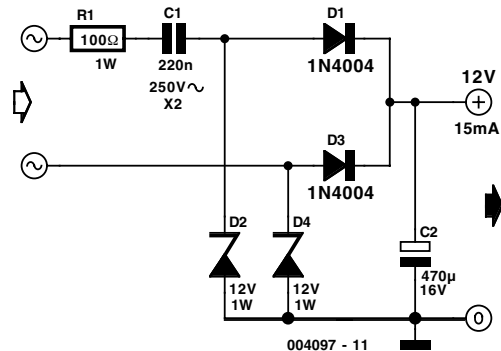


K. Walraven

Many circuits can be powered directly from the mains with the aid of a series capacitor (C1). The disadvantage of this approach is that usually only one half cycle of the mains waveform can be used to produce a DC voltage. An obvious solution is to use a bridge rectifier to perform full-wave rectification, which increases the amount of current that can be supplied and allows the filter capacitor to be smaller. The accompanying circuit in fact does this, but in a clever manner that uses fewer components. Here we take advantage of the fact that a Zener diode is also a normal diode that conducts current in the forward direction. During one half wave, the current flows via D1 through the load and back via D4, while during the other half wave it flows via D3 and D2.

Bear in mind that with this circuit (and with the bridge rectifier version), the zero voltage reference of the DC voltage is not directly connected to the neutral line of the 230-V circuit. This means that it is usually not possible to use this sort of supply



to drive a triac, which normally needs such a connection. However, circuits that employ relays can benefit from full-wave rectification.

The value of the supply voltage depends on the specifications of the Zener diodes that are used, which can be freely chosen. C2 must be able to handle at least this voltage. The amount of current that can be delivered depends on the capacitance of C1. With the given value of 220 nF, the current is approximately 15 mA.

A final warning: this sort of circuit is directly connected to mains voltage, which can be lethal. You must never come in contact with this circuit! It is essential to house this circuit safely in a suitable enclosure (see the 'Safety Guidelines' page that appears occasionally in *Elektor Electronics*).