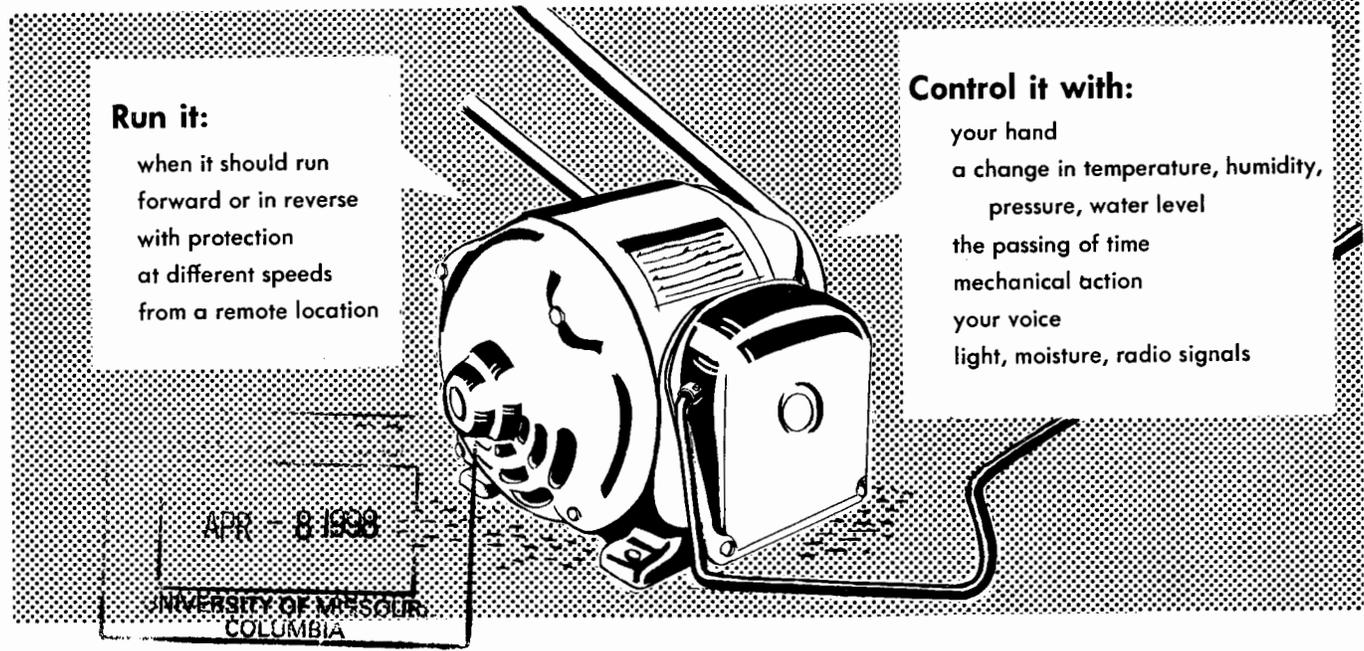




TV
197



KEEP YOUR MOTORS UNDER CONTROL



One thing is certain about the electric motors that you know--not all of them run all the time!

Instead, they run only when they should--to refrigerate, ventilate, elevate, clean, mix, sew, move materials, and so on.

In addition, some of them run some of the time at one speed, then later at a different speed. Others run sometimes in one direction, at other times in another.

Did you ever wonder how all this starting and stopping and changing of speeds and direction is done?

The answer, of course, is that it is all done by means of the right kind of control device for each motor. Some controls also provide protection for the motor. (NOTE: Many of the control devices described may be used for lights and heating equipment, too.)

What to Do

1. Learn what the most common kinds of motor controls are, how they work, and where they are used.

2. List all the motors used in your home or on your farm. In a separate column, tell how each one is controlled, and whether overload protection is provided.

3. Inspect as many different types of motor controls as you can. If possible, help your club leader bring some of these to a club meeting so that you might better understand how they work.

4. Show others how some of these controls work, and tell how they are used.

How to Pick the Right Control

Selecting the right control for a motor depends on many things: Can the control be automatic, or will it be operated by some person? What safety measures should be taken? If manual, will it be near the motor, or at one or more remote locations? If automatic, what will be the changing condition that will make the control work? Will the control include overload protection for the motor? How large is the motor?

These are some of the questions that must be answered before the right control is picked.

Manual or Automatic?

What determines when the motor should be turned on or off? Is it a change in temperature or humidity? A change in water level? A change in air pressure? The passing of time? The movement of equipment that could cause damage?

Generally speaking, changes in temperature, humidity, fluid level, pressure, time, and location all can be used to control electric motors automatically. Other types of automatic controls are in use, but these are the most common.

How Many Locations?

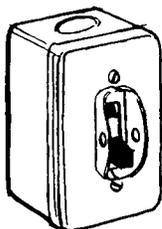
If a motor is to be controlled manually, it may be that control from more than one point is desired. If so, this will affect the type of manual control used.

Manual On-Off Switches

The only control that many small motors have is a cord and plug, but an on-off switch is much safer and more convenient.

Snap switches such as are used for lights are suitable for controlling motors, up to the limit of their current-carrying capacity. (Almost all motor controls have quick snap-action to cut down on the "arcing" or flow of current through the air when the circuit is broken.)

Three-way and four-way switches can be used to control small motors from two or more locations. (Compare rated capacity of the switches with the current requirements of the motor.)



Snap-action switch for small motors—with overload protection

Special small-motor snap switches that include overload protection are better, however, if the motor does not have such built-in protection. When you go to buy such a control, know the full-load current rating of the motor so that the store can supply you with the right size "heater" for it. This is the part that causes the switch to open if a dangerous overload does occur.

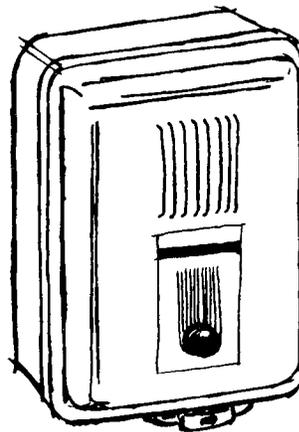
Other kinds of manual switches are those that spring back into the off position when you let go of them. These trigger switches are common on power shop tools. Treadles, that work when people, animals, or vehicles pass over them, use the same principle.

Magnetic Starters

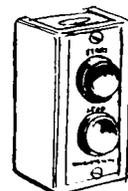
Magnetic starters are made for motors ranging in size from one horsepower on up. The push of a button, either on the starter or at any one of several remote locations, closes a circuit that causes an electromagnet to snap the contacts together. It includes overload protection.

Because the control circuit does not carry the full motor current, this kind makes it possible to control a larger motor automatically. It can be actuated by the small amount of current that will safely flow through a thermostat or other sensing device.

It also permits the use of any number of control locations, and the wiring that connects these push-button stations is relatively light.



Magnetic starter for larger motors—with remote push-button



Reversing Switches

This kind of manual switch changes the motor connections to get reverse rotation when that is desired. It is used on two-way conveyors, certain fans, and shop equipment.

Variable Speed Controls

This kind of control uses varying amounts of resistance in the motor circuit, or changes from one motor winding to another.

It is used on some fans, food mixers, and sewing machines.

Time Switches

These use electric or spring-driven clocks to open and close contacts. Some kinds automatically start and stop motors at certain times each day. Others can be set for motors to be on for a certain number of minutes and off for a length of time.

Still others will stop operation the desired length of time after the motors have been started manually.

Kitchen appliances, off-peak water heaters, poultry and cattle feeders, fans, irrigation pumps, and incubators use time switch controls.

Thermostats

Thermostats depend on the expansion and contraction of gases, liquids, or solids to open and close contacts.

They come in "heating" and "cooling" types. The heating type is normally closed (contacts together). This means that the

motor will run until the temperature comes up to a set level. This kind is used on brooders, and of course on many devices which have no motors but which merely have heating elements.

The cooling type is normally open (contacts apart). It does not complete the circuit until the temperature gets up to a set level. It is used on ventilating fans, refrigerators, and air conditioners.

There is a limit to the size of motor that can be controlled directly by a thermostat or other sensing device, and on a large motor it may be necessary to use a magnetic starter to carry the motor current.

Humidistats

A humidistat is a mechanical snap-action switch operated by an element, generally made of human hair (sensitive to changes in the amount of moisture in the air).

This device is used to control humidifiers, dehumidifiers, and ventilating fans.

Pressure Switches

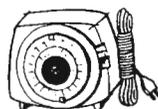
This kind of switch has a bellows or diaphragm that is linked to a snap-action switch. When certain pressures are reached, the switch is tripped on or off, according to the way it is adjusted.

Pressure switches can be actuated by changes in pressure of gases, liquids, and by the presence or absence of bulk materials such as grain in a bin.

They are commonly used on water pumps and air compressors.



Reversing switch



Time switch



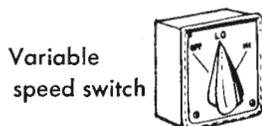
Pressure switch



Limit switch



Thermostat



Variable speed switch



Humidistat



Float switch

Float Switches

This is a mechanical snap-action switch operated by a float. When the water or other liquid rises to a pre-determined level, the float rod actuates a trip-lever and opens the circuit. When the liquid level falls, the circuit is closed again. These are used on stock-watering tanks and also on sump pumps.

Limit Switches

There are certain types of equipment, such as motor-operated doors, windows, gates, elevators, and hoists that are safer and more convenient if they have a switch to open the circuit when they reach the end of their travel. A limit switch depends on mechanical action, something pushing on an external bar or roller to open a snap-action switch.

Miniature Snap-Action Switches

Trigger-type snap switches that operate with a very small amount of mechanical pressure are used to control many types of electrical equipment. They are available in normally-open and normally-closed types.

Electronic Controls

Through the miracle of electronics, motors can be controlled by many other means.

Electronic controls can be built or purchased that will operate when actuated by: the human voice, the presence of the human body, light, the presence of moisture, the passing of time, and radio signals.

What Did You Learn? (True or False)

1. A switch should open and close quickly to prevent arcing of the electric current.

2. Switches with overload protection are used only for large motors.

3. A pressure switch operated by a diaphragm does not have a snap action.

4. A pressure switch cannot be used to control air pressure.

5. The float rod of a float type switch operates a trip-lever that always opens the circuit.

6. Without a limit switch, an elevator could cause extensive damage.

7. You can use the same thermostat for a stable ventilating fan and for an electric room heater.

8. You can control a large motor directly with a humidistat.

9. Time switches can control only lighting circuits.

10. Radio signals are the only things that will actuate electronic controls.

Demonstrations You Can Give

Borrow or otherwise get as many different kinds of motor controls as you can. After studying how they work, connect each of them to a separate light. Show others how each device will turn its light on and off, manually or automatically, as the case may be. (Use the warmth of your hand to actuate a thermostat, or the moisture in your breath to actuate a humidistat, and so on.)

For More Information

See the literature of manufacturers of control devices, or ask your power supplier representative.

<i>Motor</i>	<i>H.P.</i>	<i>Control</i>	<i>Overload Protection?</i>
<i>Water Pump</i>	<i>1/4</i>	<i>Pressure Switch</i>	<i>No</i>
<i>Dehumidifier</i>	<i>1/6</i>	<i>Humidistar</i>	<i>No</i>
<i>Crop Dryer</i>	<i>5</i>	<i>Magnetic Starter</i>	<i>Yes</i>

University Libraries
University of Missouri

Digitization Information

Local identifier ty197

Source information

Identifier	Cataloging pending
Format	Book
Content type	Text
Notes	Stamp in blue on front cover. Handwritten notes on cover in pencil and red ink.

Capture information

Date captured	2018 March
Scanner manufacturer	Ricoh
Scanner model	MP C4503
Scanning software	
Optical resolution	600 dpi
Color settings	grayscale and color
File types	tiff
Notes	

Derivatives - Access copy

Compression	
Editing software	Photoshop
Resolution	600 dpi
Color	grayscale and color
File types	tiff and pdf
Notes	