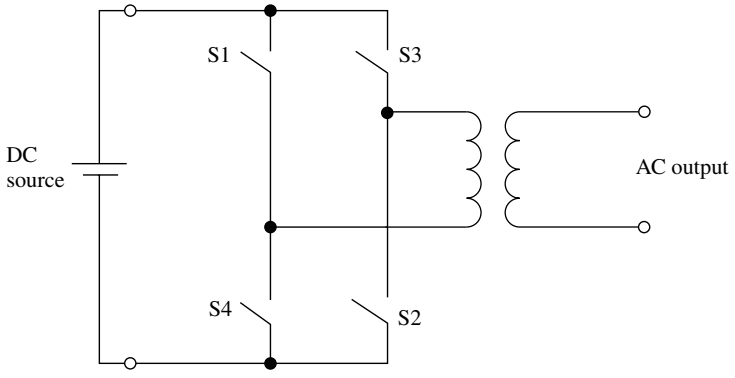

Figure 19.22 H-bridge-type inverter

AC at the primary windings of the transformer is produced by alternatively closing the switches 1 and 2. If switch 1 is closed, switch 2 is open and vice versa. The resulting AC output voltage is of the square-wave type, which may be used for resistive-type loads such as incandescent light bulbs and so on. The two primary windings of the transformer can be reduced to one if two more switches are used as shown in Figure 19.22.

In this configuration, the switches are opened and closed pairwise in such a way that the groups S1 and S2 and the groups S3 and S4 open and close alternately. At the output of the H-bridge formed by the switches S1 through S4, AC is already available. The transformer is only necessary in case of a voltage transformation.

19.2.4.3 Inverters with sinusoidal AC output

Since many consumers and the public grid operate on the basis of sinusoidal voltage, high-quality inverters should also be able to provide this type of AC output. This voltage form can be produced by voltage-transformation principles. Two of the most common transformation principles, namely, the step-down and the step-up converter and a combination of both will be highlighted as well as a digital synthesis one.

19.2.4.3.1 Step-down converter (Buck converter)

With the help of these converters, the input DC voltage, which is, for example, generated by the PV generator (V_{PV}) as represented in Figure 19.23, can be stepped down.

If the switch S_1 is turned on at t_0, the diode D is reverse-biased and a circuit current arises (Figure 19.24). The current ($= i_L$) does not increase immediately but rather rises with a rate imposed by the inductor L:

$$\frac{di_L}{dt} = \frac{V_{PV} - V_{load}}{L}$$

Meanwhile, the inductor stores energy in a magnetic form. If S_1 is turned off after $t = t_1$, the load is separated from the supplied system. The current is, however, maintained by the stored energy in the inductor L and flows through the freewheeling