

March 31, 1942.

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2,278,280

ELECTRICAL SWITCHING DEVICE

Filed April 9, 1940

2 Sheets-Sheet 1

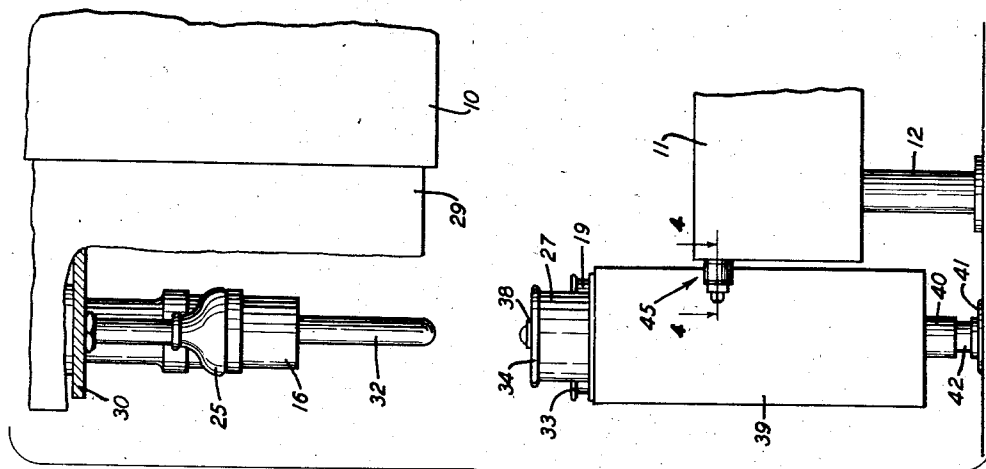


FIG. 2

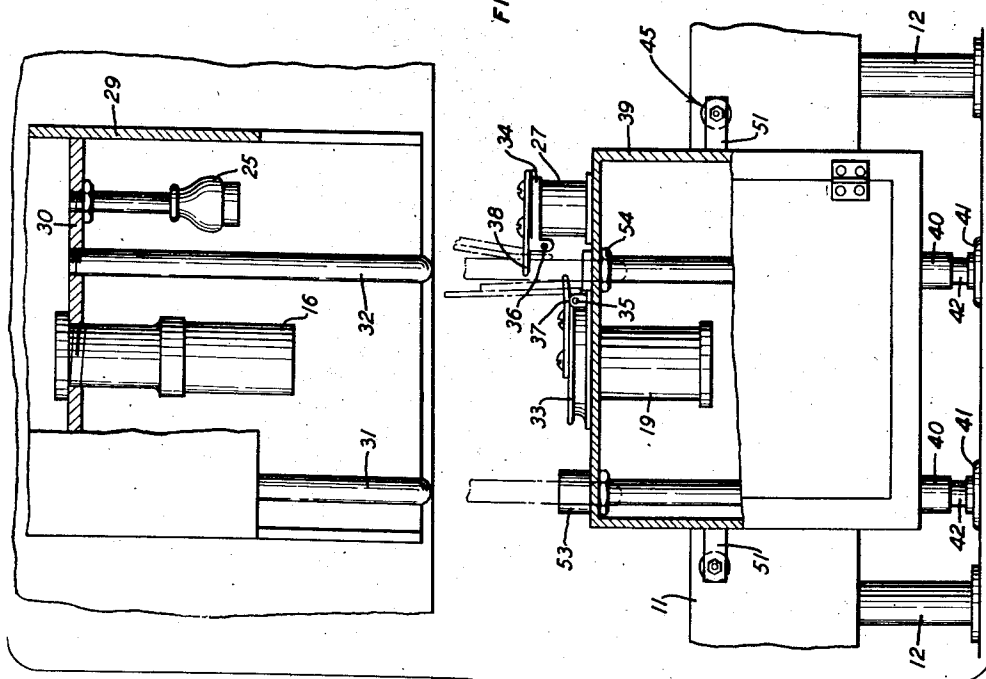


FIG. 1

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FIG. 3

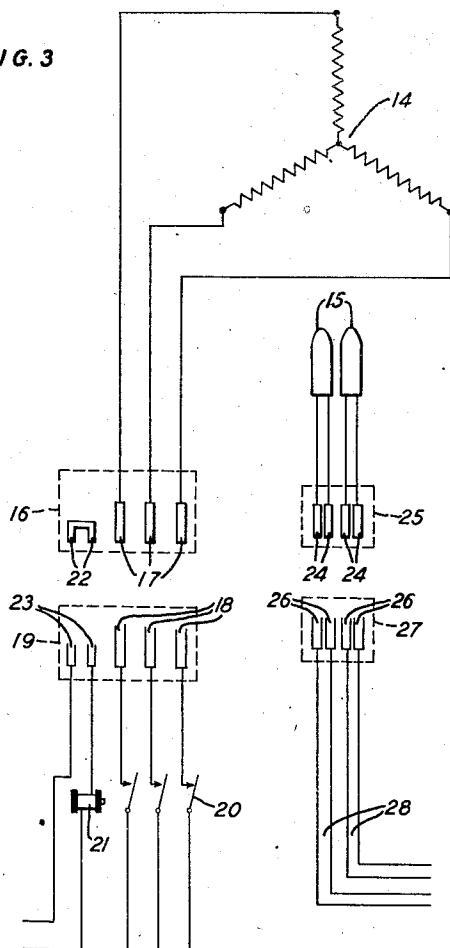
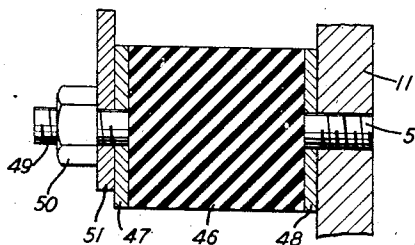


FIG. 4



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ELECTRICAL SWITCHING DEVICE

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4 Claims. (Cl. 173—328)

This invention relates to electrical switching devices, and more particularly to electrical switches for electrically heated units such as ovens.

Occasionally in processing various materials and articles of manufacture, one or more of the process steps includes heat treating by vertically reciprocable electrically heated ovens, the latter in some instances being suspended by grapples and moved thereby relative to a base on which articles or materials to be treated are to be disposed. It is frequently desirable to have electrical switching devices conditioned to close electrical circuits to heating elements of such ovens as the ovens come to rest on their bases and to open the circuits as the ovens leave their bases, but in such instances slight lateral movement of the oven might tend to prevent accurate alignment and thus accurate interengagement of the corresponding parts of the switching devices.

An object of the invention is to provide an electrical switching device, particularly for use with vertically reciprocable heating units, which is simple in structure and efficient in accurately aligning the corresponding parts thereof. With this and other objects in view, the invention comprises a switching member which may be movable with an electrical unit and guided into accurate engagement with a switch element by a projection capable also of opening a cover on the switch element.

Other objects and advantages will be apparent from the following detailed description when taken in conjunction with the accompanying drawings, wherein

Fig. 1 is a fragmentary side elevational view of the electrical switching device associated with an electrically heated unit;

Fig. 2 is a fragmentary side elevational view of the structure shown in Fig. 1;

Fig. 3 is a wiring diagram illustrating the electrical circuits completed by the switching device, and

Fig. 4 is a fragmentary sectional view taken substantially along the line 4—4 of Fig. 2.

In the present embodiment of the invention, a heating unit 10 in the form of an oven has been chosen to illustrate the invention. Due to the size of the oven as compared to the electrical switching device, it has not been possible to show the complete oven and the grapple supporting it. The oven 10 is of the hollow type, open only at the bottom and closed by a base 11 upon which it rests. The base 11 is rigidly mounted upon suitable supports 12 and the articles or materials to be treated may be placed upon the base in suitable positions so that they will be within the oven when the oven is lowered upon the base. In the present instance the oven is provided with a heating element 14 (Fig. 3) and thermocouples

15, the latter being disposed at different positions in the oven to control the heating circuit through suitable means (not shown). In the present instance the heating circuit, that is, the circuit including the heating element 14, is connected to a 440 volt, 3 phase, 60 cycle source of electrical energy. A switch member 16 of the plug type has three terminals 17 electrically connected to the ends of the heating element. The terminals are receivable in electrical engagement with contacts 18 of a switch element 19. The contacts 18 are electrically connected to the source of electrical energy through the control of relay operated switches 20. The switches 20 are normally open and are closed through the energization of a relay 21. The relay 21 is in a separate circuit which is completed by connected terminals 22 of the switch member 16 engaging contacts 23 of the switch element 19.

The thermocouples 15 are electrically connected to sets of terminals 24, of a switch member 25, receivable in electrical engagement with contacts 26 of a switch element 27. The contacts 26 are electrically included in control circuits 28 with suitable control means (not shown). The switch members 16 and 25 are mounted in a housing 29 and rigidly supported by a wall 30 of the housing for movement with the oven toward and away from its base 11. Downwardly projecting guide pins 31 and 32 are also carried by the wall 30 of the housing and extend downwardly to positions slightly beneath the lower extremity of the housing.

To eliminate the possibility of foreign particles entering the switch elements 19 and 27 and causing possible short circuits or interfering with the completion of electrical connections with their respective switch members 16 and 25, covers 33 and 34 are provided for the switch elements 19 and 27, respectively. These covers are conditioned to rest upon and completely cover their respective switch elements and are pivotally supported at 35 and 36, respectively, for movement free of their switch elements when it is desirable for interengagement of the switch members therewith. Projections 37 and 38 extend laterally in the path of the guide pin 32 so that downward movement of the guide pin with the oven will cause both covers to be moved about their pivots into open positions prior to the arrival of the switch members.

The switch elements 19 and 27 are supported by a receptacle 39 conditioned to house the various connections between the switch elements and the main electrical circuits associated therewith. The receptacle 39 is supported by two suitable legs which rest upon the floor adjacent the base 11. The legs 40 may be composed of suitable flanges 41 and adjustable threaded members 42 to position the receptacle a desired variable dis-

tance relative to the floor and the base to properly locate the switch elements relative to their switch members.

It has been found that in supporting electrical units of this type, for example, suspended ovens, by the aid of grapples which must be lowered over articles or material to be treated, that a positive mounting for switching devices does not provide a flexible connection, between the switch elements and members, which has been found necessary to compensate for slight lateral movements which might occur in lowering the oven upon its base. The receptacle 39 is, therefore, mounted somewhat on its two legs so that the receptacle may move a slight distance in any direction laterally to accurately align the switch members and the switch elements. Additional means is, therefore, required to hold the receptacle normally in one position, yet allow a slight movement of the receptacle laterally in any direction. This means consists of holding members, indicated generally at 45 in Figs. 1 and 2 and illustrated in detail in Fig. 4. Each holding member consists of a flexible central portion 46 formed of suitable material such as rubber. At the ends of each central portion, plates 47 and 48 are vulcanized thereto. Threaded portions 49 and 50 are mounted on the plates 47 and 48 and extend outwardly therefrom, the threaded portion 50 of each holding member being rigidly secured to the base 11 at spaced positions upon each side of the receptacle 39. The threaded portions 49 extend through brackets 51 rigidly mounted at adjacent sides of the receptacle 39 and are held in place by nuts 52.

The upper wall of the receptacle 39 carries bushings 53 and 54 for receiving the pins 31 and 32. It will be noted that the free ends of the pins are rounded, and the entrance ends of the bushings are chamfered so that the pins may readily enter the bushings even when they are not in perfect alignment.

When the oven is in the raised position the articles or materials to be heat treated may be disposed on the base 11 and during this time the circuits are not completed and the switch elements 19 and 27 are closed against accidental short circuiting due to the fact that their covers will drop by gravity about their pivots as soon as they are released by the pin 32. Movement of the oven downwardly toward its base will cause the pins 31 and 32 to move toward their bushings 53 and 54, respectively. The pin 32 prior to its reaching its bushing 54, will engage first the projection 38 and move the cover 34 into open position, after which it will engage the projection 37, moving the cover 33 into its open position, conditioning the switch elements 19 and 27 to receive their respective switch members 16 and 25. However, before the switch members are moved into engagement with their corresponding switch elements the pins 31 and 32 will find their bushings and if they are not in perfect alignment the pins, upon entering their bushings, will cause lateral movement of the receptacle or the oven or both to accurately align the switch members and switch elements before the former have been moved a sufficient distance to engage the latter. Movement of the receptacle is made possible through the holding members 45 due to the flexible portions 46. It is, therefore, possible to accurately align the switch members with their corresponding switch elements prior to their movement into engagement with each other.

Furthermore, the arrangement of the contacts 18 of the switch element 19 are such that their respective terminals 17 are moved into engagement therewith before their respective circuits are closed. Their circuits are closed when the connected terminals 22 engage the contacts 23 to energize the relay 21 and close the switches 20. It will be observed also that the relay will be deenergized to allow opening of the switches 20 by movement of the terminals 22 free of the contacts 23 prior to the movement of the terminals 17 free of the contacts 18. This eliminates the possibility of arcing and thus burning of the terminals and contacts of the heating circuit.

The embodiment of the invention herein disclosed is illustrative only and may be widely modified and departed from in many ways without departing from the spirit and scope of the invention as pointed out in and limited solely by the appended claims.

What is claimed is:

1. An electrical switching device comprising a switch member mounted for movement, a switch element for electrical engagement with the switch member, means to cause lateral movement of the element to cause alignment of the element with the member, and resilient means normally holding the switch element in a predetermined position and to adapt the switch element for movement into other positions by the aligning means.

2. An electrical switching device comprising a switch member mounted for movement, a switch element for removable electrical interengagement with the switch member, means to cause movement of the element to cause alignment of the element with the member prior to their interengagement, and resilient means normally holding the switch element in a predetermined position and to adapt the switch element for movement into other positions by the aligning means.

3. An electrical switching device comprising a switch member mounted for movement, a switch element for removable electrical interengagement with the switch member, and separate interengageable members respectively associated with the switch member and switch element to interengage one with the other prior to interengagement of the switch member and switch element with each other to cause transverse movement of the switch element to cause alignment thereof with the switch member.

4. An electrical switching device comprising a switch member mounted for movement, a switch element for removable electrical interengagement with the switch member, separate interengageable members respectively associated with the switch member and switch element to interengage one with the other prior to interengagement of the switch member and switch element with each other to cause transverse movement of the switch element to cause alignment thereof with the switch member, and resilient means normally holding the switch element in a predetermined position and to adapt the switch element for movement into other positions by the aligning means.

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