United States Patent [19]

Stone

[11] **3,924,085**

[45] **Dec. 2, 1975**

[54] **SAFETY-START DEVICE AND CIRCUIT CONTROLLER FOR DOMESTIC APPLIANCE**

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[73] Assignee: **General Electric Company**, Louisville, Ky.

[22] Filed: **Mar. 18, 1974**

[21] Appl. No.: **451,973**

[52] **U.S. Cl.** **200/61.62**; 200/61.68; 200/61.81

[51] **Int. Cl.**[2] **H01H 3/16**; H01H 27/00

[58] **Field of Search** ..... 200/16 B, 51 A, 51.09, 200/61.62–61.83, 159 R, 318–328

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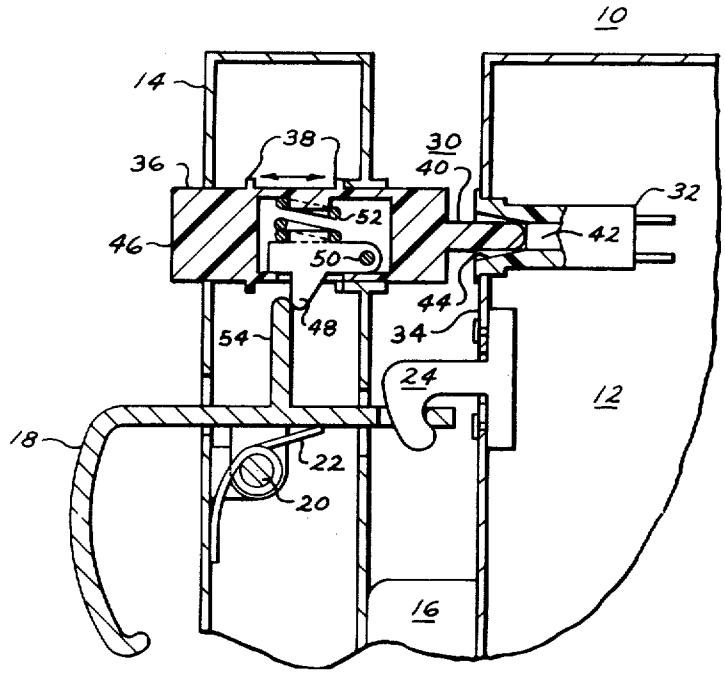
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Primary Examiner—James R. Scott

[57] **ABSTRACT**

A safety-start device for a domestic appliance insures that upon opening of the access door thereof, operation of the appliance will cease and will not automatically start again upon closing the door. Included is a switch mounted on the appliance cabinet in axial alignment with a manually operated actuating member secured to the access door. Means are included for latching the actuating member such that when the actuating member is depressed, it moves in a direction coaxially with the switch member so as to actuate the switch, becoming latched in the switch actuated position until such time as the access door is opened. The switch is in circuit with the operational components of the appliance and prevents their operation until actuated by the intentional manual operation of the actuating member.

6 Claims, 4 Drawing Figures



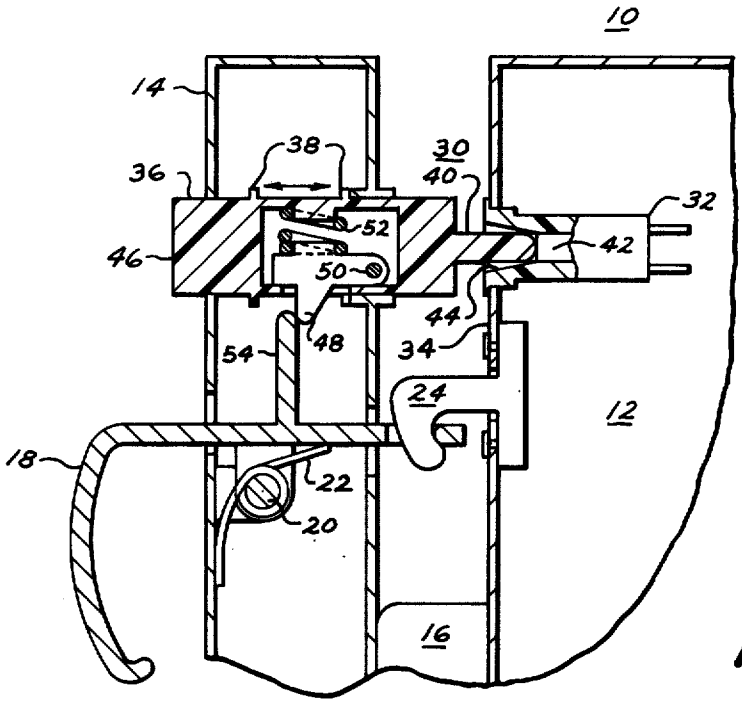


FIG. 1

FIG. 3

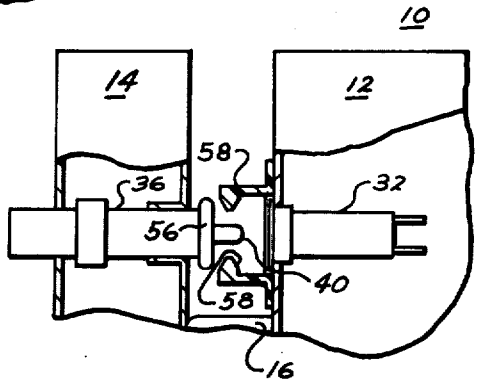
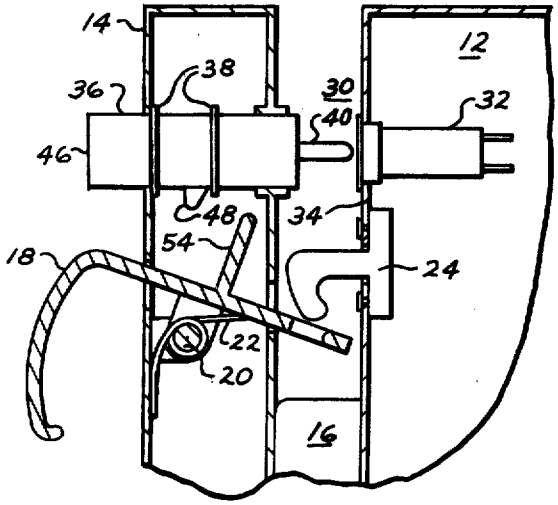


FIG. 2



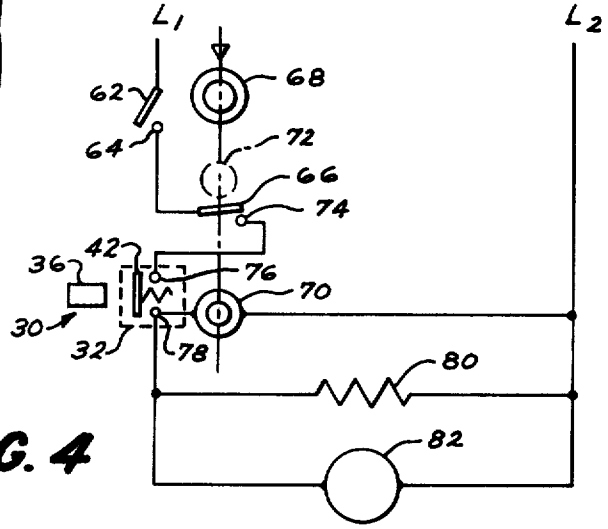


FIG. 4

SAFETY-START DEVICE AND CIRCUIT CONTROLLER FOR DOMESTIC APPLIANCE

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a safety-start device and more particularly, to a domestic appliance such as a clothes dryer making use of such a safety-start device for preventing operation of the appliance unless the safety-start device is intentionally actuated.

2. Description of the Prior Art

Safety dictates that certain domestic appliances be provided with means for preventing the operation of the appliance unless and until the access door associated therewith is in its closed position and a definite step is taken, independent of the closing of the access door, to set the appliance into operation. Generally such a device includes a switch which must be manually actuated upon the closing of the access door of the appliance.

The prior art, such as in U.S. Pat. Nos. 2,135,685 - Wells; 2,157,112 - Bonner; 2,284,026 - Stockham; and 2,291,088 - Morgenstern, disclose safety-start devices for appliances which generally require some sort of rotational movement of a handle or knob to effect actuation thereof to set the appliance in operation.

U.S. Pat. No. 3,133,168 - Jacobson, assigned to the same assignee as the present invention, shows safety-start apparatus for a domestic appliance wherein rotation of a handle effects locking of a door and at the same time actuation of a switch for setting the appliance into operation. To open the access door the handle must be again rotated. U.S. Pat. No. 3,602,662 - Haller discloses a safety-start device wherein manual depression of a push button, with the access door in the closed position, causes longitudinal positioning of a cam mechanism for effecting actuation of a switch member, the plunger of which moves at right angles to the motion of the pushbutton actuated cam mechanism. U.S. Pat. No. 3,742,162 - Wasemann discloses a safety-start device for a laundry appliance wherein the closing of an access door causes the biasing of switch contact in a direction to close them while a blocking member internal to the switch housing prevents the contacts from closing until removed through manually depressing a pin extending through the housing of the laundry appliance. U.S. Pat. No. 2,858,619 - Hughes, assigned to the same assignee as the present invention, discloses a control system for a clothes dryer. Shown therein is a schematic representation of a control circuit including a push-to-start safety switch located on the control panel of the dryer. Included is a door switch operated by the door and a speed-responsive switch operated by the drive motor, the drive motor being arranged serially in a circuit with the door switch. Once the door is closed, the door switch is also closed and the machine may be made operational by depressing the push-to-start button, and upon the motor coming up to speed, the speed-responsive switch therein is coupled in circuit to bypass the push-to-start button. In other words the push-to-start button is depressed long enough such that the motor will come up to speed to allow the speed-responsive switch to close.

It is desirable then to provide a safety-start device for an appliance, such as a domestic clothes dryer, that requires supplemental manual effort to actuate after closing of the appliance door, and further in which the opening of the door automatically unlatches the safety-start device thereby stopping the operation of the appliance. It is further desirable to provide such a safety-start device which is fairly simple of construction yet does not need a speed-responsive switch in the motor to be used in maintaining the appliance in operation.

By the present invention, there is provided an improved safety-start device useful in an appliance, such as a domestic clothes dryer which is rather simple of construction, highly reliable, efficient and of low cost and easily adapted to any appliance cabinet having a door hinged thereto. The safety-start device of this invention is, upon actuation, latched to maintain the appliance in operation and, is automatically unlatched upon opening the appliance door to effect shut-down of the appliance.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided in an appliance having a body including an access opening and a closure therefor, a safety-start device. The safety-start device comprises a switch associated with the appliance body for preventing operation of the appliance unless the switch is intentionally actuated. An actuating member is associated with the closure in axial alignment with the switch when the closure is in its closed position such that auxiliary movement of the actuating member axially inward toward the switch actuates the switch to allow operation of the appliance. Means are provided for latching the actuating member when in its axially inward position thereby maintaining the switch in its actuated state until the closure is open.

It is an object of the present invention to provide an improved safety-start device for an appliance.

It is a further object to provide a safety-start device for a domestic appliance such that the appliance may become operational only when the access door thereof is closed.

It is a further object to provide, in a domestic appliance such as a clothes dryer, a safety-start device which automatically resets upon opening of the access door of the dryer such that the dryer does not automatically become operational should the access door be closed again.

BRIEF DESCRIPTION OF THE DRAWINGS

In the accompanying drawings:

FIG. 1 is a side elevational view of a domestic appliance, such as a clothes dryer, incorporating the preferred embodiment of the present invention, the view being partly in section and broken away;

FIG. 2 is a view similar to FIG. 1 wherein the safety-start device of the present invention is shown in its unactuated state;

FIG. 3 is a view similar also to FIG. 1 incorporating the preferred embodiment of the present invention wherein an alternate form of latching means is provided; and

FIG. 4 is a schematic representation useful in the operation of such a clothes dryer and incorporating the safety-start device of the present invention.

DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to FIG. 1, there is shown an appliance such as domestic clothes dryer 10 which includes a body such as cabinet 12 having an access opening (not shown) for the placement of clothes within a drying

chamber (also not shown) therein. The access opening is arranged to be manually closed by a closure such as access door **14** suitably secured to cabinet **12** as by hinges (not shown). Means are provided, such as a gasket **16** for effecting a seal around the access opening, the door being shown in its closed and locked position.

The locking of door **14** in its closed position is secured by a closure locking handle such as door handle **18.** Handle **18** is hingedly mounted as at **20** and is provided with a spring member such as spring **22** for biasing the handle normally in the position as shown in FIG. **1.** Handle **18** then is movably secured to door **14** and is arranged to engage with a locking member **24** suitably secured to the cabinet **12.** As can be seen in FIG. **2,** upon the placement of door **14** in its closed position to mate with and seal the cabinet **12** access opening, handle **18** needs to be rotated so as to be in condition to engage with locking member **24** as shown in FIG. **1.** The spring **22** then causes handle **18** to be retained in the position shown in FIG. **1.**

In accordance with the present invention, in the preferred embodiment thereof, there is provided a safety-start device, generally referred to by the numeral **30,** useful in an appliance such as clothes dryer **10** for allowing the dryer to become operational only when the door **14** is in its closed and latched position and only when the device is intentionally actuated and further, for automatically terminating the operation of the dryer should the door be opened at any time during the operation thereof. Included is a switch such as normally open switch **32** suitably secured to cabinet **12** as on the door jamb **34** thereof.

Also included is an actuating member such as manually actuated operator **36.** Operator **36** is associated with door **14** and may be generally cylindrical of configuration but prevented from rotating by keying and arranged so as to be generally movable within a channel formed within the door **14** in a direction shown by the arrows. Operator **36** is provided with a pair of stop members **38** located annularly thereon for maintaining the operator **36** in captured engagment within the door **14.** In other words, operator **36** is free to move back and forth in the direction of the arrows when the door **14** is closed as shown in the drawings. Operator **36** is substantially in axial alignment with switch **32** when door **14** is in its closed position, manufacturing tolerance being understood. A pin member **40** is provided as a portion of operator **36,** also substantially in axial alignment with the operator and the switch **32,** and is arranged to mate with a spring loaded contact member **42** through an opening **44** in the wall of switch **32,** such that axial inward movement of the operator **36,** as by manual pressure on face **46** thereof, effects the actuation of switch **32** to allow the operation of the clothes dryer **10.** The operator **36** may, of course, be caused to move by other than direct manual pressure, such as by solenoids energized intentionally through a remotely located, manually operated switch, if so desired.

Means are provided for latching operator **36** in its operated or axially depressed position, in the form of a detent **48.** Detent **48** is secured within operator **36** and is rotatably movable therein about a pivot **50** and is further biased into the position shown in FIG. **1** through a compression spring **52.** Upon being manually depressed, operator **36** will stay in the position shown in FIG. **1** through the latching action effected by engagement of detent **48** with boss **54** of door handle **18.**

To open door **14,** it is necessary to raise handle **18** to the position shown in FIG. **2** thereby effecting disengagement of the handle **18** from locking member **24.** At the same time however, the raising of handle **18** effects the raising also of detent **48** such that the boss **54** of the handle may bypass the detent **48** thereby allowing the operator **36** to snap back to its unactuated condition shown in FIG. **2.** This happens because spring loaded contact member **42** forming a part of switch **32** exerts pressure against pin **40** thereby driving operator **36** carrying pin **40** back to its unactuated position.

Referring now to FIG. **3,** there is shown a safety-start device having an alternate form of latching means. Parts corresponding to those shown in FIGS. **1** and **2** are numbered to agree therewith. With such an arrangement, a handle such as **18** shown in FIGS. **1** and **2** is not necessary, there being a need only for some means such as a knob (not shown) for manually pulling the door **14** from its latched position. An annular member **56** is provided on one end of operator **36** for engagement with resilient detent members **58** for engaging the operator **36** when in its axially inward, depressed position. Inward depression of operator **36** will cause detent members **58** to spring outwardly to allow annular member **56** to pass thereby. With operator **36** in its fully depressed position such that pin member **40** causes actuation of switch **32,** operator **36** will be latched in place by the springing back of detent members **58,** thereby maintaining door **14** in its closed and locked position. Movement of door **14** away from door jamb **34** of cabinet **12** causes resilient detent members **58** to spring outwardly thereby allowing annular member **56** and thereby operator **36** to return to its unactuated position in the same manner as hereinbefore described. Detent members **58** may be molded of any suitable material such as polypropylene and may also be formed as a portion of switch **32.**

Referring now to FIG. **4,** there is shown a schematic representation of an electrical circuit useful in the operation of such a clothes dryer and incorporating the safety-start device **30** of the present invention. Included are a pair of input lines L1 and L2 for suitable connection to a source of electrical power such as **120** volt **60** Hz AC. A switch **62** may be located in line **L1,** the switch **62** being of the type that would normally be mounted within the door jamb of the clothes dryer such that closing of the door automatically closes the switch **62** with its contact **64.** A second switch **66** is coupled serially with switch **62** and is arranged to be closed by the rotation of a knob **68,** normally located on an instrument control panel provided with a clothes dryer (not shown), and coupled with a sequence control means such as timer **70.** Rotation of knob **68** effects the rotation of a cam **72** operable by timer **70** thereby causing switch **66** to be closed with contact **74.** Were it not then for safety-start device **30,** timer **70** would begin operation upon closing door **14** since it is coupled across lines L1 and L2. It is now necessary, in order to complete the circuit to timer **70,** to depress operator **36** which in turn actuates spring loaded contact member **42.** Provided as a portion of switch **32** are a pair of contacts **76** and **78** which, upon the actuation of safety-start device **30,** are contacted by member **42** to complete the circuit to timer **70.** Likewise, an electric heater **80** of the resistive type and a motor **82** are coupled across lines L1 and L2. Upon the completion of the circuit by actuation of the safety-start device, heater **80** and motor **82** will then be energized. Motor

82 serves to rotate a tumbling drum (not shown) for receiving therein clothes to be dried and heater **80** provides the source of heat for effecting the drying of the clothes placed within the tumbling drum. Both heater **80** and motor **82,** as well as timer **70,** will be energized so long as the door remains closed and switch **66** remains in its closed position with contact **74,** as determined by operation of timer **70** and cam **72** thereof. After a predetermined amount of time, the cam **72** will allow switch **66** to open thereby removing power from timer motor **70,** heater **80** and motor **82.** Of course, the opening of door **14** will also effect the opening of the circuit and thereby the removal of power from the operating components. However, it can be seen that the simple closing door **14** and thereby the closing of switch **62** to mate with contact **64** will not bring about the restarting of operation of the clothes dryer, since it is again necessary to intentionally manually depress operator **36** of safety-start device **30.**

The fact that the circuit shown is adaptable for use on 120 volt AC does not limit the use of such a safety-start switch. It is certainly within the realm of contemplation of this invention that it be usable in applications wherein another voltage source is used, such as 220–240 volt AC. It should be understood that switch **62** serves as an additional safety, precautionary device and is not necessary to the successful operation of the safety-start device of the present invention. Furthermore, there are many forms which this safety-start device may take, provided that the operator is substantially in axial alignment with the switch member which it actuates and the switch is actuated thereby by auxiliary movement of the operator axially inward in a direction toward the switch member. For example, the resilient detent members may be replaced by magnets for engaging a piece of magnetic material associated with the actuating member (operator) and of course, their relative placement may be reversed, i.e., the detent members or the magnets may be secured to the door. Furthermore, such a safety-start device may find a use in other appliances such as gas clothes dryers, laundry machines, dishwashing machines, microwave ovens and the like wherein it is desirable that operation of the appliance cease upon opening the door thereof, the operation thereof not to begin again without an intentional manual operation in addition to the closing of the door.

It should be apparent to those skilled in the art that the embodiment described heretofore is considered to be the presently preferred form of this invention. In accordance with the Patent Statutes, changes may be made in the disclosed apparatus and the manner in which it is used without actually departing from the true spirit and scope of this invention.

What is claimed is:

1. In an appliance having a body including an access opening and a closure therefor, a safety-start device comprising:

a switch having an opening and supported within the appliance body for preventing operation of the appliance unless the switch is intentionally actuated;

an actuating member supported on the closure and free to move back and forth normal to the closure and relative thereto, said actuating member being in co-axial alignment with an inserted into the switch opening when the closure is in its closed position such that auxiliary movement of the actuating member axially inward toward the switch and relative to the closure actuates the switch to allow operation of the appliance and completely removable from the switch when the closure is in its open position; and

means in the safety-start device for latching the actuating member with the switch and retaining it therein when in its axially inward position thereby maintaining the switch in its actuated state until the closure is opened whereupon the actuating member is moved relative to the closure and separated from the switch and the switch unactuated.

2. The safety-start device of claim **1** wherein the appliance is a clothes dryer.

3. The safety-start device of claim **2** wherein the switch has fixed contacts and is mounted on a door jamb of the dryer body and further comprises a spring loaded contact member in co-axial alignment with and operated by the actuating member for effecting actuation of the switch.

4. The safety-start device of claim **3** wherein the switch is of the normally-open type, and upon actuation becomes closed to allow energization of a circuit for effecting operation of the dryer.

5. The safety-start device of claim **4** wherein the means for latching includes a spring loaded detent member supported on the actuating member and positioned to cooperate with a closure locking handle movably secured to the closure such that the detent latches the actuating member when said member is moved axially inwardly and the closure is in its closed and locked position, and upon the unlocking of the closure, the detent member is unlatched allowing the actuating member and thereby the switch to return to their respective unactuated positions.

6. The safety-start device of claim **1** wherein the means for latching comprises at least one resilient detent member and is mounted on a door jamb of the appliance body and associated with the switch for engaging the actuating member when in its axially inward position.

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