

Inside a handheld hairdryer



Have you ever wondered how they fit a powerful motorised fan, a heater and control circuits inside the compact case of a modern handheld hairdryer. A look inside shows that they are an interesting application of basic electronics principles.

by **PETER VERNON**

The most expensive and heaviest component of larger hairdryers is the motor to drive the fan. The fan motor needs to be reasonably powerful in order to deliver a concentrated blast of air right to the roots of the hirsute mass on the user's head.

Larger hairdryers, such as the bonnet type, generally use a shaded-pole AC motor, while the older "heat-gun" type of hand-held dryer often use a "universal", or series wound AC/DC motor. Both sorts of motors are quite difficult to manufacture below a certain size, and they lack sufficient power.

The "slim line" style of hand-held hairdryer, illustrated here, gets around this problem by using a small permanent-magnet DC motor. These motors combine small size with the power required to drive an efficient tangential blower fan.

This DC motor is powered directly from the mains via a bridge rectifier. The heating element itself is used as a series limiting resistor to drop the mains voltage for use by the motor. The circuit diagram illustrates the concept.

Power is applied to the dryer through a three-position switch. The heating element is actually tapped, and the bridge rectifier fed from the tap to produce approximately 15V DC (unfiltered) for the fan motor.

Speed and temperature selection are provided for the dryer by a simple method. When the three position switch is in the "dry" position, the full mains voltage is applied to the heating element, to produce a high temperature and a high fan speed.

When the switch is in the "style"

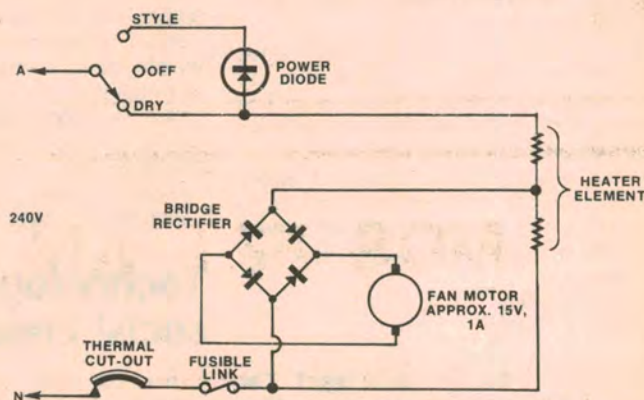
is reduced by a proportionate amount, causing it to run at a slower speed.

Great attention has also been paid to safety in the design of hand-held dryers. They are double insulated — even the switch is operated by a sliding plastic cover plate. A thermal cut-out is provided in the form of a bi-metallic strip mounted near the heater coil, and there is a fusible link in the power supply wiring.

All told, these new lightweight hairdryers are an ingenious application of simple electronics circuitry to produce a highly effective product.

And just before we conclude, here is an interesting idea. That fan and motor

The fan motor is run from a bridge rectifier connected to a tap on the heating element.



position the mains voltage is half-wave rectified by a power diode before it is applied to the heating element. This half-wave rectification cuts the mains voltage to approximately 170V RMS, reducing the power to the heating element by half. The voltage to the motor

could be very useful for forced air cooling in a high power amplifier or computer power supply. When run from 12VDC or less it should be reasonably quiet but still deliver a copious quantity of air. Think of that possibility if ever you come across a discarded unit. ☺

That compact DC motor in the dryer below delivers a really copious flow of air from the efficient blower.

