

The invention relates to a switched power supply for the production of various operating voltages from the mains voltage, especially for television receivers, video recorders, personal computers and the like. Such a switched power supply is known from EP-A2-0 211 300.

In general, a switched power supply comprises a switching transistor which is connected via the working winding of a transformer to an operating voltage obtained from the mains voltage. The switching transistor is controlled by a control voltage so as to be periodically conductive and blocked. The control voltage is derived for example from an oscillator provided on the primary side or is transferred from the secondary side to the primary side via a transformer. Preferably, the control voltage is modulated in the sense of a pulse width modulation (PWM) in dependence on the amplitude of the generated operating voltage such that the duration of the current flow through the switching transistor is altered in the sense of a stabilisation of the output voltages.

With such a circuit, it has become apparent that although the turning-on of the switching transistor functions perfectly upon the appearance of the control voltage after the circuit has been turned-on, the turning-off in the blocked state is unsatisfactory by virtue especially of the base-charge dispersal effect. This leads especially to an unreliably long turn-on time of the switching transistor so that the approximately linearly increasing current through the switching transistor and the working winding of the transformer during the turn-on period, and thus the voltages on the transformer arising when the current is turned-off, take on impermissibly high values.

The object of the invention is to ensure with simple circuit means, that immediately after the turning-on of the circuit, the turning-off of the switching transistor also occurs faultlessly.

This object is achieved by the invention defined in claim 1. An advantageous development of the invention is defined in the appendant claim.

The preferably negative bias voltage, obtained in a simple manner from the mains voltage in the sense that it is the action of a blocking of the switching transistor, ensures that, after the whole switched power supply has been switched-on, not only the turning-on but also the turning-off of the switching transistor occurs faultlessly and no impermissibly high currents and voltages arise in the transformer. The bias voltage must be

available to the full extent if the control voltage appears after the turning-on of the switched power supply. This condition is easily achieved because, in general, long time constants are effective in the path of the operating voltage for the circuit for the generation of the control voltage and thus the control voltage only appears after a relatively long delay of 1 sec. Thus, the bias voltage acts like a battery, having, during the decisive period, a constant voltage which considerably improves the characteristics of the switched power supply as regards the control of the switching transistor after switching-on.

The invention will be explained by an embodiment with the help of the drawing. The figure shows in simplified form, the primary side of a switched power supply fed from the mains voltage.

In the figure, the operating voltage $+U_B$ between the points a and b is obtained via the mains rectifier 1 from the mains voltage U_N which can vary between 90 V and 260 V. This is applied via the working winding 2 of the transformer Tr to the switching transistor T_1 . The latter's emitter is connected via the low resistance resistor 3 to the primary side earth. The switching transistor T_1 is controlled by the driver circuit having transistors T_2 , T_3 via the network 4. The control circuit 5 is provided on the primary side. This receives an operating voltage at the terminal c which is obtained by rectification of the pulse voltage occurring on the winding 6 by the rectifier 7 and the capacitor 8. A control voltage U_r , which is obtained on the secondary side from the level of the generated operating voltage, is supplied to the control circuit 5 at the terminal d and modulates the pulse width of the control voltage 9 obtained at the terminal e in the sense of a stabilisation of the operating voltage. The control voltage reaches the bases of the driver transistors T_2 , T_3 via the bias voltage network 10 and causes a periodic turning-on and turning-off of the switching transistor T_1 .

The mains voltage U_N from the point f of the mains rectifier 1 is applied via the resistor 11 and the capacitor 12 to the Zener diode Z_1 having a Zener voltage of 3.9 V. In this way, negative pulses having an amplitude of 3.9 V occur at point g. These pulses are rectified by the diode D_1 and produce a negative bias voltage $-U_v$ of 3.5 V on the capacitor 13 at the point h. The bias voltage reaches the bases of the two transistors T_2 , T_3 via the resistor 14. The negative bias voltage $-U_v$ is effective in the sense of a conducting transistor T_3 and a blocked transistor T_2 . This means, that the bias voltage $-U_v$ acts on the switching transistor T_1 in the sense of a lock-out. The bias voltage $-U_v$

is available to the full extent before the control voltage 9 appears and controls the switching transistor T1. This has the effect that upon the appearance of the control voltage 9, a faultless control of the switching transistor T1 is already occurring in the sense that this is turned-on faultlessly and also is blocked faultlessly and no impermissibly high currents or voltages appear on the transformer Tr.

The transformer Tr provides operating voltages of different magnitudes and polarity by means of several secondary windings 15 and associated rectifier circuits.



Claims

1. Switched power supply in which an operating voltage (UB) obtained from the mains voltage (UN) is applied via a working winding (2) of a transformer (Tr) to a switching transistor (T1) and the output of a driver circuit (T2, T3) is connected via a direct voltage coupling (4) to its base, wherein a control voltage (9) for the switching transistor (T1) is applied to the control input of the driver circuit (T2, T3), characterised in that, a direct voltage (-Uv) is obtained from the mains voltage (UN) by a rectifier (D1) and this is applied to the control input of the driver circuit (T2, T3) in the sense of a blocking of the switching transistor (T1), wherein after the turning-on of the switched power supply, the direct voltage (-Uv) which has been obtained is available before the control voltage (9) appears.

2. Switched power supply in accordance with Claim 1, characterised in that, a point (f) carrying the mains voltage (UN) is connected via an RC member (11, 12) to a Zener diode (Z1) and the input of the rectifier (D1) is connected to the latter.