Nov. 4, 1924. 1,514,268

D. V. STEWART

CONTROLLING MECHANISM

Filed July 19, 1923 3 Sheets-Sheet 1

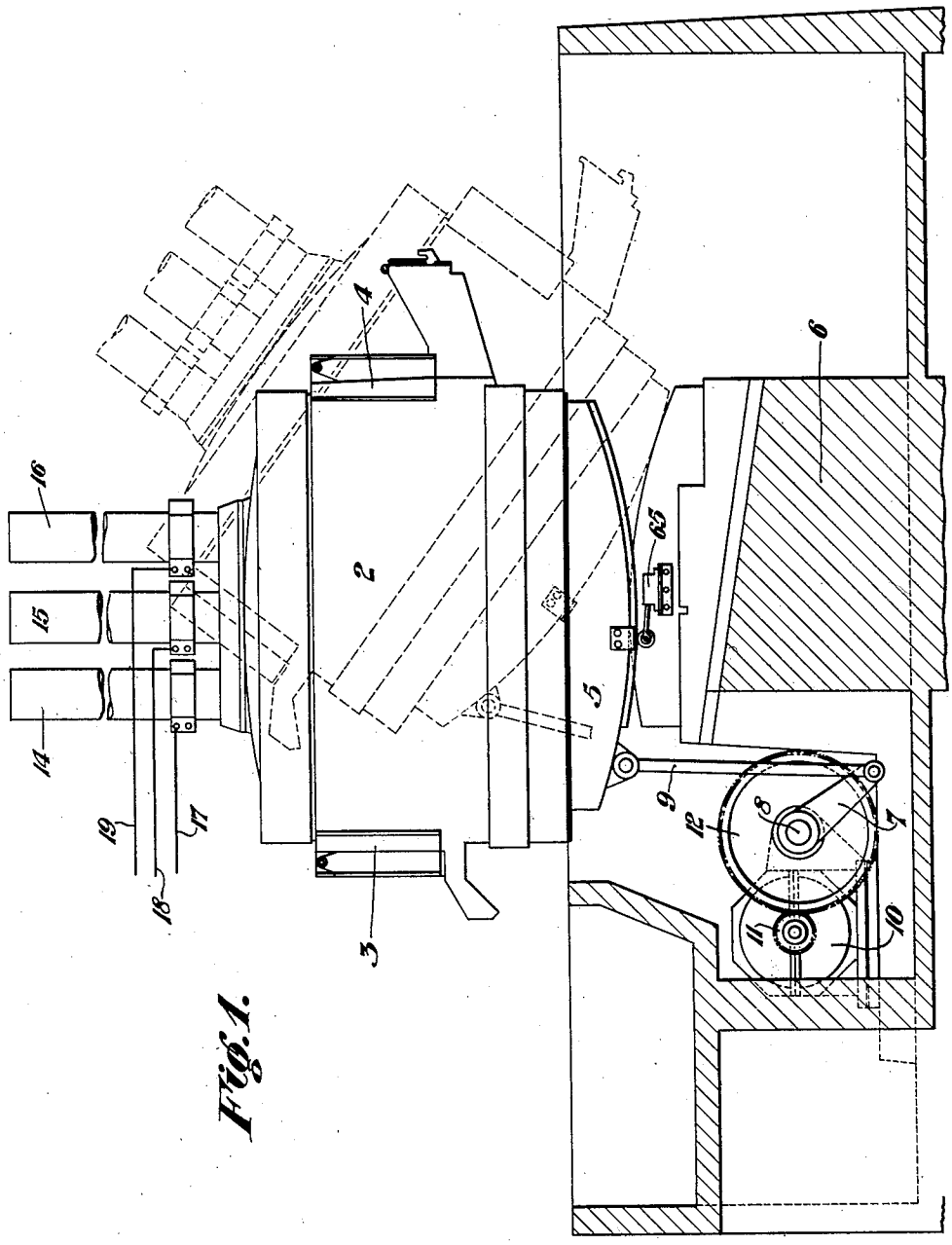


Fig. 1.

Witnesses:
Edwin Trueb

Inventor:
DAVID V. STEWART,
By:
D. Anthony Veeder
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Nov. 4, 1924.

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CONTROLLING MECHANISM

Filed July 19, 1923

3 Sheets-Sheet 2

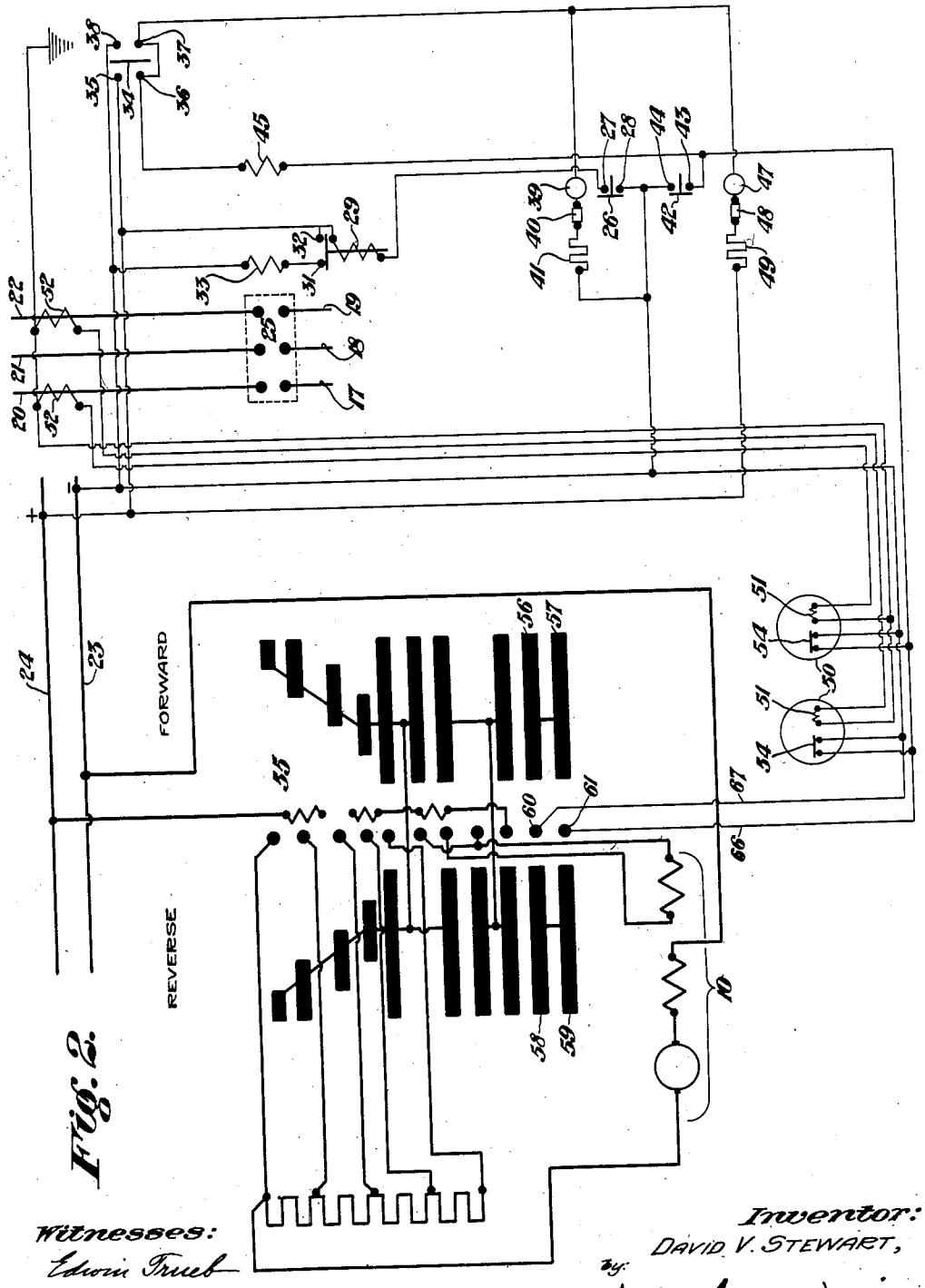


Fig. 2.

Witnesses:
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Inventor:
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Filed July 19, 1923 3 Sheets-Sheet 3

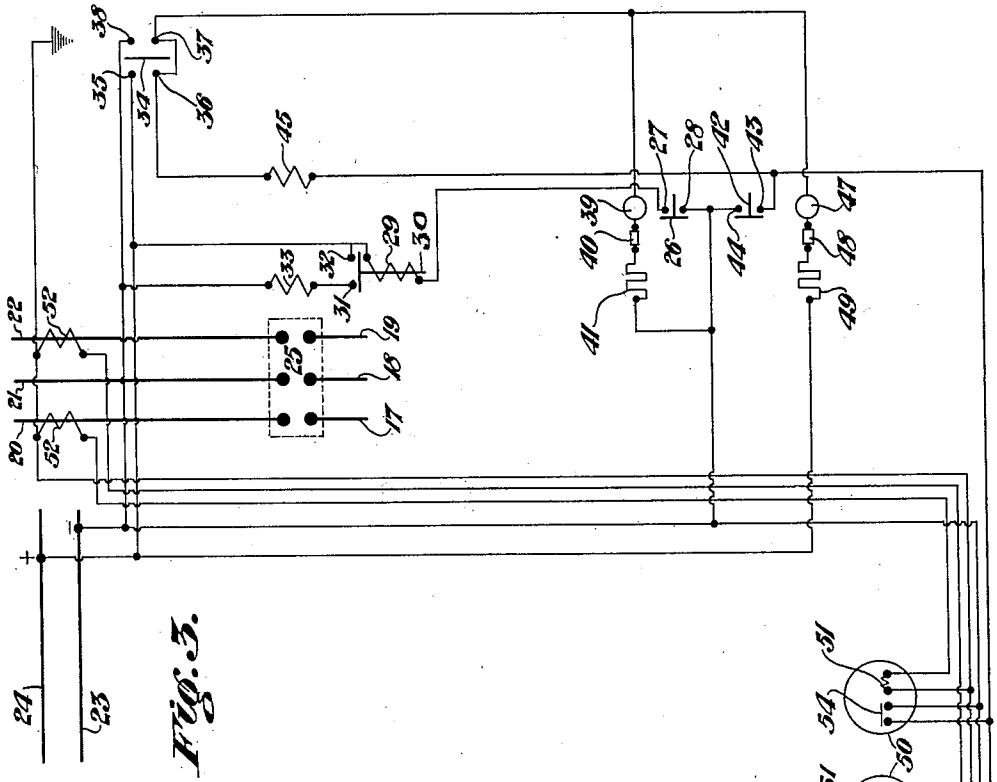


Fig. 3.

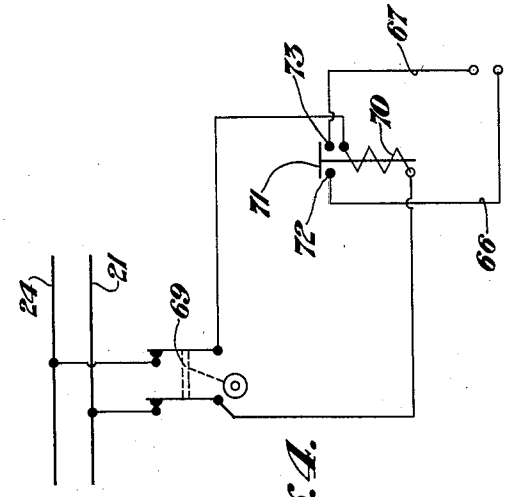


Fig. 4.

Witnesses:
Edwin Trueb

Inventor:
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Patented Nov. 4, 1924. 1,514,268

UNITED STATES PATENT OFFICE.

DAVID V. STEWART, OF COLUMBIANA, OHIO.

CONTROLLING MECHANISM.

Application filed July 19, 1923. Serial No. 652,586.

To all whom it may concern:

Be it known that I, DAVID V. STEWART, a citizen of the United States, and resident of Columbiana, in the county of Columbiana and State of Ohio, have invented certain new and useful Improvements in Controlling Mechanisms, of which the following is a specification.

This invention relates to electric furnaces and more particularly to means for automatically controlling the flow of electric current to the electrodes of such furnaces.

One object of the present invention is to provide suitable apparatus adapted to automatically break the electrical circuit to the electrodes when the furnace is tilted.

Heretofore hand operated means have been provided for breaking the electrical circuit to the electrodes when desired, and the operators have been required to break the electrode circuit prior to tilting the furnace. However, the operators at times would tilt the furnace without breaking the electrode circuit and at such times there is danger of the electrodes or their connections touching the cables which hold the ladle, positioned to receive the metal, and making a short circuit which burns the cable and drops the ladle. The dropping of a ladle having molten metal therein, as is well known, generally results in serious accidents to employes.

Again, when a furnace has been emptied and is tilted back empty, the operators assume that the electrode circuit has been broken and when it has not they have been known to have gotten shocked, causing more or less serious results.

With the present invention all of the above objectionable and serious results are eliminated, since the electrode circuit will be automatically broken when the furnace is tilted.

In the drawings, Figure 1 is a somewhat diagrammatic side elevation of an electric furnace of the class to which my invention pertains.

Figure 2 is a wiring diagram illustrating the preferred embodiment of my invention.

Figures 3 and 4 are wiring diagrams illustrating modifications of my invention.

Referring particularly to the drawings, the numeral 2 designates the body of the furnace as a whole, which is of well known construction, and is provided with back and front ports closed by doors 3 and 4, respectively. Rockers 5 are mounted on the bottom of the body 2 and rest on the curved upper face of supporting base 6. The furnace is adapted to be rocked or tilted by one or more cranks 7 which are secured to a shaft 8 and connected to the furnace body 2 by links 9. The shaft 8 is adapted to be rotated by a motor 10 through gears 11 and 12.

It will be understood that this invention is not limited to the specific form of furnace described above, but is adapted to any form of tilting electric furnace, the form shown being used to illustrate the invention because of its simplicity.

A plurality of electrodes 14, 15 and 16 are mounted in the usual manner in the furnace body 2 and are adapted to receive electric current through the wires or cables 17, 18 and 19.

Referring to the wiring diagram of Figure 2, the numerals 20, 21 and 22 designate the main power lines to the furnace electrodes, and the numerals 23 and 24 designate power lines leading to the tilting motor 10 and from which the control circuits are conveniently run in apparatus made as shown in the drawings.

The lines 20, 21 and 22 lead to a main oil switch or interrupter 25, which is adapted to break the circuit to the furnace electrodes which are connected to the switch 25 by means of wires 17, 18 and 19. The switch 25 is adapted to be closed as follows:—Close push button 26 connecting points 27 and 28, thus putting negative potential from line 23 on one side of the auxiliary relay coil 29, the other side being connected to the positive line 24 and energizing coil 29. By energizing coil 29, the plunger 30 in the auxiliary relay is raised, making a circuit between contact points 31 and 32. Contact 32 is connected to the positive line 24 and contact 31 is connected to the closing coil 33 for the switch 25, the other side of the coil being connected to the negative line 23, thus energizing the coil 33 and closing the switch 25. At the same time auxiliary switch 34 closes contacts 35 and 36 and opens contacts 37 and 38, thus placing a positive potential from line 24 on one side of red light 39, the other side being connected to the negative line 23 through fuse 40 and resistance 41, thus lighting the red light 39, which forms a visible signal for telling the operator that the current is on the electrodes.

When it is desired to break the electrode

circuit in the usual manner, the push button 42 is closed, thus connecting points 43 and 44 and putting negative potential from line 23 on one side of trip coil 45 for switch 25, the other side of the coil being connected to point 36, and thence through switch 34 to point 37 and positive line 24. The coil 45 is thus energized and opens the switch 25, which breaks the circuit to the electrodes 14, 15 and 16. At the same time, auxiliary switch 34 mechanically opens contacts 35 and 36, and breaks the circuit to the red light 39, and closes contacts 37 and 38. Closing of contacts 37 and 38 puts a negative potential from line 23 on one side of a green light 47, the other side being connected to positive line 24, through the fuse 48 and resistance 49, thus lighting the green light 47.

In case of an overload on the electrode, circuit may be broken through the switch 25 by the overload relays 50. If the electrode circuit exceeds a certain predetermined value, coil or coils 51 in the overload relays 50 will be sufficiently energized, due to the transformers 52, to actuate contact or contacts 54, so as to cause the closing of the positive and negative lines 23 and 24 across the trip coil 45, in the same sequence as in closing the push button 42, as described above, thus tripping the main oil switch 25 and opening the electrode circuit and lighting green light 47.

The above control of the electrode circuit, it will be noted, either depends upon the operator pushing the button 28 or upon an overload, and if the operator omits to operate the button 28 when tilting the furnace the electrode circuit will remain unbroken.

In order to positively prevent the electrode circuit remaining on during the tilting of the furnace, I have provided a control for said circuit, which is coupled with the controller for the tilting motor 10. A standard controller 55 is provided for controlling the circuit to the motor 10, and it is provided with additional contacts 56, 57, 58 and 59, the remaining contacts, not being of necessity in the same arrangement, are not shown. When the controller 55 is moved to either the "forward" or "reverse" position, power is applied to the motor 10 to move it in the desired direction to tilt the furnace. Assume that the controller 55 be moved to the forward position, making contact between contacts 56 and 57 and points 60 and 61. When this contact is made, negative potential is supplied to point 60 from line 23, thence through contacts 56 and 57 and point 61, to trip coil 45, from trip coil 45 to point 36, through switch 34 to point 35 to positive line 24. The oil switch 25 is thus tripped and the electrode circuit broken, and the green light circuit is made as explained in the manual operation. The same result is obtained when the controller 55 is moved to the reverse position, since contacts 58 and 59 will make contact with the points 60 and 61 the same as contacts 56 and 57. In short, when the tilting motor controller 55 is moved in either forward or reverse position, a circuit will be automatically made to the trip coil 45, thus opening the switch 25 and interrupting the electrode circuit.

Referring now to the modified construction of Figure 3, the controller 55 is omitted since it is of standard construction and controls the tilting motor circuit only. In this modified control a normally open limit switch 65 is secured on the base 6 of the furnace (see Figure 1) and serves to make the circuit through lines 66 and 67, which are the same lines closed by the contacts 56—57 and 58—59 on the controller 55 of Figure 2. In operation, when the furnace is tilted the switch 65 will be operated to close points 69 and 70, thus putting negative potential from supply line 23 on one side of trip coil 45, the other side being connected to point 36, through switch 34 to point 35, and thence to the positive line 24, thus energizing the trip coil 45 and operating the main switch or interrupter 25. The circuit to the red light is also broken and the circuit made to the green light, as heretofore described.

Referring now to the modified construction of Figure 4, a normally closed limit switch 69, which controls a circuit from the lines 23 and 24, is substituted for the switch 65 of Figure 3, and operates to normally hold an auxiliary relay 70 open. The relay 70 is provided with a plunger 71 adapted to close across contact points 72 and 73 connected to lines 66 and 67, respectively. When the furnace is tilted in either direction the switch 69 will be operated to open the circuit to the relay 70 and, therefore, the plunger 71 will drop closing a circuit through points 72 and 73 and wire 66 and 67 with exactly the same results as when the switch 65 is closed or contacts 56—57 or 58—59 are closed in the other controls.

The main feature of the invention is to provide an automatic control for breaking the electrode circuit when the furnace is tilted.

While I have specifically described certain embodiments of my invention, I do not wish to be limited thereto, since various changes and modifications may be made without departing from the scope of my invention as defined in the appended claims.

I claim:—

1. The combination with a tilting electric furnace having at least one electrode, and a source of electric current for said elec-

trode, of means for automatically breaking the circuit to said electrode when tilting said furnace.

2. The combination with a tilting electric furnace having at least one electrode, and a source of electric current for said electrode, of an interrupting device controlled by an individual control circuit and adapted to interrupt the flow of electric current to said electrode, and means for automatically making said control circuit to cause said device to interrupt the circuit to said electrode when tilting said furnace.

3. The combination with a tilting electric furnace having electrically operated tilting mechanism and at least one electrode, and a source of electric current for said electrode, of means for controlling the flow of electric current to said tilting mechanism, and an interrupting device controlled by an individual control circuit adapted to interrupt the flow of electric current to said electrode, and means controlled by said first named means for making and breaking the control circuit to said interrupting device.

4. The combination with an electric furnace having a furnace body mounted for tilting about a fixed axis, means for tilting said furnace, an electric motor for operating said means, a source of electric current for said motor, at least one electrode mounted in said furnace, and a source of electric current to said electrode, of an interrupting device for interrupting the flow of current to said electrode, and means for automatically operating said interrupter to break the flow of current to said electrode when tilting said furnace.

5. The combination with an electric furnace having a furnace body mounted for tilting about a fixed axis, means for tilting said furnace, an electric motor for operating said means, a source of electric current for said motor, at least one electrode mounted in said furnace, and a source of electric current to said electrode, of an interrupting device for interrupting the flow of current to said electrode, said device being operated by a separate control circuit, and a controller for controlling the flow of electric current to said motor for tilting said furnace and for making and breaking said control circuit to said interrupting device, said controller being adapted to make the control circuit to said interrupting device when moved to either its forward or reverse position.

In testimony whereof I have hereunto signed my name.

DAVID V. STEWART.