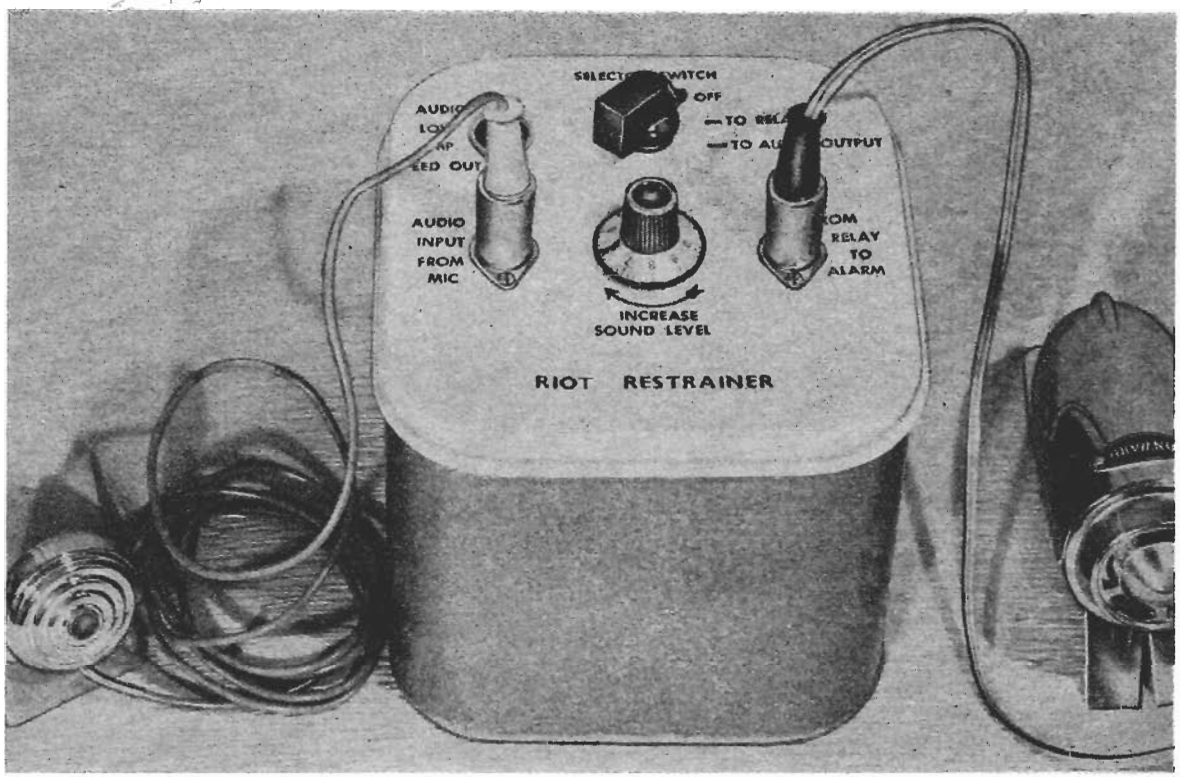


Build the RIOT RESTRAINER

Control Rumpus Room Noise

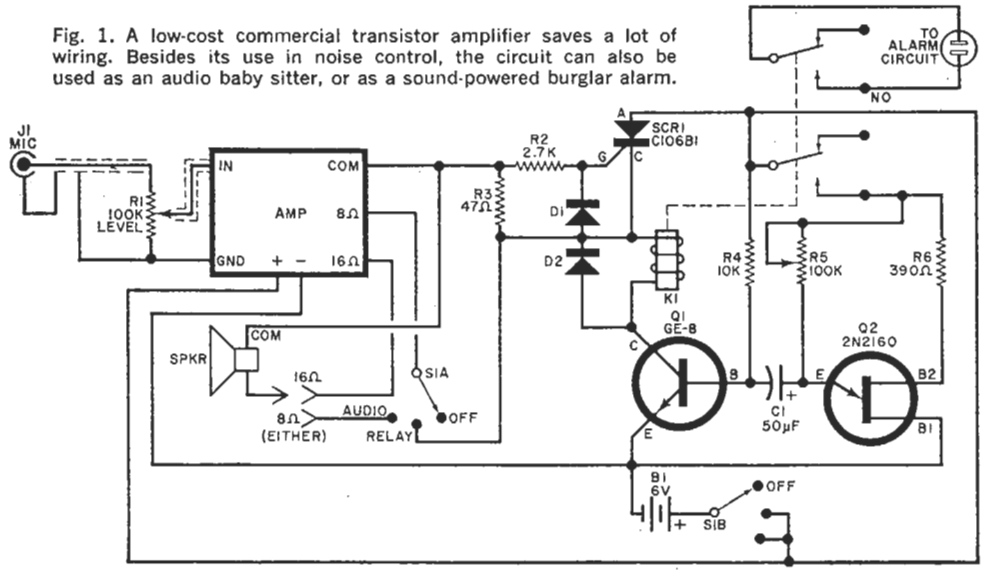
BY A. J. LOWE

DID YOU EVER wish you knew how to quiet a noisy bunch of youngsters when they are cutting up in the rumpus room? No matter how many times you tell them to keep the racket down, they always claim that they were not making that much noise. With the aid of the "Riot Restrainer," you can predetermine just how loud a racket you'll permit them to make; and, if they exceed it, this simple electronic device will let them know —in no uncertain terms!

Besides helping keep a bunch of youngsters under control, the Riot Restrainer can double as an alarm to signal when the baby is crying, as a noise-sensitive burglar alarm, or as a snore alarm to inform the culprit that he (or she) is keeping even the electronic equipment awake.

The device is a sound-trigger alarm with the circuit shown in Fig. 1. It will turn on an external alarm at any sound level from a footstep to a first-class riot. The alarm is on for a predetermined time; and, if the hubbub has died down when the alarm stops, it remains silent. If the noise is still present after another "sens-

Fig. 1. A low-cost commercial transistor amplifier saves a lot of wiring. Besides its use in noise control, the circuit can also be used as an audio baby sitter, or as a sound-powered burglar alarm.



PARTS LIST

AMP—4-transistor, 3-watt amplifier (Lafayette 99T9132, Burstein-Appleby 49A210, or similar)
B1—6-volt battery (or power supply)
C1—50-μF, 6-volt electrolytic capacitor
D1, D2—1N34 diode, or similar
J1—Microphone connector to suit microphone
K1—Low-current, double-pole, double-throw relay (see text)
Q1—Transistor (GE-8 or similar)
Q2—Unijunction transistor 2N2160
R1—100,000-ohm potentiometer
R2—2700-ohm, ½-watt resistor
R3—47-ohm, ½-watt resistor
R4—10,000-ohm, ½-watt resistor
R5—100,000-ohm miniature potentiometer (see text)
R6—390-ohm, ½-watt resistor
SO1—Socket for alarm
SCR1—Silicon controlled rectifier (GE C106B1)
S1—Two-pole, three-position switch
Misc.—Perf board, metal enclosure, four AA-type penlight cells with holders, crystal microphone, siren, knobs, shielded wire, etc.

ing" period, the alarm continues, intermittently, until the din subsides. The alarm signal *does not* feed back into the circuit.

Construction. The physical layout is not critical and almost any arrangement can be used. As shown in the photographs, the author used a metal container that happened to be handy. Perf-board construction is used to assemble the electronics while LEVEL control *R1*, switch *S1*, alarm-circuit socket *SO1*, and the microphone connector *J1* are mounted on the front panel. If it is desired to hear the audio output, a speaker connector can also be mounted on the front panel.

Check the circuit of the commercially made audio amplifier module to see if the common output terminal is connected to the battery positive lead. If this connection exists, it must be broken so that the secondary of the output transformer is isolated from the remainder of the amplifier. The printed circuit foil can be cut with a razor blade or a very sharp knife, making sure that you don't cut any other leads or chip or break the PC board.

If you happen to have an amplifier whose ratings are less than those specified in the Parts List and it has an output transformer, you can use it if you connect large-value capacitors to each side of the transformer primary and raise the value of R3 to about 1000 ohms. In this way, the audio signal can reach the remainder of the circuit but the d.c. will do no harm.

Once the perf board circuit is built and the front-panel components are mounted, wire the circuit in accordance with Fig. 1. With the audio amplifier energized and the alarm circuit off, current drain is about 15 mA. Although batteries were used in the prototype, a 6-volt d.c. power supply can be used.

Use the microphone suggested for the

particular amplifier in your project. In most cases, this will be a common type of high-impedance microphone. The author used a low-cost lapel-type crystal mike. This type of microphone is mismatched to the amplifier and produces low fidelity; however, all the mike does is pick up room noise so fidelity is not important. For more sensitive operation (such as might be required in using the Riot Restrainer as an intruder alarm), a cheap low-impedance dynamic microphone will be best.

Any type of low-power, two-pole, double-throw relay can be used for *K1* as long as it can be energized by the collector current of *Q1*. The transistor can be almost any *npn* audio type.

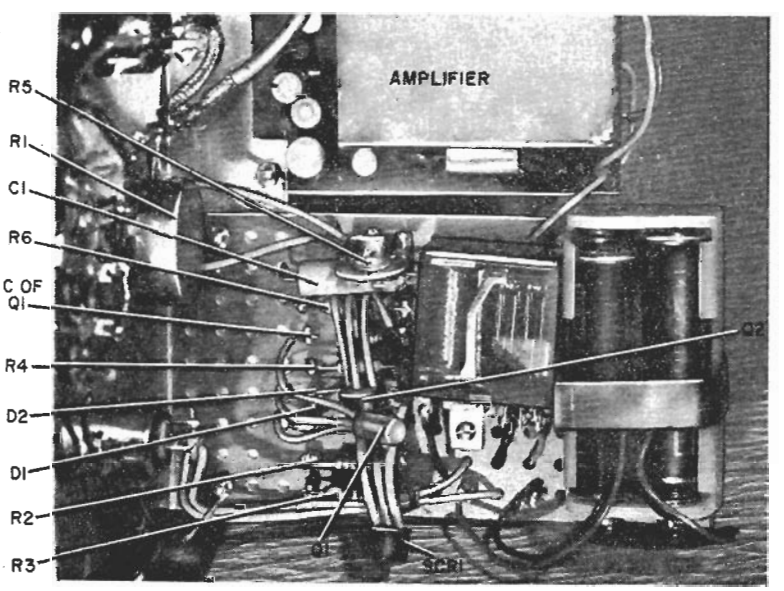
There are many types of alarms available—the author used a conventional electric bicycle horn having its own internal batteries. Be sure that the current required by the alarm does not exceed the contact rating of relay *K1*. The normally open contacts on the relay substitute for the pushbutton on the bicycle horn. For any other type of alarm, make up a series circuit with the alarm, power source, and the normally open contacts of the relay. If you want to use the Riot Restrainer to turn on a 117-volt light or a high-power alarm, you will have to add another relay with heavy-duty contacts. Energize the second relay's coil through the normally open contacts of *K1*.

Testing and Adjusting. Once the project is built, check it carefully for any wiring errors. Connect the microphone to *J1*. Connect a loudspeaker to the audio output leads (loudspeaker common to amplifier common and the other speaker lead to the 8- or 16-ohm output, depending on the speaker) and place *S1* in the AUDIO position. Speak into the microphone and adjust *R1* until the amplified voice can be heard. Audio quality may be poor, but this system is designed for noise pickup, not high fidelity. Reset *R1* for minimum volume.

Plug the alarm selected into *SO1* and place *S1* in the RELAY position. While talking near the microphone, advance *R1* until the alarm sounds. The amount of time that the alarm stays on is determined by the setting of *R5*. If desired, this potentiometer can be replaced by a fixed resistor whose value is selected to keep the alarm on for the desired period.

If the system does not work, first check to make sure that the SCR is firing. To do this, place a short between the emitter and collector of transistor *Q1*,

Layout of the author's version. Since layout is not critical, any physical arrangement will do. Though battery power is called for, you can use a 6-volt power supply. If you want a high-power alarm, use K1 to drive a heavy-duty relay.



HOW IT WORKS

Room sounds are picked up by the microphone and passed through the LEVEL control to the audio amplifier module. The load for the amplifier is *R3*, whose value is selected for a higher-than-normal output *voltage* (not power). This voltage is applied through current-limiting resistor *R2* to the gate and cathode of *SCR1*. Diode *D1* allows only positive-going pulses to reach the gate of *SCR1*.

When the room noise level is sufficiently high, *SCR1* conducts and permits current to flow through the coil of relay *K1* and *npn* transistor *Q1*. This transistor is turned on by the bias provided by resistor *R4*. When the relay is energized, one set of contacts supplies power to the external alarm and the other set applies d.c. to the timing circuit composed of *C1*, *R5*, *R6*, and unijunction transistor *Q2*.

Capacitor *C1* starts to charge through *R5* (the timing control) and when it reaches a certain level, fires *Q2*. With *Q2* conducting, *C1* is discharged, cutting off *Q1*. The series circuit through the relay coil is thus broken and the alarm stops. Because the SCR is operating from a d.c. source, its series circuit must be interrupted to make it turn off. The circuit is then ready to operate again whenever the room sound level reaches the prescribed level. The setting of potentiometer *R5* determines how long the alarm operates after being set off. Diode *D2* suppresses voltage spikes generated when the relay is switched off.

and connect a 20,000-ohms/volt d.c. voltmeter between the battery negative and the cathode of *SCR1*. With *R1* turned fully up, tapping the microphone should produce an indication on the voltmeter. If not, make sure diode *D1* is wired correctly, and increase the value of *R3* while reducing the value of *R2* in small steps.

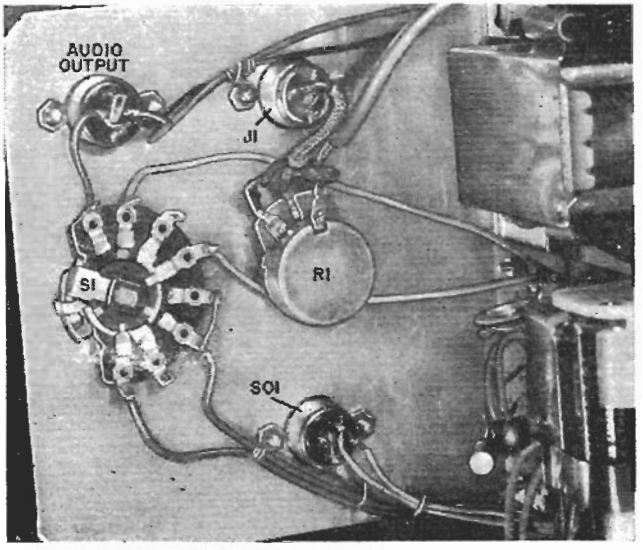
Remove the short on the collector and emitter of *Q1* and again tap the microphone. If the alarm still doesn't sound off, *Q1* may not be turned on. Reduce the value of *R4* in small increments until the alarm sounds when the microphone is tapped.

If the alarm sounds continuously after it once turns on, *Q1* may not be cutting off when *Q2* fires. To check this, connect a high-impedance voltmeter between the battery negative and the emitter of *Q2*. The indicated voltage should rise slowly and then fall rapidly as *Q2* fires. The value of *R5* (with the value of *C1*) determines the rise time.

Calibration. The LEVEL potentiometer, *R1*, can be calibrated in arbitrary values across its range. As examples of calibration, you can use steps such as "someone sick in the house," "birthday party," "Saturday night," "normal riot," etc. or you can calibrate it in hours of the day, with the least amount of noise permitted for the late hours.

Once the microphone has been placed in an out-of-the-way place, and the LEVEL set as desired, the alarm will sound off if the room noise exceeds that for which the Riot Restrainer is set.

To use the device as an intruder detector, place the microphone in the center of the room, and set the LEVEL control as desired. Then tiptoe out. Unfortunately, the barking of a nearby dog, a plane overhead, or the horn of a passing car can set off the alarm. —30—



Front-panel components. As in the internal layout, physical arrangement is not critical, and any packaging approach will do. The audio output jack can be eliminated if the chosen loudspeaker is wired directly to the correct impedance tap of amplifier output transformer through one contact of switch S1.