

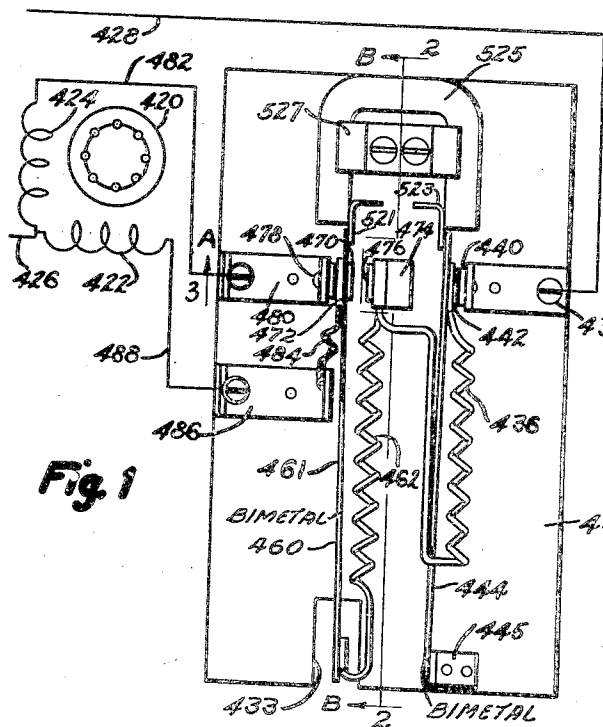
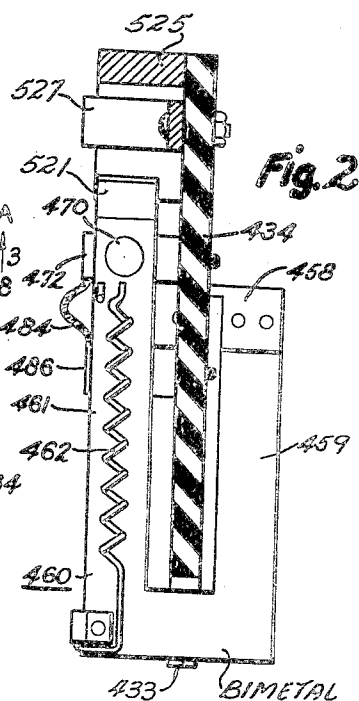
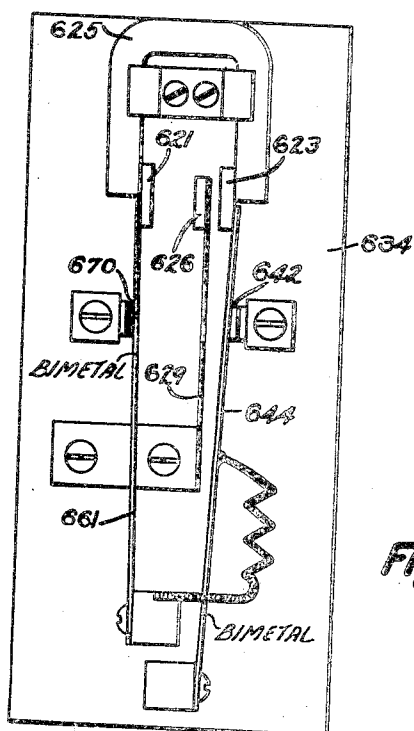
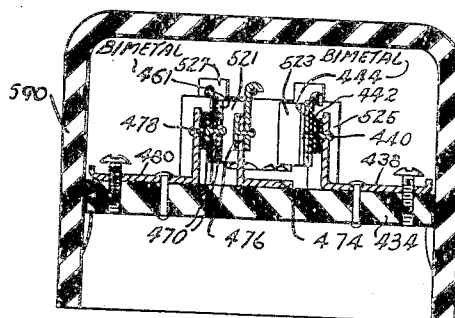
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MULTIPLE CONTROL

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MULTIPLE CONTROL

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This invention relates to multiple control devices in which only under one circumstance there is an interlocking control.

In single phase starting devices it is normally desired that the starting and overload controls operate independently. However, when the starting device moves to its running position and the overload device trips open it is desired that the overload device either be prevented from returning to closed position before the starting control returns to the starting position or an arrangement made by which the starting control will return to starting position simultaneously with the closing of the overload control. While this simultaneous return is shown applied to the starting and overload protection of an electric motor it is also applicable to other applications where a simultaneous return is required.

It is therefore an object of my invention to provide a simple magnetic device which is so arranged to provide a snap-action in opening the contacts and which also provides a means for insuring simultaneous reclosing of the contact devices.

It is another object of my invention to provide a simple magnetic means for insuring the operation of the two controls at the same time.

These objects are attained by providing an arrangement in which between the poles of a simple U-shaped permanent magnet are separate armatures connected to the starting control and the overload protector. The starting control and the overload protector are so arranged that when both trip open, their armatures will contact and be located in series with the field so that when either resets and its armature breaks away from the other armature, the other control will reset and, in fact both will always reset simultaneously.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings wherein a preferred form of the present invention is clearly shown.

In the drawings:

Fig. 1 is a plan view of a form of my starting and overload control connected diagrammatically to a diagrammatic split phase motor;

Fig. 2 is a sectional view taken along the lines 2-2 of Fig. 1;

Fig. 3 is a sectional view taken along the lines 3-3 of Fig. 1; and

Fig. 4 is a plan view of another form of control similar to that shown in Fig. 1.

In the figures of the drawings, a form of control is shown in which a simple U-shaped perma-

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nent magnet provides a snap action and also insures that when both the starting and overload controls trip open, they will reset simultaneously. This particular application of magnetic control is not confined to the particular starting system shown but may be used whenever separate armatures to separate control may be operated to contact each other in a magnetic field and it is desired that they be released simultaneously.

In Fig. 1 there is shown a split phase motor designated by the reference character 420 provided with a main winding 422 and a phase winding 424 connected by a common junction to the supply conductor 426. The other supply conductor 428 is connected to a connector 438 mounted upon the base 434 of insulating material. This connector 438 carries a stationary contact 440 engaged by a movable contact 442 carried upon the free end of a bimetal strip 444 which is anchored at its lower end in cantilever fashion by means of a bracket 445 to the base 434. The movable contact 442 upon the bimetal strip 444 connects the upper end of an electric heater 436 to the adjacent part of the bimetal strip 444.

The other end of the electric heater 436 extends directly to the connector 474 supporting the back contact 476. The connector 474 also connects to one end of an electric heater 462, the other end of which is fastened to the yoke of a U-shaped bimetal member 460. The yoke of this U-shaped bimetal member 460 is received within a recess 433 provided in the base 434. One leg 459 of the bimetal 460 is upon the bottom side of the base 434 and is fastened to a support 458 extending from the base 434. The upper leg 461 of the bimetal 460 carries a movable starting contact 470 which also fastens the pig-tail clip 472 to the leg 461 for connecting the pig-tail connection 484 to the movable contact 470. The other end of the pig-tail connection is connected to the pig-tail clip 486 which is connected by the conductor 488 to the other end of the main winding. A stationary starting contact 478 is supported by the connector 480 which is connected by the conductor 482 to the other end of the phase winding 424.

A cover 90 fits over the top of the base 434 but allows the lower leg 459 to be exposed to the environment air. When current flows through the conductor 428 to the stationary contact 440 it will flow through the heater 436 thereby heating the bimetal 444 without passing through the bimetal 444. Current will also pass through the heater 462 and through the upper leg 461 of the bimetal 460 to the movable starting contact 470.

from which current will flow through the connector 480, the conductor 482 and the starting or phase winding 424. Current will also flow through the pig-tail connection 484, the connector 486, the conductor 488 and the main winding 422 to the supply conductor 426. This will cause the upper leg 461 of the bimetal 460 to be heated and curl to the right as shown in Fig. 1 until the movable contact 470 engages the back contact 476. The bimetal leg 461 will creep to momentarily separate the contacts 470 and 476 to supply sufficient heat to the bimetal leg 461 to keep the contact 470 separated from the contact 476.

The lower leg 459 of the bimetal 460 will compensate the starting control for changes in environment temperature since any extraneous heating effect upon the leg 461 will provide a compensating heating effect upon the leg 459. Inasmuch as this bimetal 460 is intended to operate at low temperatures, such a compensation is desirable.

For this control, I have provided a simple means providing a snap action for both the starting and overload controls and in addition this same means is employed to insure that if the overload contacts open and the starting contacts open, both are reset simultaneously. To do this, I have provided the armatures 521 and 523 at the upper end of the leg 461 of the bimetal 460 and of the bimetal 444. These armatures are located between the legs of a U-shaped permanent magnet 525 which is fastened to the base 434 by the bracket 527. These armatures are, of course, some suitable magnetic material such as soft iron and are provided with extensions which are long enough so that in case the overload protector bimetal 444 trips to the open position to open the overload contacts, the armature 523 will engage the armature 521 when it is holding the contact 470 in engagement with the contact 476, or very nearly so.

With this arrangement not only will each of the armatures snap away from their respective leg of the U-shaped permanent magnet with a suitable snap action, but the armatures 521 and 523 will stick together until there is a sufficiently powerful force provided by the cooling of either or both bimetals to separate the armatures 521 and cause both bimetals to move to their starting positions which is shown in Fig. 1.

In Fig. 4 there is shown another form which may be used to carry out this same magnetic principle. In this form the U-shaped permanent magnet 625 is mounted upon the base 634 of insulating material. Also mounted upon the base 634 are the cantilever supported bimetal members 661 and 644 which correspond to the bimetals 461 and 444. The bimetal 661 at its upper end carries the armature 621 while the bimetal 644 at its upper end carries the armature 623. When the bimetals are cool, these armatures rest directly against the inside of the legs of the U-shaped permanent magnet so that only a very small comparative weak permanent magnet is required to produce the desired snap action for the movable contacts 670 and 642 which are carried by the bimetals.

In order to insure that in case both bimetals trip open that they will reset simultaneously, a third armature 626 is provided between the armatures 621 and 623 so as to provide a connecting path for the flux between the armatures 621 and 623. This armature 626 is supported upon one end of a leaf spring 629, the other end of which is anchored to the base 634. With this arrange-

ment when both of the bimetals 661 and 644 snap away from the legs of the permanent magnet 625 to open the contacts 670 and 642, they will engage the armature 626 and will remain magnetically connected until by the cooling of the bimetals 661 and 644 sufficient force is created to cause all the armatures to separate and return to the position shown in Fig. 4.

By making the starting bimetal of proper cross-section and length by operating it at a high temperature and by properly adjusting it through the set-screw 68, ideal starting time conditions can be obtained for the motor even with wide variations in room temperature conditions as well as wide variations in voltage. The control may accommodate various sizes and types of motors by varying the width, thickness, length, column loading and material of the bimetal strips, and/or the relationship to the contacts and the heaters. The relay may be mounted in any desired position and may be used for 25, 50 or 60 cycle standard currents. The control is adequately compensated for all changes in room temperatures and is made of a few simple parts which may be made without expensive tools and the entire control may be manufactured and assembled at a low cost. It may be made in very small sizes and has no starting hum. The back contact reduces the voltage drop through the starting control after the starting period of the motor and prevents overheating of the starting bimetal.

While the form of embodiment of the invention as herein disclosed, constitutes a preferred form, it is to be understood that other forms might be adopted, as may come within the scope of the claims which follow.

What is claimed is as follows:

1. A control including a plurality of movable means, each of said movable means including a portion of magnetic material, means for mounting said movable means to hold said portions of magnetic material in alignment for movement into contact with and away from each other, separate independent flow control devices individually operable by two of said movable means when said two movable means each reach a predetermined position away from each other, magnetic means having poles located beyond the limit of movement of said portions of magnetic material to form a magnetic field throughout the path in which said portions of magnetic material operate for providing a magnetic force to hold said two movable means in said predetermined positions and to cause the portions of magnetic material to be attracted to each other when both leave said predetermined positions and move toward each other and also to cause said portions of magnetic material to return simultaneously to said predetermined positions when this attraction is overcome.

2. A control including a plurality of strip portions mounted for movement toward and away from each other, each of said strip portions being provided with a piece of magnetic material, said pieces of magnetic material being located on said strip portions so as to have aligned paths of movement into contact with and away from each other, two of said strip portions carrying a switch contact, a cooperating contact for each of said switch contacts located to be contacted by the switch contacts upon reaching a limit of movement away from each other, magnet means located immediately beyond the limit of movement of two of the magnetic pieces away from

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each other to provide a magnetic force holding the contacts engaged and providing a magnetic field within which the pieces of magnetic material move to cause the pieces to be held together magnetically with a light force when they contact.

3. A control including a plurality of movable means, each of said means including a portion of magnetic material, means for mounting said movable means to hold said portions in alignment for movement into contact with and away from each other, two of said mounting means including individual actuating means, separate independent flow control devices individually operable by two of said movable means upon reaching a predetermined position away from each other, permanent magnet means having pole areas positioned directly beyond two of said portions when said two movable means are in said positions to provide a magnetic force to hold said two movable means in said positions and to provide a magnetic field throughout the path in which said portions operate.

4. A control including a plurality of movable means, each of said means including a portion of magnetic material, means for mounting said movable means to hold said portions in alignment for movement into contact with and away from each other, two of said mounting means including individual actuating means, separate independent flow control devices individually operable by two of said movable means upon reaching a predetermined position away from each other, a U-shaped permanent magnet having its yoke extending around said portions and its poles positioned directly beyond two of said portions

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when said two movable means are in said positions.

5. A control including two movable bimetal strip portions each provided with a piece of magnetic material, means for mounting said portions so that said pieces move in substantial alignment into contact with and away from each other, a U-shaped permanent magnet extending around said pieces and having its pole areas located directly beyond the limits of movement of the pieces away from each other, and separate independent flow control devices operably connected to said strip portions.

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