Circuit & Design Ideas

Interesting circuit ideas from readers and technical literature. While this material has been checked as far as possible for feasibility, the circuits have not been built and tested by us. As a consequence, we cannot accept responsibility, enter into correspondence or provide constructional details.

10A regulated enlarger supply

Colour photographic enlarging demands a well-regulated supply voltage for the enlarger lamp to produce a stable light output. Unfortunately, commercial AC stabilisers are very expensive. This DC voltage regulator circuit provides a stable 12V output at currents up to 10A and is suitable for powering 12V lamps with ratings up to 100W.

The circuit is quite conventional, with the low voltage transformer secondary being rectified by a 25A bridge rectifier and fed to an 11,000μF filter capacitor. From there, the DC is applied to the emitter of series pass transistor Q1 which is controlled by a 12V three-terminal voltage regulator.

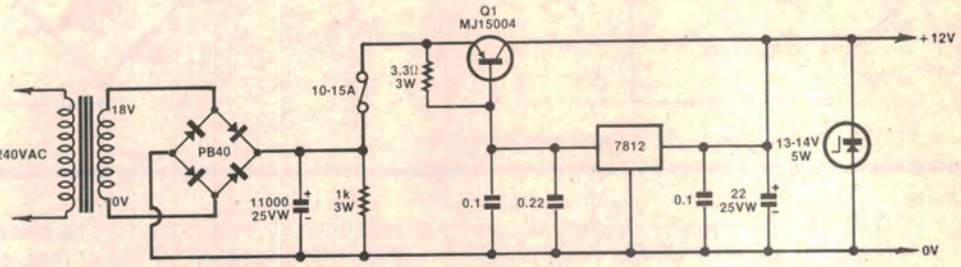
There are two current paths, one through transistor Q1 and one through the 3.3Ω resistor and the regulator IC. The current drawn by the regulator IC produces a voltage drop across the 3.3Ω resistor, thus forward biasing Q1 which supplies the bulk of the load current. This arrangement makes it possible for the regulator IC to closely control the voltage applied to the load, at currents far above its normal rating.

It works like this. If the voltage across the load tends to rise above the nominal 12V output, the regulator tends to shut down slightly; ie, it draws less current. This reduces the voltage across the 3.3Ω resistor and thus Q1 shuts down by the appropriate amount.

Similarly, if the voltage applied to the load tends to drop below the nominal 12V, the regulator tends to draw more current and Q1 is driven just a little harder.

On test, the regulated voltage output showed no variation for currents between zero and 8.3A and/or mains inputs between 216V and 250V AC. The zener diode across the output is optional. Its job is to protect the enlarger globe by blowing the fuse in the event that Q1 goes short circuit.

The 11,000μF filter capacitor used in the prototype was a high-ripple computer type, but three or four conventional electrolytics connected in parallel to give 10,000-20,000μF will suffice. The MJ15004 transistor is a heavy duty PNP type rated at 20 amps and 250W. It must be fitted to a substantial heatsink equivalent to 350cm² of 3mm-thick aluminium.



Finally, the transformer should be rated to produce 18V AC at a minimum 8.5A. Either the Jones JT314 (as used in the VK Powermaster published in this issue) or the Fergusson PF4244 (16V, 18A) will be suitable.

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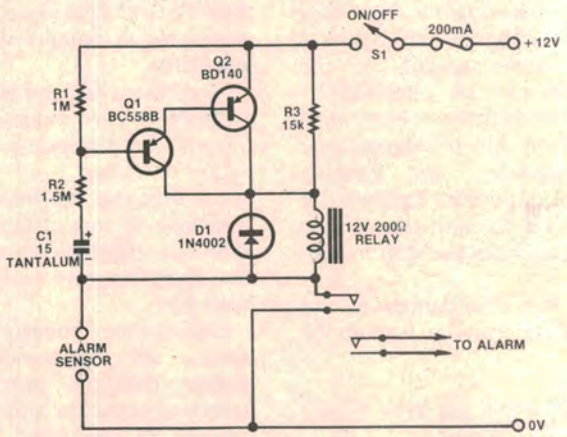

Simple, low-cost burglar alarm

With suitable values of R1, R2 and C1, this alarm unit will operate for 30s or more when the sensor contacts are momentarily closed; eg, when an intruder steps on a pressure mat. The alarm automatically resets at the end of the timing period.

When the sensor contacts close, current flows to charge C1. At the same time, transistor Q1 is forward biased and turns on Q2, thus closing the relay contacts. The relay is a double-pole unit. Contacts RL/1 are used to hold the relay on after the sensor contacts open, while contacts RL/2 provide power to an external alarm unit.

As the voltage across C1 rises, the forward bias on Q1 falls until the current through Q2 can no longer hold the relay on. The relay then releases, thus silencing the alarm.

Suitable values of R1 and R2 will depend on the characteristics of the relay and the two transistors used. For reliable operation, the relay should operate at supply voltages down to about 9V and should release when the voltage across C1 reaches 65-75% of the supply voltage.

Transistors Q1 and Q2 in the prototype had gains of 300 and 100 respectively. Using 1MΩ for R1 and 1.5MΩ for R2 allowed the relay to release when C1 reached 8.5V. Note that a BC558 with a suitably high gain may be used instead of a BC558B.

For home use, the sensor can be a pressure mat, microswitch, or any other normally open device. You can use as many sensors as you like – just connect them in parallel. The audible alarm may be a siren or piezo unit, but make sure that the rating of the relay contacts is not exceeded.

Finally, the circuit draws no quiescent current and is thus suitable for battery operation.

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