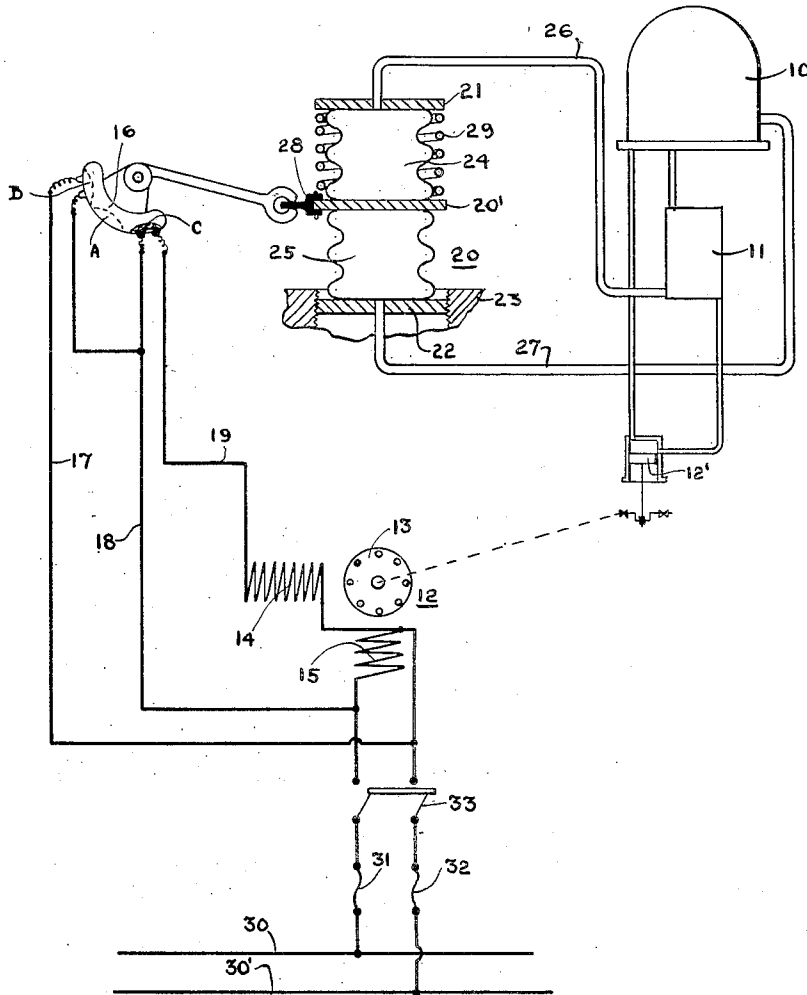


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M. C. TERRY
MOTOR STARTING SWITCH

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WITNESSES:

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MOTOR-STARTING SWITCH

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My invention relates to devices for controlling electric currents, more particularly to devices which will automatically break the circuit in the event of overloading by mechanical apparatus associated therewith.

The invention is particularly adapted to controlling the electric motor of continuously-operating domestic type refrigerators, employing motors having starting and running windings. In this type of refrigerator, it is essential that controlling means be employed that will automatically cut out the motor starting winding at the proper time and that will also disassociate the refrigerator apparatus from the electric circuit in the event that the condenser pressure becomes excessive.

In the accompanying drawing, I have shown a diagrammatic view of my invention in a preferred form.

Referring to the drawing, 10 represents the high pressure side of a refrigerator machine of the compression type while 11 indicates the low pressure side. A split-phase motor 12 drives a pressure pump 12', the motor 12 having a rotor 13, a starting winding 14 connected through a mercury switch member 16 by leads 18 and 19, respectively, and a running winding 15. The switch 16 is of a common type, including a tiltable arc-shaped tube of insulating material having a mercury globule therein and contact members projecting through the wall thereof.

A sylvon bellows unit 20 is held between supports 21 and 22, the support 22 being adjustable in the threaded bushing 23. The sylvon bellows 20 is divided into two individual chambers 24 and 25 by a partition 20', said chambers being connected respectively to the low side 11 and the high side 10 of the refrigerator as by pipes 26 and 27, respectively. Fastened to one edge of the partition member 20' is a link 28 which in turn operates the switch 16. A spring 29 is provided between the under side of the member

21 and the top side of the partition member 20' for partially compensating for the pressure difference between the high and low sides 10 and 11 of the refrigerator. The motor 12 is supplied from feed lines 30 and 30' through fuses 31 and 32 and a manual switch 33.

The operation of the device is as follows: When the switch 33 is closed current flows from the feeders 30 and 30' through the running winding 15 of the motor 12, the current also flowing through the leads 18 and 19 which are normally, at starting, electrically connected through the mercury switch 16, the globule thereof having the position C. This allows current to pass through the starting winding 14, causing the motor to start. The motor 12 drives the compressor or pump 12' which supplies pressure to the high side 10 of the refrigerator.

It is evident that after starting, it becomes advisable to disconnect the starting winding 14 which is accomplished by the combined effect of the rise in pressure in the chamber 25, and the drop in pressure in the chamber 24. This pressure difference lifts the partition member 20' and tilts the mercury switch 16 so that the mercury therein moves to the position indicated at A, causing the leads 18 and 19 to be disconnected, thereby leaving on the line only the running winding 15. The normal pressure difference between the low and high sides 10 and 11, with the aid of the spring 29, maintains the mercury globule of the switch 16 out of contact with the leads 17, 18 and 19.

After being set in operation as described, should the pressure in the high side 10 rise to such a point as to be excessive, this effect will be transmitted to the chamber 20 and will cause the mercury switch to tilt still further so that the mercury globule will assume the position indicated at B, thereby connecting the leads 17 and 18, causing a short circuit across the supply line and thereby blowing one or both of the fuses 31 and 32.

Should the current in the feeders 30 and 30' fail for any reason, the spring 29 causes the switch 16 to return the mercury globule to contact with the leads 18 and 19, thereby placing the circuit in readiness for restarting upon resumption of service from the feeders 30 and 30'.

While I have shown my invention in but one form, it will be obvious to those skilled in the art that it is not so limited, but is susceptible of various changes and modifications, without departing from the spirit thereof, and I desire, therefore, that only such limitations shall be placed thereupon as are imposed by the prior art or as are specifically set forth in the appended claims.

What I claim is:

1. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined difference of pressure between said chambers, a motor pump device embodying an armature, a starting winding, a running winding and a pump for maintaining said pressure difference, a pressure responsive device subject to the pressures in said chambers, means for energizing said motor pump device and control means subject to movements of said pressure responsive device to energize said starting winding and operative upon excessive pressure difference to stop the energization of said motor pump device.

2. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined difference of pressure between said chambers, a motor pump device embodying an armature, a starting winding, a running winding and a pump for maintaining said pressure difference, a pressure responsive device having compartments communicating respectively with the two chambers of the machine and operative in response to the difference in pressure prevailing between said chambers, means for energizing said motor pump device, and control means subject to movements of said pressure responsive device to energize said starting winding and operative upon excessive pressure difference to stop the energization of said motor pump device.

3. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined difference of pressure between said chambers, a motor pump device embodying an armature, a starting winding, a running winding and a pump, for maintaining said pressure difference, a pressure responsive device subject to the pressures in said chambers, means for energizing said motor pump device and a control switch actuated by the movements of said pressure responsive device to control the energization of said motor pump device starting winding and operative upon excessive pres-

sure difference to stop the energization of said motor pump device.

4. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined difference of pressure between said chambers, a motor pump device, an armature, a starting winding, a running winding, an electric circuit associated therewith and adapted to energize said starting and running windings, a pressure responsive device subject to the pressures in said chambers, and a control switch actuated by the movements of said pressure responsive device to control the energization of said motor pump device starting winding.

5. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined difference of pressure between said chambers, a motor pump device including an armature, a starting winding, a running winding, and a pump, means for energizing said motor pump device and fuses interposed therein, and means for blowing said fuses upon excessive pressure difference in said machine.

6. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined pressure difference between said chambers, a motor pump device including a split-phase, electric motor having a starting and a running winding, said starting winding and running winding being adapted to be simultaneously energized, a pump, a switch adapted to cut out said starting winding to permit continuous operation of said motor pump device at a predetermined pressure difference between said chambers, fuses in a circuit that is arranged to energize said motor, and means for blowing said fuses upon further operation of said switch upon development of excessive pressure difference between said chambers.

7. In combination with a machine embodying two chambers wherein it is desired to maintain a predetermined pressure difference between said chambers, a motor pump device, having an electric motor provided with a starting and running winding, said starting winding and running winding adapted to be simultaneously energized, a pump, a switch adapted to cut out said starting winding to permit continuous operation of said motor pump device at a predetermined pressure difference in said chambers and fuses adapted to be blown by further operation of said switch upon development of excessive pressure difference in said chambers.

8. In a control device the combination with a refrigerating machine embodying a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device having starting and running windings for effecting the pressure difference between

the two portions, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the working conditions prevailing within the machine for actuating said control means.

9. In a control device for a refrigerating machine, the combination with a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the difference in working conditions prevailing within the high pressure portion and the low pressure portion for actuating said control means.

10. In a control device, the combination with a refrigerating system embodying a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the pressure prevailing within the system for actuating said control means.

11. In a control device for a refrigerating machine, the combination with a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the difference in pressures prevailing within the high and low pressure portions for actuating said control means.

12. In a control device, the combination with a refrigerating machine embodying a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy to the motor pump device, separate means for controlling the flow of electrical energy through the starting winding, and means dependent upon the working conditions prevailing within the machine for actuating said last-mentioned control means.

13. In a control device for a refrigerating machine, the combination with a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for

effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy to the motor pump device, separate means for controlling the flow of electrical energy through the starting winding, and means dependent upon the difference in working conditions prevailing between the high and low pressure portions for actuating the last-mentioned control means.

14. In a control device, the combination with a refrigerating machine embodying a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy to the motor pump device, separate means for controlling the flow of electrical energy through the starting winding, and means dependent upon the pressure prevailing within the machine for actuating said last-mentioned control means.

15. In a control device for a refrigerating machine, the combination with a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two portions, of means for controlling the flow of electrical energy to the motor pump device, separate means for controlling the flow of electrical energy through the starting winding, and means dependent upon the difference in pressures prevailing within the high and low pressure portions of the machine for actuating the last-mentioned control means.

16. In a control device for a refrigerating machine, the combination with a condenser, an evaporator, and a motor pump device embodying starting and running windings for maintaining a difference in pressure between said condenser and evaporator, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the working conditions prevailing within the condenser as well as within another portion of the machine for actuating said control means.

17. In a control device for a refrigerating machine, the combination with a condenser, an evaporator, and a motor pump device embodying starting and running windings for maintaining a difference in pressure between said condenser and evaporator, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the working conditions prevailing within the evaporator as well as within another portion of the machine for actuating said control means.

18. In a control device, for a refrigerating machine, the combination with a condenser, an evaporator, and a motor pump device embodying starting and running windings for maintaining a difference in pressure between said condenser and evaporator, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the working conditions prevailing both within the evaporator and within the condenser for actuating said control means.
19. In a control device for a refrigerating machine, the combination with a condenser, an evaporator, and a motor pump device embodying starting and running windings for maintaining a difference in pressure between said condenser and evaporator, of means for controlling the flow of electrical energy through said starting winding, and means dependent upon the difference in working conditions prevailing within the condenser and within the evaporator for actuating said control means.
20. In a control device for a refrigerating machine, the combination with a condenser, an evaporator, and a motor pump device embodying starting and running windings for maintaining a difference in pressure between said condenser and evaporator, of means for controlling the flow of electrical energy through said starting winding, and means utilizing both the pressure of the evaporator and the pressure of the condenser for actuating said control means.
21. In a control device for a refrigerating machine, the combination with a condenser, an evaporator, and a motor pump device embodying starting and running windings for maintaining a difference in pressure between said chambers, of means for controlling the flow of electrical energy through said starting winding, and means responsive to the difference in pressure between the condenser and the evaporator for actuating said control means.
22. In a control device for a refrigerating machine, the combination with a relatively high pressure portion including a condenser, a relatively low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the pressure difference between the two chambers, of a switch for opening and closing a circuit through said starting winding, and means dependent upon a predetermined increase in pressure within the high pressure portion and a predetermined decrease in pressure within the low pressure portion for opening the circuit through said starting winding and dependent upon a predetermined decrease in pressure within the high pressure portion and a predetermined increase in pressure within the low pressure portion for closing the circuit through said starting winding.
23. In a control device for a refrigerating machine, the combination with a high pressure portion including a condenser, a low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the difference in pressure between said portions, of means for connecting said starting and running windings to a source of electrical energy, a switch located in said last-mentioned means for controlling the flow of electrical energy to both the starting and running windings, a second switch connected in series with the starting winding, and means dependent upon a predetermined increase in pressure within the high pressure portion and a predetermined decrease in pressure within the low pressure portion for placing the second switch in an open position and dependent upon a predetermined decrease in pressure within the high pressure portion and a predetermined increase in pressure within the low pressure portion for placing the second switch in a closed position.
24. In a control device for a refrigerating machine, the combination with a high pressure portion including a condenser, a low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the difference in pressure between said portions, of means for connecting said starting and running windings to a source of electrical energy, a switch located in said last-mentioned means for controlling the flow of electrical energy to both the starting and running windings, a second switch connected in series with the starting winding, and means dependent upon a predetermined difference in the pressures prevailing in the high and low pressure portions for placing said second switch in an open or closed position.
25. In a control device for a refrigerating machine, the combination with a high pressure portion including a condenser, a low pressure portion including an evaporator, and a motor pump device embodying starting and running windings for effecting the difference in pressure between said portions, of means for connecting said starting and running windings to a source of electrical energy, a switch located in said last-mentioned means for controlling the flow of electrical energy to both the starting and running windings, a second switch connected in series with the starting winding, and means dependent upon the working conditions prevailing within the high and low pressure portions of the machine for placing said second switch in an open or closed position.
26. In a control device, the combination with a compression refrigerating system embodying connected high and low pressure portions together with a motor pump device having starting and running circuits and ar-

5 ranged to translate refrigerant fluid from the low pressure portion to the high pressure portion, of a source of electrical energy, means for connecting and disconnecting said starting and running windings to the source of electrical energy, and means depending upon operating conditions within the refrigerating system for controlling the operation of the starting circuit.

10 In testimony whereof, I have hereunto subscribed my name this eighth day of July, 1925.

MATSON C. TERRY.

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