwise direction for most of the path of travel of the door while it is being opened, and resists said movement at the proper time to prevent the slamming of the door.

Closing

The counterbalance arrangement, as shown in Figs. 3 to 6, also aids the operator in moving the door from its Fig. 6 position to its Fig. 3 position. In moving from its Fig. 6 position to its Fig. 5 position, the counterclockwise movement of the door is assisted by the downward movement of weight **17** to its lowermost or Fig. 5 position.

As the door moves from its Fig. 5 to its Fig. 4 position, weight **17** starts to slow the counterclockwise movement of the door. This slowing action is increased as the door moves from its Fig. 4 to its Fig. 3 position by the engagement of weight **18** by weight **17**, which lifts weight **18** beyond stops **25** and moves it upwardly. This resisting action prevents the slamming of the door **14** when it reaches its closed position.

As shown in Fig. 7, weight **18** may be dispensed with, if desired, and the action of weight **17** will accomplish the resisting movement occurring as a consequence of the arrangement of the parts of the device of the invention.

It is to be understood that details of construction can be varied without departing from the spirit of the invention except as defined in the appended claims.

What is claimed is:

1. A counterbalance arrangement for a washing machine having an upper portion containing an opening providing access to the interior of the machine, and a door for covering said opening, said door being rotatably mounted with respect to said upper portion on a horizontal axis of rotation, the path of travel of said door extending from a closed position substantially in a front upper quadrant to an opened position substantially in a rear upper quadrant, said quadrants being defined with respect to said machine by horizontal and vertical planes intersecting substantially along said horizontal axis of rotation, said counterbalance arrangement comprising a vertically movable weight located rearwardly of said washing machine, means connecting said door to said weight, and a guide means over which said connecting means travels, said guide means being located in the rear upper quadrant outside the path of travel of said door, said connecting means and said guide means for all positions of said door being disposed in a plane extending through the path of travel of the door, substantially perpendicular to and intersecting said horizontal and vertical planes, so that when said door is initially moved rearwardly the weight moves downwardly, urging the door in a rearward direction until after the center of gravity of the door passes from said front to said rear quadrant and the line of action of the connecting means between said door and said guide means has passed through a position coincidental with a radial line extending from the axis of rotation of said door and disposed in said plane extending through the path of travel of said door, whereupon the weight moves upwardly opposing the rearward movement of the door.

2. A counterbalance arrangement for a washing machine having an arcuate surface containing an opening providing access to the interior of the machine, and a door circumferentially slidable on said surface, for covering said opening, the path of travel of said door extending from a closed position substantially in a front upper quadrant to an opened position substantially in a rear upper quadrant, said quadrants being defined with respect to said machine by horizontal and vertical planes intersecting substantially along the center of curvature of said arcuate surface, said counterbalance arrangement comprising a vertically movable weight located rearwardly of said washing machine, means connecting a portion adjacent the rear end of said door to said weight, and a pulley wheel over which said connecting means travels, said pulley wheel being located in the rear upper quadrant outside the path of travel of said door, said connecting means and said pulley wheel for all positions of said door being disposed in a plane extending through the path of travel of the door, substantially perpendicular to and intersecting said horizontal and vertical planes, so that when said door is initially moved rearwardly the weight moves downwardly, urging the door in a rearward direction until after the center of gravity of the door passes from said front to said rear quadrant and the line of action of the connecting means between said door and said pulley wheel has passed through a position coincidental with a radial line extending from said center of curvature of said arcuate surface and disposed in said plane extending through the path of travel of said door, whereupon the weight moves upwardly opposing the rearward movement of the door.

3. A counterbalance arrangement for a washing machine having an upper portion containing an opening providing access to the interior of the machine, and a door for covering said opening, said door being rotatably mounted with respect to said upper portion on a horizontal axis of rotation, the path of travel of said door extending from a closed position substantially in a front upper quadrant to an opened position in substantially in a rear upper quadrant, said quadrants being defined with respect to said machine by horizontal and vertical planes intersecting substantially along said horizontal axis of rotation, said counterbalance arrangement comprising a vertically movable weight located rearwardly of said washing machine, means connecting said door to said weight, and guide means over which said connecting means travels, said guide means being located in the rear upper quadrant outside the path of travel of said door, said connecting means and said guide means for all positions of said door being disposed in a plane extending through the path of travel of the door, substantially perpendicular to and intersecting said horizontal and vertical planes, a second weight slidably mounted on said connecting means between said first weight and said guide means and normally urged against said first weight, the bottom surface of said second weight having a transverse dimension greater than the transverse dimension of said first weight, and a stop for said second weight which engages said second weight to prevent further downward movement thereof after said door travels to a predetermined position disposed between said closed position and said opened position, so that when said door is initially moved rearwardly, both weights move downwardly together urging

the door in a rearward direction until the door reached said predetermined position and said stop engages said second weight, said first weight urging the door in a rearward direction until after the center of gravity of the door passes from said front to said rear quadrant and the line of action of the connecting means between said door and said guide means has passed through a position coincidental with a radial line extending from the axis of rotation of said door and disposed in said plane extending through the path of travel of said door, whereupon said first weight moves upwardly opposing the rearward movement of the door.

4. A counterbalance arrangement for a washing machine having an arcuate surface containing an opening providing access to the interior of the machine, and a door circumferentially slidable on said surface for covering said opening, the path of travel of said door extending from a closed position substantially in a front upper quadrant to an opened position substantially in a rear upper quadrant, said quadrants being defined with respect to said machine by horizontal and vertical planes intersecting substantially along the center of curvature of said arcuate surface, said counterbalance arrangement comprising a vertically movable weight located rearwardly of said washing machine, means connecting said door to said weight, and a pulley wheel over which said connecting means travels, said pulley wheel being located in the rear upper quadrant outside the path of travel of said door, said connecting means and said pulley wheel for all positions of said door being disposed in a plane extending through the path of travel of the door substantially perpendicular to said intersecting horizontal and vertical planes, a second weight having an aperture therethrough,

said second weight being slidably mounted on said connecting means between said first weight and said pulley wheel means, said connecting means passing through said aperture, the bottom surface of said second weight having a transverse dimension greater than the transverse dimension of the said first weight, and a stop for said second weight which engages said second weight to prevent further downward movement thereof after said door travels to a predetermined position disposed between said closed position and said opened position, so that when said door is initially moved rearwardly, both weights move downwardly together urging the door in a rearward direction until the door reaches said predetermined position and said stop engages said second weight, said first weight urging the door in a rearward direction until after the center of gravity of the door passes from said front to said rear quadrant and the line of action of the connecting means between said door and said pulley wheel has passed through a position coincidental with a radial line extending from the center of curvature of said arcuate surface and disposed in said plane extending through the path of travel of said door, whereupon said first weight moves upwardly opposing the rearward movement of the door.

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