

Feb. 17, 1970

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START AND STOP SWITCH ACTUATING PUSHBUTTONS
INTERLOCKED WITH A DOOR
Filed Sept. 17, 1968

3,496,316

FIG 1

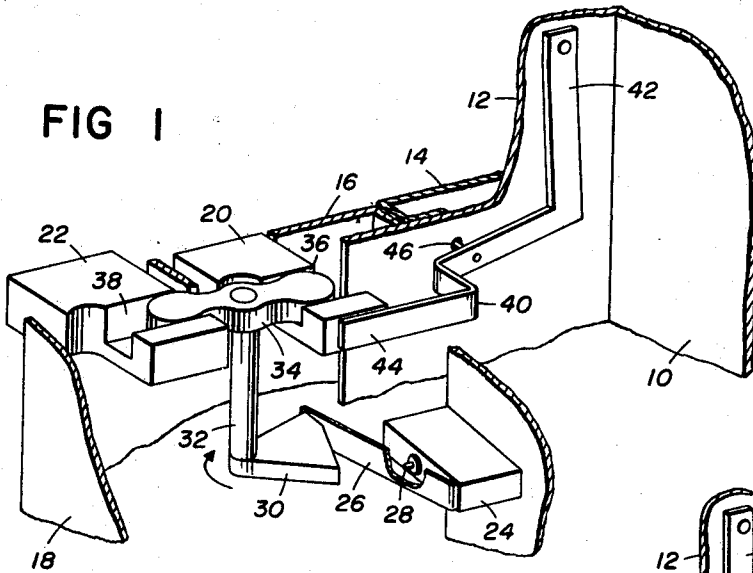


FIG 2

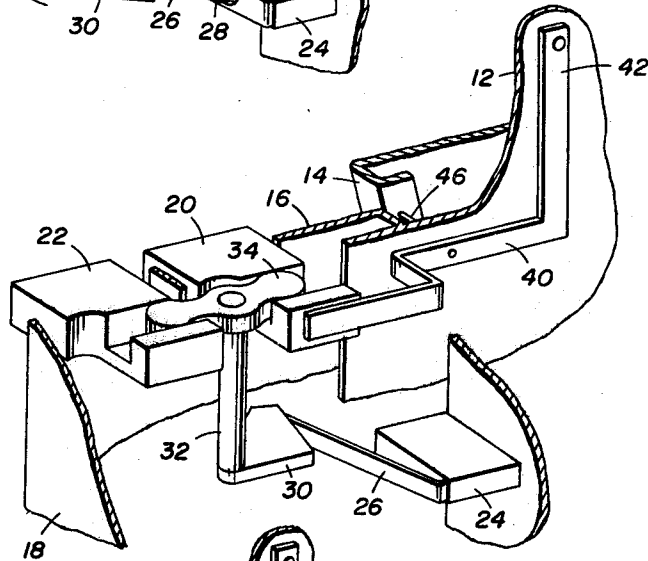
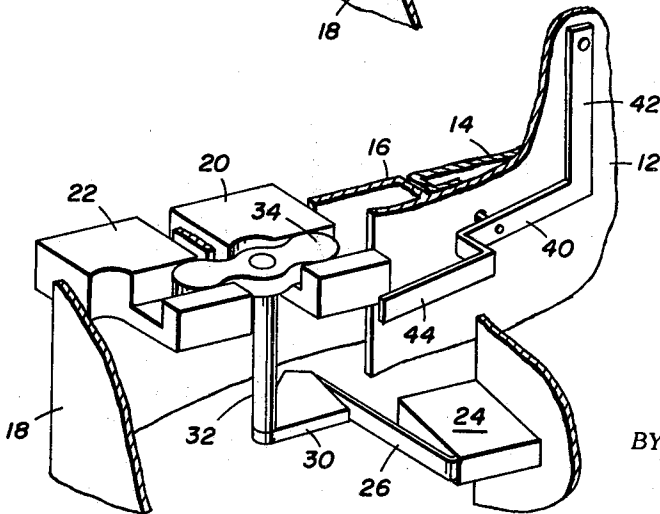


FIG 3

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3,496,316
START AND STOP SWITCH ACTUATING PUSH-BUTTONS INTERLOCKED WITH A DOOR
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Amana Refrigeration, Inc., Amana, Iowa
Filed Sept. 17, 1968, Ser. No. 760,299
Int. Cl. H01h 9/20, 33/46, 9/26
U.S. Cl. 200—50

2 Claims

ABSTRACT OF THE DISCLOSURE

A mechanical switch arrangement for a microwave oven which assures that the unit will be switched off any time the door is opened or the proper button is pushed, and will not be turned on again until the user closes the door and pushes a second button to start the unit.

Background of the invention

In recent times, there have appeared on the market for use by the average housewife, ovens for preparing food by the use of short electrical magnetic waves or microwaves which are transmitted into the oven chamber from a wave generator. In these microwave ovens, it is essential that the generator be off whenever the oven door is opened. It is also desirable that the unit not be operated without some food in the oven since this type of operation tends to be harmful to the wave generator. Thus, the unit must be designed so that the generator is turned off the instant the door is opened, but will not start when the door is closed unless the user again wishes to start the unit. In the past, control of the starting and stopping of the unit has been achieved by a control circuit including an electrical relay and a safety interlock switch in the door hinge linkage. However, in the event of failure of the relay for any reason, the stop-start function of the control system would thereby be inoperative. Thus, while the unit would always shut off when the door is opened, owing to the additional safety interlock switch, yet, depending upon in which position the relay failed, the unit could either not be turned on or not be turned off when the door is closed.

SUMMARY OF THE INVENTION

My invention provides a mechanical arrangement which will positively operate each time the oven door is opened to stop operation of the wave generator. The mechanical arrangement is such that even though the oven door is subsequently closed, the unit will not commence operation unless the operator depresses a start button. The mechanical arrangement is very simple, completely fool-proof and thus provides an entirely reliable arrangement for shutting off the wave generator the instant the oven door is opened. The arrangement, therefore, makes the use of a microwave oven completely safe by even the most inexperienced operator. The arrangement is so simple it can be incorporated into a microwave oven unit without adversely affecting the cost of the unit, and the arrangement does not detract from the aesthetics of the final finished unit since it is completely hidden within the control panel provided for the unit.

Brief description of the drawings

FIGURE 1 is a perspective view of a mechanical interlocking arrangement incorporating the principles of my invention; the view being from the inside of the control panel portion of the unit looking outwardly and showing the unit with the door closed and the start button depressed;

FIGURE 2 is a perspective view similar to FIGURE 1, but showing the oven door opened; and

FIGURE 3 is a view similar to FIGURE 1 and showing the oven door closed but with the start button not depressed.

Description of the preferred embodiment

The reference numeral 10 designates a side wall of the oven chamber, which side wall 10 would be the right interior side wall when the unit is viewed while facing it. Side wall 10 is joined to a recessed portion 12 of the front wall 16 of the unit into which recessed portion 12 the oven door 14 fits so that the door is flush with the front wall 16. The front wall 16 is then joined with an exterior side wall 18, which would be the right side wall when viewed as facing the unit. The space between the oven side wall 10 and the exterior side wall 18 provides an area for location of the controls for the unit. The front wall 16 thus is the face of the control panel, and protruding from the front wall or face 16 are two control buttons, a start button 20 and a stop button 22.

Included within the space between oven side wall 10 and the exterior side wall 18 is a switch 24 having an operating lever 26. The switch 24 is one of the main switches which operates the wave generator (not shown) that produces the microwaves which heat the food or other objects placed inside the oven. As is well known to those skilled in the art, microwave ovens are commonly equipped with a second safety switch (not shown) operatively associated with the oven door hinge so that the switch will be open the instant the oven door is opened, and will be closed when the door is closed. This second safety switch is in series with switch 24 in the control circuit so that both switches must be closed before the wave generator will be turned on. The operating lever 26 for switch 24 is preferably constructed of a resilient material so that it at all times is biased away from the switch 24. By any suitable internal connection, the switch 24 will be closed whenever the operating lever 26 is forced toward the switch 24, and the switch 24 will be open when the operating lever 26 is allowed to move away from the switch 24. This could be done, for example, by a small button 28 extending from the switch 24 which button will be depressed when the operating lever 26 is moved toward the switch to close the switch and thus turn the unit on. The operating lever 26 is at all times engaged with a cam 30 which is affixed to the lower end of a rod 32 the upper end of which is connected to the double cam 34. As shown, the start button 20 and stop button 22 are in side-by-side spaced-apart position and each of them extends inwardly to the space behind the front wall 16. The rod 32 extends upwardly between the inner ends of the start button 20 and stop button 22, and the double cam 34 has one end extending into recess 36 formed in the inner end of start button 20 while the other end of double cam 34 extends into a similar recess 38 in the stop button 22. It should be noted that for ease of manufacture and reduced cost, the start button 20 and stop button 22 are identical.

In FIGURE 1, the operative components are shown in the relative positions necessary for the unit to operate. Thus, the oven door 14 is in a closed position, the start button 20 is depressed and the switch 24 is, therefore, closed. The closing of the switch 24 is accomplished through the cam arrangement when the start button 20 is depressed inwardly. When the start button 20 is depressed inwardly, the end of the double cam 34 engaged in recess 36 will be moved so as to rotate the operating rod 32 in the direction of the arrow in FIGURE 1. This in turn rotates the cam 30 so as to move the operating lever 26 toward the switch 24 depressing the button 28 to close the switch 24. Thus, the wave generator will be turned on and the unit placed in operation if the second safety

switch associated with the oven door is also closed to complete the control circuit.

In order to reset the start button 20 and thus open switch 24 whenever the oven door 14 is opened, a reset arm 40 is provided. The arm 40 is made of a resilient material and has its upper end 42 affixed to the back side of the recessed portion 12 of the front wall. The transversely extending leg 44 of the arm 40 extends behind the start button 20 and in its path. As previously mentioned, the reset arm 40 is constructed of a resilient material so that the leg 44 is biased toward the front wall 16. Secured to the leg 44 of the reset arm 40 in any suitable manner is an operating button 46. Button 46 extends through an opening in the recessed portion 12 of front wall 16 and extends slightly beyond the portion 12 so as to be engageable with the inside of the oven door 14 when that door is closed. As shown in FIGURE 1, when the oven door 14 is closed, the operating button 46 will be engaged by the door 14 and will be pushed inwardly carrying with it the leg 44 of the reset arm 40. The leg 44 will be forced inwardly a sufficient amount to permit the start button 20 to be depressed thus closing the switch 24 as previously described.

If the oven door 14 is opened, however, the arrangement resets the start button 20 and opens the switch 24. This is illustrated in FIGURE 2 in which the oven door 14 is shown in an opened position and thus the button 46 protrudes outwardly from the recessed portion 12 of front wall 16. The reset arm 40 thus is biased forwardly and the leg 44 extends behind and engages the rear of the start button 20, forcing it outwardly and through the cam arrangement opening switch 24. If an attempt is made to depress start button 20 with door 14 open, it can be moved inwardly against the resistance of arm 40 and will close switch 24, but the previously mentioned second safety switch will prevent the wave generator from starting unless the door 14 is also closed. Of course, when the start button 20 is released, and if the door 14 is open, the arm 40 will reset the start button 20 and open switch 24. However, once the oven door 14 is closed, the small operating button 46 will be forced inwardly moving the leg 44 of the reset arm 40 inwardly as shown in FIGURE 3. In this position, there is sufficient space between the rear of the start button 20 and the leg 44 so that the start button 20 can be depressed and will remain in the start position when released.

In the event that it is desirable at any time to shut the unit off even though the oven door 14 remains closed, the operator can depress the stop button 22. If the unit is in operation, the start button 20 will, of course, be in the position shown in FIGURE 1. In this position, the stop button 22 is extended outwardly from the front wall 16, and when the stop button 22 is pressed inwardly, the double cam 34 will be rotated in a direction opposite the arrow of FIGURE 1. When this rotation of the double cam 34 occurs, it will force the start button outwardly to "off" position, and at the same time through the rod 32 the cam 30 will be rotated allowing the operating lever 26 to move away from the switch 24 thereby opening the switch and shutting off the unit. Because the cams 30 and 34 rotate about a fixed axis, it should be noted that the stop button 22 will be forced outwardly beyond its original position at the time that the start button 20 is depressed to turn the unit on. When the stop button 22 is then depressed back to its original position, it will return the start button 20 also to its original position as shown in FIGURE 3. Thus, merely returning the stop button 22 to its original position will shut the unit off and return the start button 20 also to its original position and in order to start the unit again, the start button 20 will again have to be pressed inwardly.

In the above description, it will be evident that I have provided a very simple mechanical arrangement for use in apparatus, such as ovens, where it is desired to assure that the door is closed before the oven can be started. This is done in my invention in a simple but positive manner. The mechanical arrangement is foolproof and easily operated by even the uninformed operator. It will be evident to those skilled in the art that various revisions and modifications can be made to the arrangement described herein without departing from the spirit and scope of the invention. It is my intention, however, that any such revisions or modifications which are obvious to those skilled in the art will be included within the scope of the following claims.

I claim:

1. In a microwave oven or the like having a normally closed door and a main electrical switch for controlling operation of said oven, said switch having switch operating means operatively combined therewith to open and close said switch, the improvement in combination therewith of a safety switching arrangement, said arrangement comprising: a pair of movable stop and start buttons positioned adjacent each other; a first rotatably mounted cam having portions engageable with both of said buttons so that when one of said buttons is moved to an operative position the other is moved to an inoperative position by rotation of said first cam; a second rotatably mounted cam operatively connected to said first cam by a rotatable member rotatable with said first and second cams, said switch operating means being operatively engaged with said second cam to close said switch as said cam rotates when said start button is moved to its operative position and to open said switch as said cam rotates when said stop button is moved to its operative position; and reset means operatively combined with said door and said start button so that when said door is opened said start button is moved to its inoperative position, said reset means including a reset arm, a portion thereof normally extending into the path of movement of said start button defined when said button is moved from its inoperative to its operative position, and door engaging means operatively combined with said arm and engageable by said door when closed to move said arm out of said path of said start button.

2. The combination of claim 1 in which said start and stop buttons are located side-by-side and each has a recess into which extends a portion of said first cam, the pivotal axis of said first cam being located between said buttons.

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U.S. Cl. X.R.

200—5, 61.62, 159