Semiconductor devices such as triacs and thyristors are taking over more and more tasks from normal relays. However, this doesn't mean that you can't build interesting or useful circuits with normal relays.

Switching with relays

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There are many practical applications in which it is necessary to switch a lamp or other device on and off by using a short pulse or briefly pressing a button. For example, this method (which is also called toggle operation) is used in the staircases of many public buildings for switching the hall lights using relays with built-in timers, such as the German Eltako series. Relays are a perfect choice for this application. A relay with two separate changeover contacts is well suited to this sort of job. Many relays are available in encapsulated form, which provides better protection against corrosion and soiling of the sensitive contacts. In principle, it does not matter which product you use as long as the relay is designed to handle the intended task. The contacts and the coil must both be specified for the currents and voltages used in the application.

Here one of the two changeover contacts (RLA1b) switches a load (such as a lamp, machine or motor) on and off. The second changeover contact (RLA1a) is used to latch the relay. This means that the relay remains actuated after pushbutton switch S1 (a normally-open switch) is released. When S1 is pressed, RLA1a closes and shorts out S1. As a result, current continues to flow through the relay after the button is released. A brief interruption is all it takes to stop the current, and this is provided by S2, a normally-closed switch.

Naturally, an external switch such as the contacts of a motion detector can be connected in place of S1 or in parallel with it. If you wish, you can also use a separate supply voltage ('optional switching') to energise the relay coil in parallel with the usual control arrangement.

Gag circuit

We conclude with small story from the author's experience. As a youth, he once hid a circuit like this in a rubbish container. The idea was that when the lid was opened, it should send a current through the filament of an incandescent lamp (with the glass removed) to light a string of small firecrackers. In order to attract potential victims, Thomas glued a piece of paper to the container with a note saying that the lid should not be opened under any circumstances. When his father came home from work in the evening, he asked with some surprise what the note on the container was supposed to mean, since he had opened the lid and nothing had happened. As his son thought that his circuit must have failed to work, he went straight to the rubbish container, opened it, and found himself in the midst of a hail of exploding firecrackers. As it happened, his father had seen him putting together his firecracker alarm earlier that morning.

SAFETY MAINS SWITCH

Picture the following situation: while a table saw is running in a carpentry shop, there is a sudden power failure. As a result, everything stops working, and everyone takes a break. If the shop foreman forgets to switch off the machine, it will unexpectedly start up again 'on its own' when the power is restored. This can be quite hazardous. If the above circuit is fitted to the table saw, this cannot happen. It will remain in the 'off' state even after power is restored, and it can only be started again by pressing switch S1 again. For a truly professional solution, the circuit can be built using a large green pushbutton for S1 and a large red pushbutton for S2 (available in the better class of home-improvement shops).

THEFT ALARM

For this application, S1 is replaced by a switch with normally-closed contacts and the object to be protected (such as a PC) is placed on top of the switch so that its weight actuates the switch. If the object is removed, the switch closes and a siren is activated by RLA1b, and it continues to sound until switch S2 (in a concealed location) is pressed.
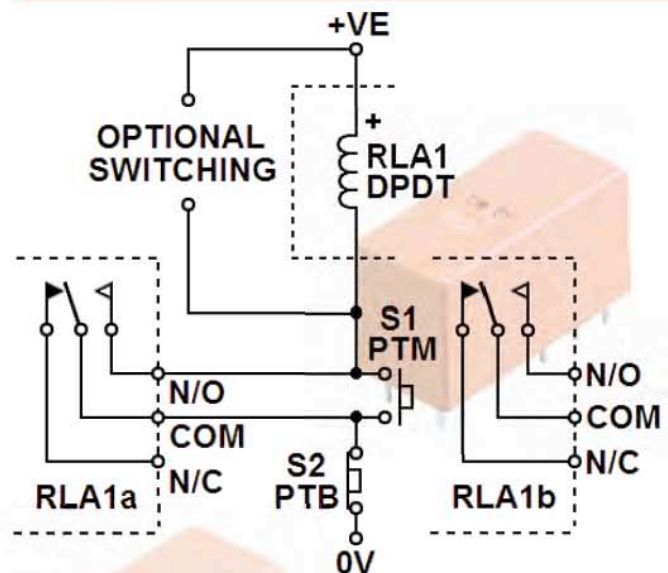
TWO-WHEELER ALARM

Contact switches respond to motion. If a contact switch is used for S1 and the entire arrangement is built into a moped, scooter or motorcycle, the alarm will be triggered as soon as a thief moves the vehicle.

INTRUSION ALARM

If S1 is replaced by a door switch or window switch, the circuit can be used as the core of a home intrusion alarm system. With this version of the circuit, as many switches as desired can be connected in parallel in place of S1. A key switch can be used for S2 in this case, so that the siren triggered in case of an alarm can only be switched off by the homeowner.