



SEMI- CONDUCTOR SPEED CONTROL for your

**electric drill ... sewing machine
... saber saw ... portable band
saw ... food mixer ... food
blender ... movie projector ...
sander ... fan ... lathe ... etc.**

By J. R. Jacques General Electric

Rectifier Components Department

SUPPOSE you want to reduce the speed of your electric drill for some heavy-duty hole-making. Or you need to slow down your saber saw to cut through some half-inch boiler plate without burning up the fine-tooth blade. Installing a variable power resistor in series with your tool isn't the answer. Sure, the drill or saw would run slower, but considerable power would be lost and it would probably stall. The torque required by a heavy-duty task just wouldn't be there.

A recent brainchild of semiconductor research has provided the answer for you. The silicon controlled rectifier unit described here can be built for about \$12 and provides an effective control over the speed of any *series-universal* type motor. The tool simply is plugged into the control box which, in turn, is plugged into a 117-volt outlet. Not only is the control continuously variable, but the amount of power provided by the speed-control *automatically adjusts it-*

PARTS LIST

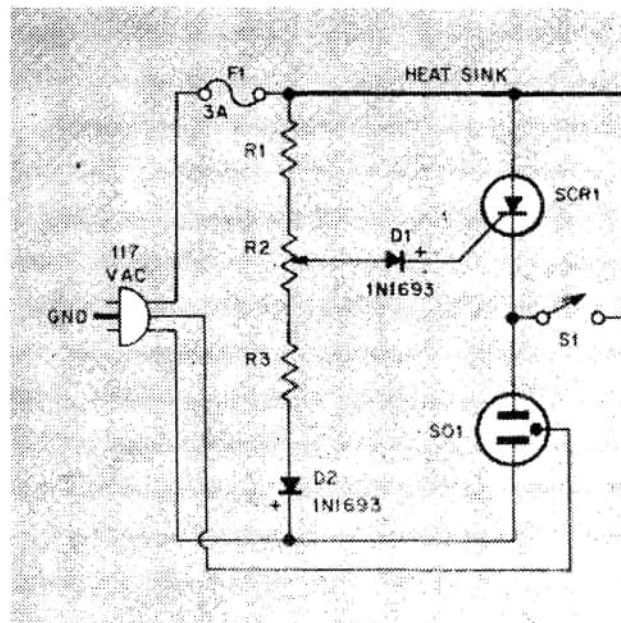
Resistors:

R1—2,500 ohms, 5 watts
 R2—250-ohm, 4-watt wirewound potentiometer
 R3—33 ohms, 1/2 watt (see text)
 D1, D2—1N1693 diodes
 S1—SPST toggle switch
 F1—Fuse block with 3 A, 3AG slow-blow fuse
 SCR1—GE C15B silicon controlled rectifier
 SO1—AC receptacle (Amphenol #61F1 female with ground)
 Misc.—3 1/4" x 2 1/8" x 1 1/8" Minibox (see text); line cord with grounding type plug; standoff insulators for heat sink; knob; etc.
 The above parts (excluding the cabinet and heat sink) are available as a package from Allied Radio, 100 N. Western Ave., Chicago 80, Ill. Stock #53B511. Price: \$11.

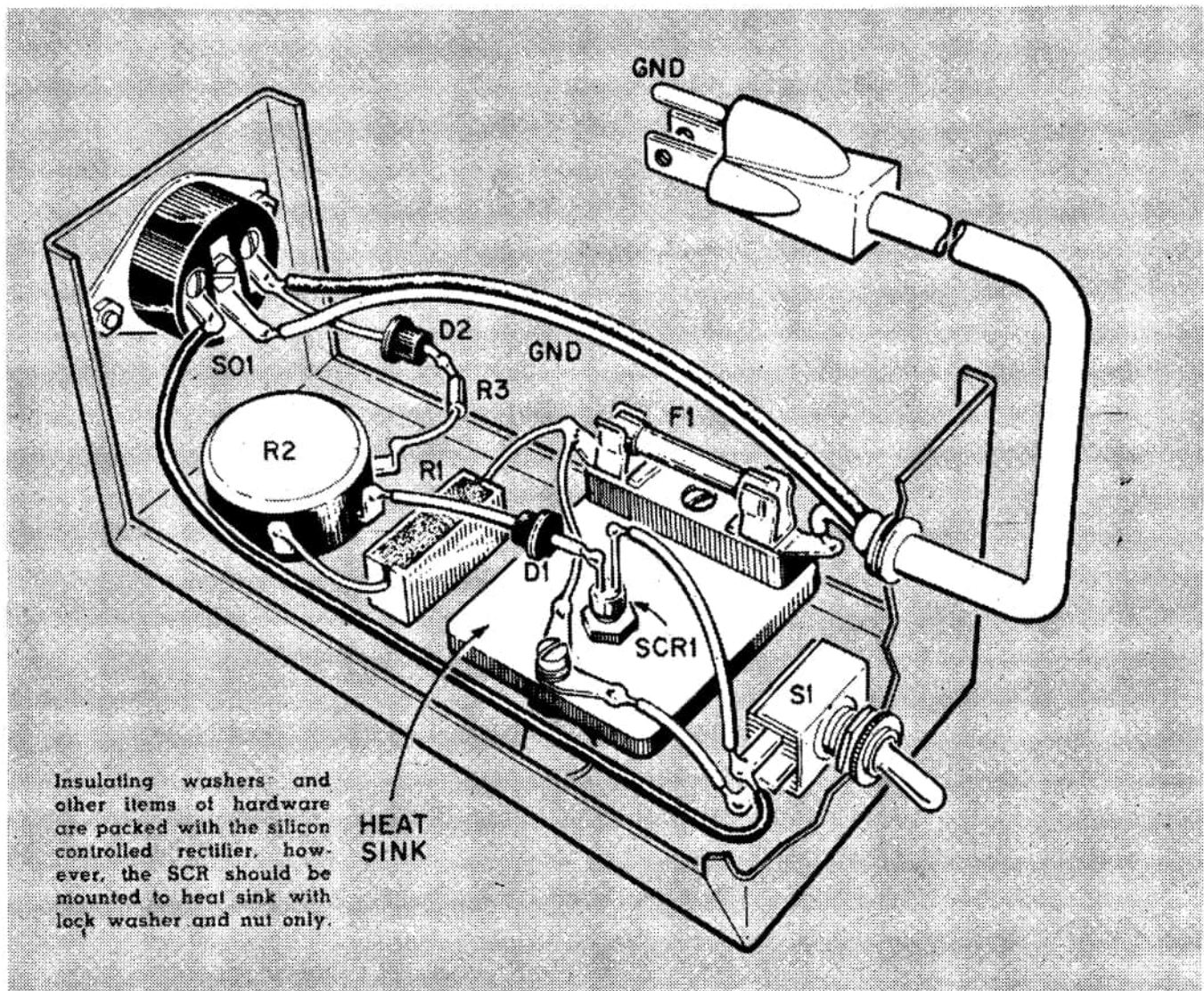
PARTS LIST (Heavy-Duty Version)

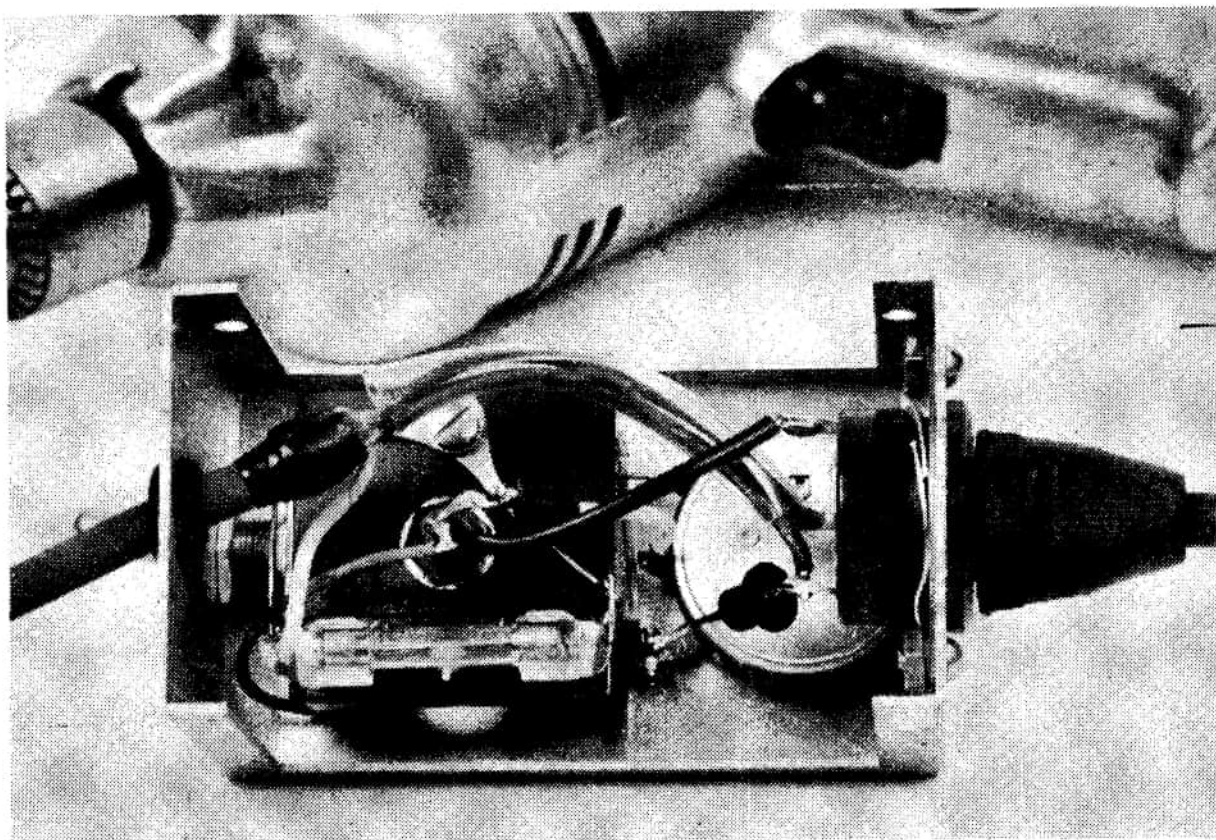
Same parts listed above except the following:

F1—Fuse block with 8 A, 3AG slow-blow fuse
 SCR1—GE C-37B silicon controlled rectifier
 R1—1,000-ohm, 5-watt resistor
 Allied Radio stock #53B512. Price: \$15.75



S1 switched to the full-speed position takes SCR1 out of the circuit but the resistors will run warm.





Compact prototype unit would benefit from larger heat sink and cabinet. Ventilation holes are required.

self to the work being done. In other words, if a drill tends to slow down because of the load, the speed control unit automatically supplies more power and thereby maintains an essentially constant speed.

Besides drills and saber saws, this speed-control works with almost any motor-operated tool or appliance with a universal motor within its 3-amp. rating—sewing machines, band saws, food mixers, blenders, movie projectors, sanders, fans, lathes, vibrators, etc. A heavy-duty version (see Parts List) with an 8-ampere rating can be constructed from the same plans.

Construction Notes. There are a few precautions to be taken in the construction of the speed-control. Layout is not critical, but care must be taken in the heat sinking of silicon control rectifier SCR1. As is shown, SCR1 is mounted on a heavy copper or aluminum disc, which in turn is electrically insulated from the box by standoffs. If you can spare the room, it would be a good idea to build the unit in a larger cabinet than is shown in order to incorporate a larger heat sink. For intermittent use, the $1\frac{1}{2} \times 1\frac{1}{2}$ -inch heat sink is adequate, but the larger the better.

If certain tools or appliances do not go as slow as desired in the minimum speed setting, R3 can be changed to reduce speeds even more. Your particular tool may require a 22-ohm to a 68-ohm, $\frac{1}{2}$ -watt resistor. Too low a resistance may lead to erratic motor operation. The heat sink for the heavy-duty model should be aluminum or (preferably) copper, about 5 x 5 inches, and at least $\frac{1}{16}$ -inch thick.

If you are not certain that your tool or appliance has a universal motor (most do) you can check by looking for the brush holders. If the motor housing label indicates that the tool can operate on AC or DC, then you can assume that it has a universal-type motor.

The theory of operation of the speed-control is quite complex, despite the simplicity of the circuit worked out at General Electric. Rather than attempt a short and possibly misleading explanation here, we refer you to GE's Silicon Controlled Rectifier Manual, which has a lengthy theoretical discussion of similar circuits on page 125. The Second Edition of the manual, available at most large jobbers or from General Electric, Rectifier Components Dept., West Genesee St., Auburn, N. Y., costs \$1.50.