

D91/075DE*WZ*101291

- 1 -



THIS SHEET HAS BEEN
REPLACED

Driver circuit for a power transistor



The present invention is based on a circuit arrangement for driving a switching transistor connected in series with a primary winding of a transformer, at the secondary windings of which transformer stabilized voltages can be picked off. A circuit arrangement of this type is used, inter alia, in switched-mode power supplies, in high-voltage generators or in line deflection circuits in television sets.

With the introduction of an increased number of lines (high scan) and of a larger picture format (wide screen), even more stringent requirements are made of the loadability and of the reduction of losses in circuit arrangements of the type mentioned in the introduction.

The invention is based on the object, therefore, of constructing a circuit arrangement described in accordance with the preamble of the patent claim in such a way that the said circuit arrangement can be constructed with little outlay in spite of the elevated requirements. This object is achieved by means of the measures characterized in the patent claim.

The invention is described below with the aid of the drawing using three exemplary embodiments.

Figure 1 shows a first exemplary embodiment with a switched-mode power supply;

Figure 2 shows a second exemplary embodiment with a horizontal deflection circuit;

Figure 3 shows a third exemplary embodiment with a high-voltage generator;

Figure 4 shows signals at the locations marked in Figure 1.

Figure 1 illustrates a switched-mode power supply, which generates a plurality of regulated operating voltages UB3, UB4 from a rectified voltage UB1 in a known manner. For this purpose, an electronic switch T1, which is connected in series with the primary winding of the switched-mode power supply transformer TR1 and connects one end of the primary winding of the

0-101291

This Sheet Has Been Replaced



D91/075DE*WZ*101291

- 2 -

transformer TR1 to earth potential, is periodically activated, the other end of which transformer TR1 is connected to the unregulated DC voltage UB1. The duty ratio of the drive pulses for the electronic switch T1 from a control circuit ST is altered with the aid of a control loop (not designated in greater detail) in such a way that the generated output DC voltages UB3, UB4 on the secondary side are kept constant.

Connected in series with the primary winding of the transformer TR1 is a further current transformer TR2, the primary winding N1 of which is situated in the collector circuit of the electronic switch T1. The secondary side of the current transformer TR2 comprises a tapped secondary winding N2, N3. The upper end of the winding N2 is connected via a diode D1 to the emitter of a transistor T2, which is connected to a positive voltage UB2 via a resistor R1. The base of the transistor T2 is connected, on the one hand, via the resistor R2 to the positive operating voltage UB2 and, on the other hand, to the output of the control circuit ST. The collector of the transistor T2 is connected to the base of the electronic switch T1. The transistor T2 needs only to supply the small base current for the electronic switch T1 and can therefore be small. The tap of the secondary winding of the current transformer TR2 is connected to the emitter of the electronic switch T1. The lower end of the secondary winding N2 of the current transformer TR2 is connected via the diodes D2 and D3 to the base of the electronic switch T1, which is connected via the resistor R3 to the reference potential. Finally, the base of the electronic switch T1 is connected via a diode D4 to the upper end of the secondary winding of the current transformer TR2.

The mode of operation of the circuit just described (Figure 1) we [sic] subsequently described with the aid of Figure 4.

- (1) At the instant t_0 , the PNP transistor T2 is switched on by the control circuit ST, with the result that

D91/075DE*WZ*101291

- 3 -



5 a base current I_B flows (Figure 4d) into the electronic switch T1 and brings about a corresponding collector current I_C of the electronic switch T1 (Figure 4b), which collector current I_C also flows through the primary winding N1 of the transformer TR2. The voltage across the winding N2 is approximately 1.5 volts, composed of the voltage U_D across the diode D1, the collector/emitter voltage V_{CE} of the transistor T2 and the base/emitter voltage V_{BE} of the electronic switch T1. The number of turns of the winding N3 is about a quarter of the number of turns of the winding N2, with the result that approximately 0.4 volt is produced across N3 and the diodes D2 and D3 remain inhibited. An undesired current through these diodes on account of an increased base/emitter voltage of the transistor T1 increases their voltage drop, thereby limiting the current. Another further diode would have to be connected in series otherwise.

20 (2) At the instant t_1 , the control circuit ST switches the transistor T2 off (Figure 4a), with the result that the positive base current of the transistor T1 is interrupted (Figure 4d). Since, owing to the transistor capacitances that are still charged, the collector current of the transistor T1 continues to flow up to the instant t_2 (Figure 4b), until these capacitances have discharged and thus generate a negative base current which flows via the diodes D2 and D3 into the winding N3 of the transformer TR2, which winding becomes active at the instant t_2 and generates a current corresponding to the turns ratio N_2/N_3 of approximately 4 : 1. In this way, the transistor T1 is switched off by means of its own collector current which, for as long as it still flows, generates the high negative voltage.

(3) When the transistor T1 is switched off, the collector voltage rises above its V_{CE0} value. Therefore,

This Sheet Has Been Replaced



D91/075DE*WZ*101291

- 4 -



5 a negative voltage must be present at its base. This is achieved by the magnetic energy stored in the transformer TR2 during the time to [sic] to t3. This energy generates a negative voltage across the winding N2 which passes via the diode D4 to the base of the transistor T1 (Figure 4d). This voltage is limited by the reverse voltage VBE of T1.

10 Whereas in Figure 1 the invention was described in terms of its application to a switched-mode power supply, Figure 2 shows the application to a horizontal deflection circuit and Figure 3 shows the application to a high-voltage generator of a picture reproduction device, such as, for example, a television receiving device or a monitor. The components which correspond to
15 those in Figure 1 are provided with identical reference symbols. The functioning corresponds to the mode of operation which has been described with reference to the exemplary embodiment according to Figure 1.

20 If, as shown in Figure 3, the current transformer TR2 is connected directly to the operating voltage UB1 upstream of the transformer TR1, the voltage between the windings N1/N2/N3 can be reduced, as a result of which a smaller coil former can be used and, consequently, the dimensions of the transformer TR2 can be reduced. In this
25 case, not only the current IBE, but also the current through the freewheeling diode DR flows through the transformer TR2, with the result that the base voltage is kept at a negative potential during the time interval t4 to t5, too.

30 The circuit arrangement applied for has the advantage that the base current of the transistor T1 is proportional to the collector current and that the collector current generates the transistor's own turn-off current. An additional negative voltage source which
35 ensures that the base voltage is below -2 volts is consequently not required. Only a very small number of inexpensive components are necessary, comprising a cost-effective, small transformer, four diodes and a low-power



THIS SHEET HAS BEEN
REPLACED

D91/075DE*WZ*101291

- 5 -



switching transistor for switching the base current for
the electronic switch.

This Sheet Has Been Replaced





Patent Claims

1. Circuit arrangement for driving a switching transistor (T1) connected in series with a primary winding of a transformer (TR1), at the secondary windings
5 of which transformer stabilized voltages can be picked off, characterized in that the primary winding (N1) of a current transformer (TR2) is connected in series with the primary winding (W1) of the transformer (TR1), which current transformer has a tapped secondary winding (N2,
10 N3), the tap of the secondary winding being connected to the emitter of the switching transistor (T1), and in that the first end of the secondary winding (N1) is connected via a diode (D1) to the emitter of a driver transistor (T2), the collector of which is connected to the base of
15 the switching transistor (T1), and in that the second end of the secondary winding (N3) is connected via at least two diodes (D2, D3) in the reverse direction to the base of the switching transistor (T1), which base is additionally connected via a further diode (D4) to the first
20 end of the secondary winding (N2).
2. Circuit arrangement according to Claim 1, characterized in that the turns ratio (N2/N3) of the secondary windings (N2/N3) is virtually four to one.
3. Circuit arrangement according to Claim 1 or 2,
25 characterized in that it is provided for a switched-mode power supply of a picture reproduction device.
4. Circuit arrangement according to Claim 1 or 2, characterized in that it is provided for a horizontal deflection circuit of a picture reproduction device.
- 30 5. Circuit arrangement according to Claim 1 or 2, characterized in that it is provided for a high-voltage generator of a picture reproduction device.





Abstract

1. Driver circuit for a power transistor.
- 2.1 With the introduction of high scan and wide screen in picture reproduction devices, ever more stringent requirements are made of the loadability of switched-mode power supplies in devices of this type, (while at the same time reducing the power loss).
- 2.2 The circuit arrangement applied for complies with this requirement in that a further transformer in the form of a current transformer is connected in series with the switched-mode power supply transformer, the secondary winding of which current transformer has a tap which is connected to the emitter of the switching transistor. One end of the secondary winding is connected via a diode to the emitter of the driver transistor, the collector of which is connected to the base of the switching transistor. The other end of the secondary winding is connected via diodes in the reverse direction to the base of the switching transistor, which base is connected via a further diode to the first end of the secondary winding.
- 2.3 Television receiver and monitor.
3. Figure 1.



1/4

THIS SHEET HAS BEEN
REPLACED

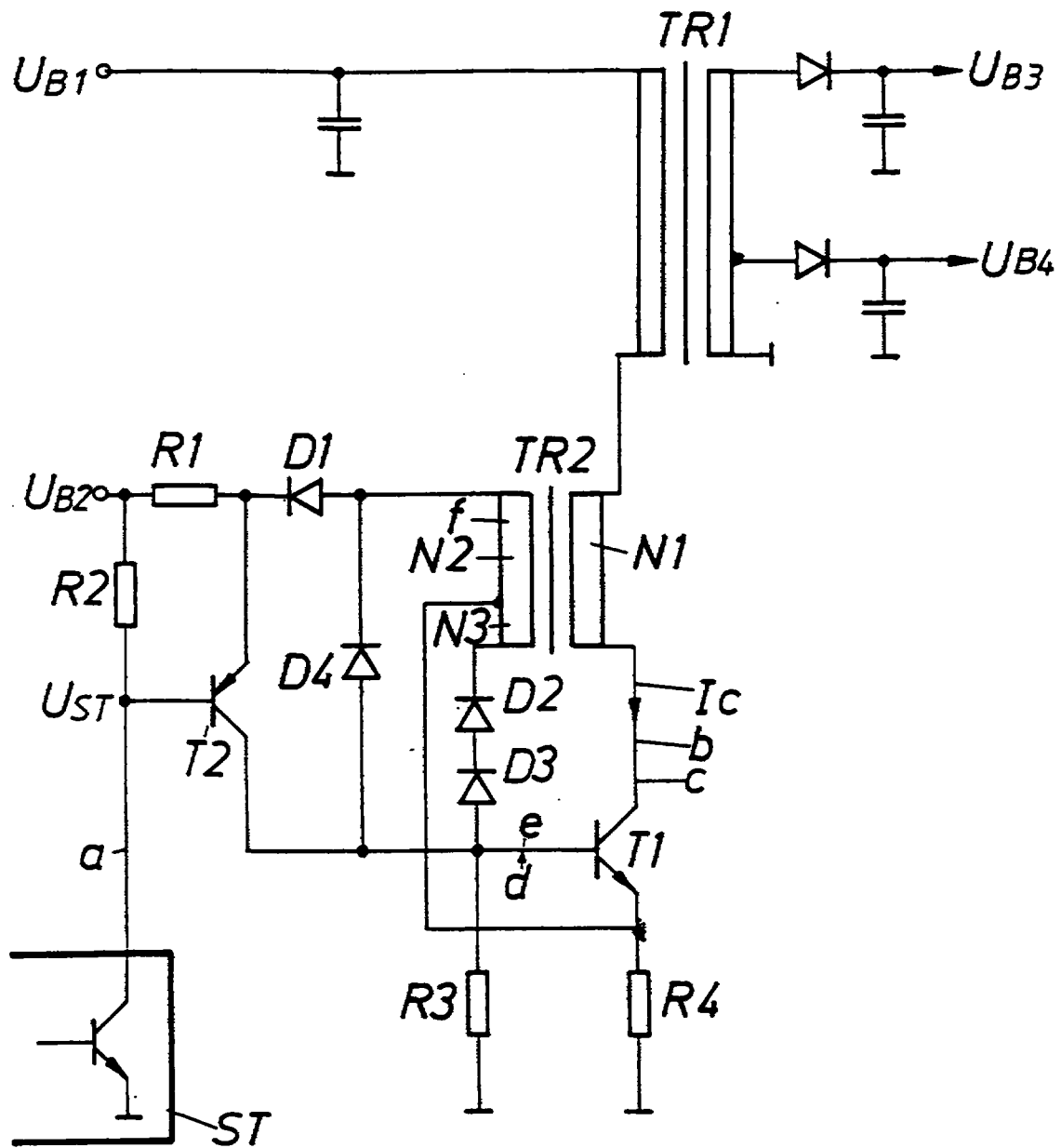


FIG.1

This Sheet Has Been Replaced



D91/075

2/4

THIS SHEET HAS BEEN
REPLACED

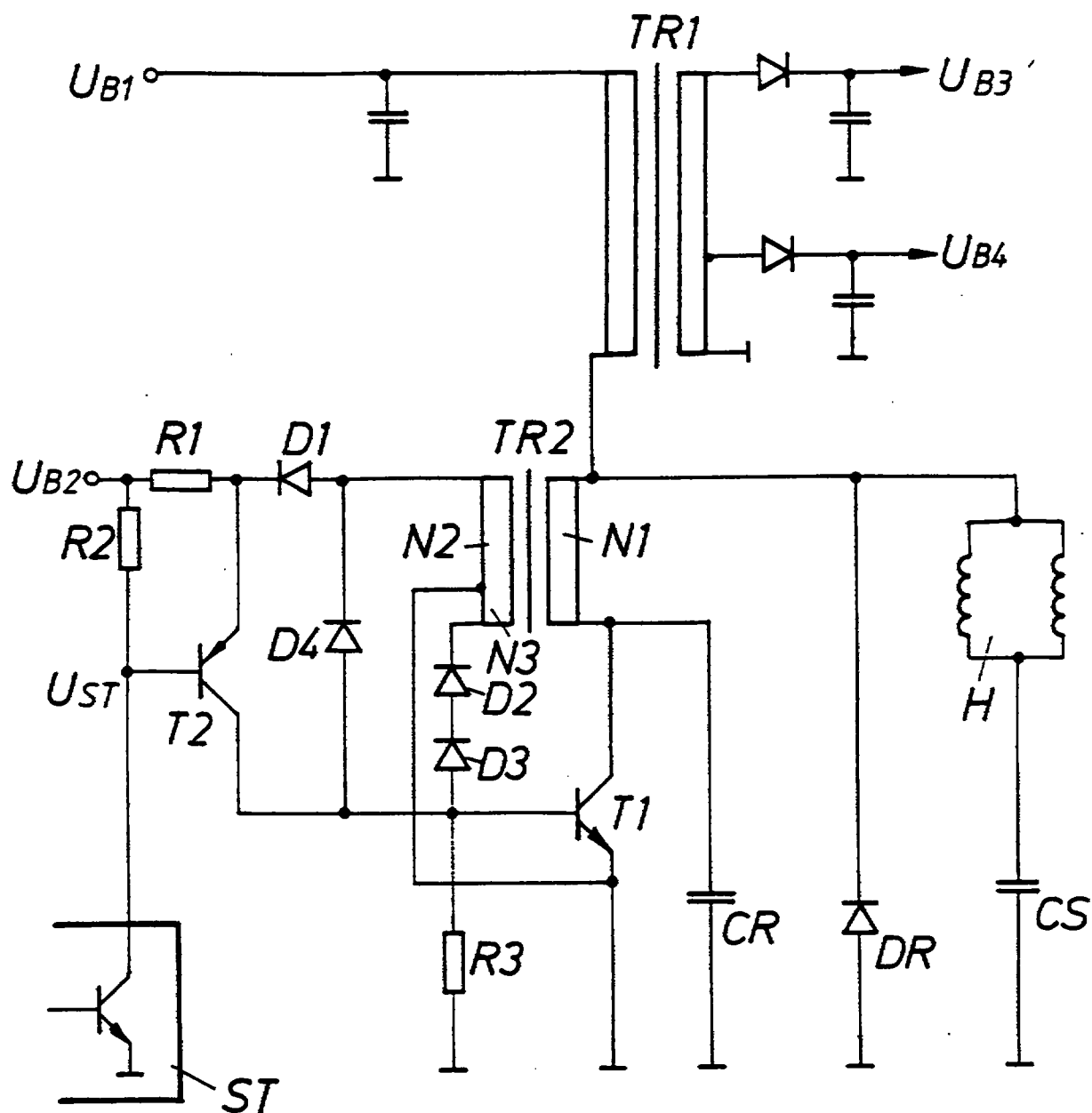
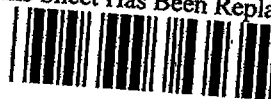


FIG. 2

This Sheet Has Been Replaced



D 91/075

3/4

THIS SHEET HAS BEEN
REPLACED

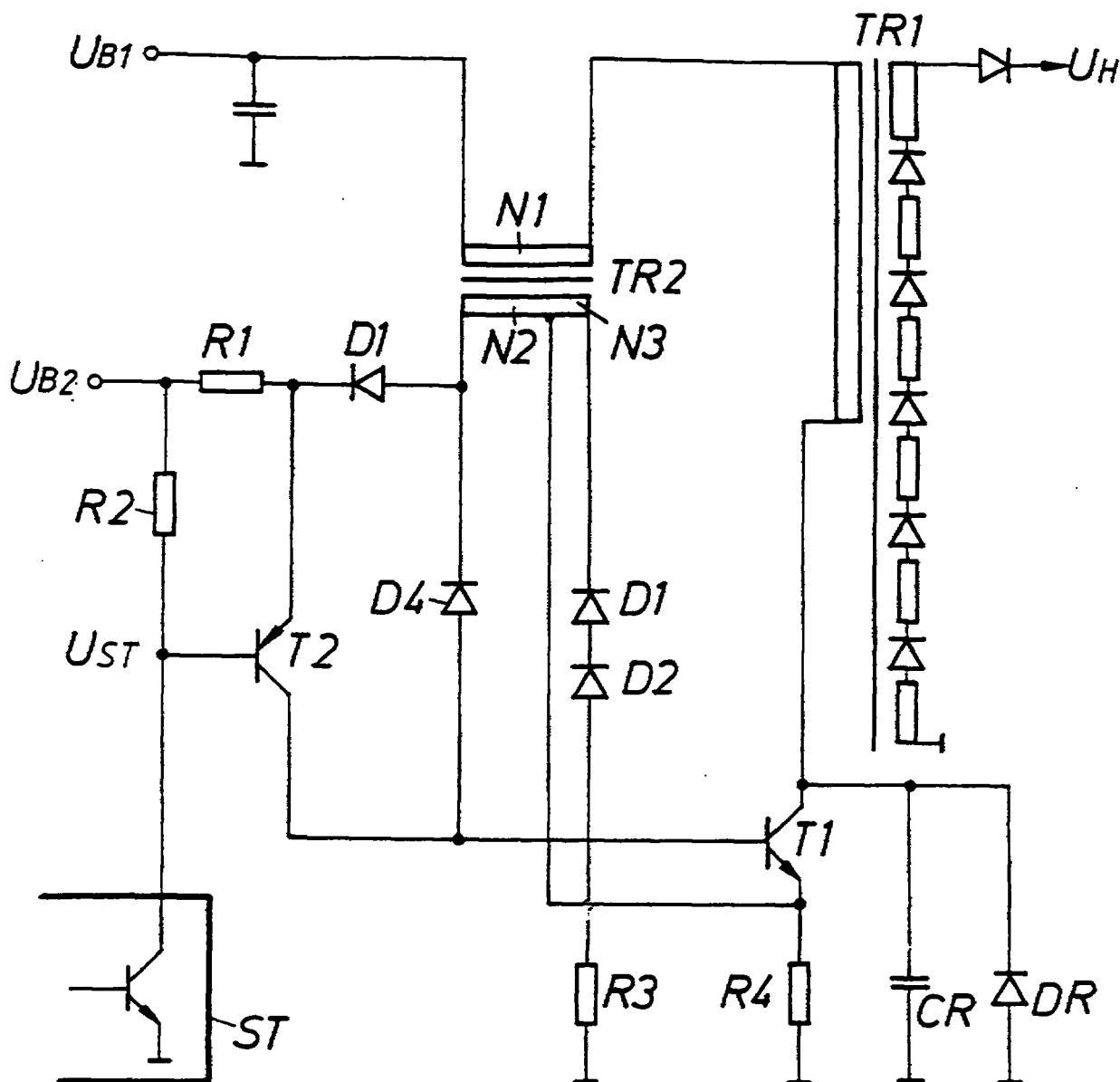


FIG.3

This Sheet Has Been Replaced



D91/075

4/4

THIS SHEET HAS BEEN REPLACED

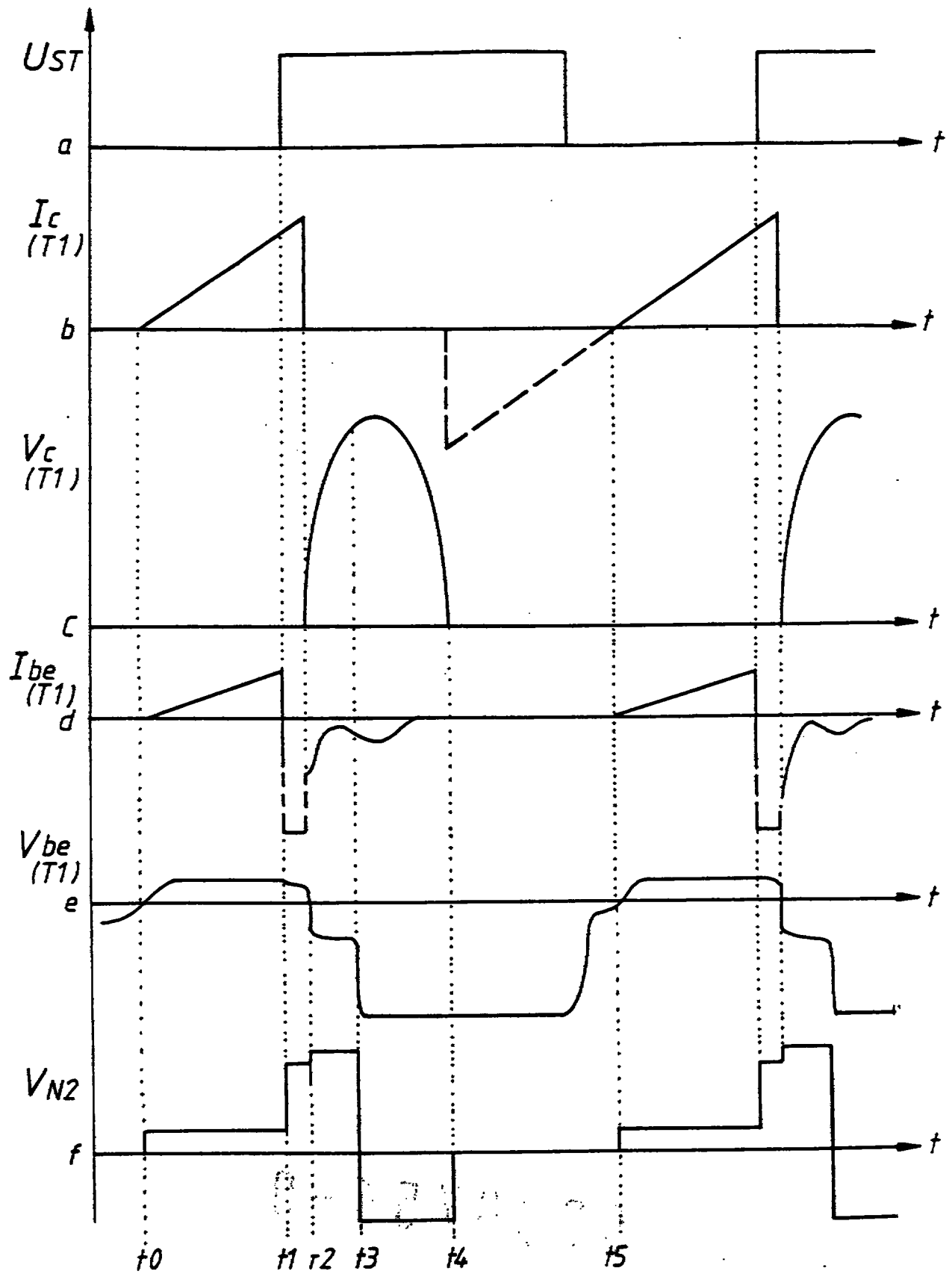
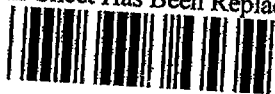


FIG. 4

This Sheet Has Been Replaced



D91/075



☒ Description : paged ...1. to paged ...5.
☒ Claim(s) : paged ...6. to paged
☒ Drawing(s) : paged ...1. to paged ...4.
☒ Abstract : paged ...7. to paged

Driver circuit for a power transistor

DATE OF RECEIPT 28 FEB 1997

The present invention is based on a circuit arrangement for driving a switching transistor connected in series with a primary winding of a transformer, at the secondary windings of which transformer stabilized voltages can be picked off. A circuit arrangement of this type is used, inter alia, in switched-mode power supplies, in high-voltage generators or in line deflection circuits in television sets.

With the introduction of an increased number of lines (high scan) and of a larger picture format (wide screen), even more stringent requirements are made of the loadability and of the reduction of losses in circuit arrangements of the type mentioned in the introduction:

The invention is based on the object, therefore, of constructing a circuit arrangement described in accordance with the preamble of the patent claim in such a way that the said circuit arrangement can be constructed with little outlay in spite of the elevated requirements. This object is achieved by means of the measures characterized in the patent claim.

The invention is described below with the aid of the drawing using three exemplary embodiments.

Figure 1 shows a first exemplary embodiment with a switched-mode power supply;

Figure 2 shows a second exemplary embodiment with a horizontal deflection circuit;

Figure 3 shows a third exemplary embodiment with a high-voltage generator;

Figure 4 shows signals at the locations marked in Figure 1.

Figure 1 illustrates a switched-mode power supply, which generates a plurality of regulated operating voltages UB3, UB4 from a rectified voltage UB1 in a known manner. For this purpose, an electronic switch T1, which is connected in series with the primary winding of the switched-mode power supply transformer TR1 and connects one end of the primary winding of the

This is the replacement sheet

Date: 28 FEB 1997

28 FEB 1997



- 2 -

transformer TR1 to earth potential, is periodically activated, the other end of which transformer TR1 is connected to the unregulated DC voltage UB1. The duty ratio of the drive pulses for the electronic switch T1 from a control circuit ST is altered with the aid of a control loop (not designated in greater detail) in such a way that the generated output DC voltages UB3, UB4 on the secondary side are kept constant.

Connected in series with the primary winding of the transformer TR1 is a further current transformer TR2, the primary winding N1 of which is situated in the collector circuit of the electronic switch T1. The secondary side of the current transformer TR2 comprises a tapped secondary winding N2, N3. The upper end of the winding N2 is connected via a diode D1 to the emitter of a transistor T2, which is connected to a positive voltage UB2 via a resistor R1. The base of the transistor T2 is connected, on the one hand, via the resistor R2 to the positive operating voltage UB2 and, on the other hand, to the output of the control circuit ST. The collector of the transistor T2 is connected to the base of the electronic switch T1. The transistor T2 needs only to supply the small base current for the electronic switch T1 and can therefore be small. The tap of the secondary winding of the current transformer TR2 is connected to the emitter of the electronic switch T1. The lower end of the secondary winding N2 of the current transformer TR2 is connected via the diodes D2 and D3 to the base of the electronic switch T1, which is connected via the resistor R3 to the reference potential. Finally, the base of the electronic switch T1 is connected via a diode D4 to the upper end of the secondary winding of the current transformer TR2.

The mode of operation of the circuit just described (Figure 1) we [sic] subsequently described with the aid of Figure 4.

- (1) At the instant t_0 , the PNP transistor T2 is switched on by the control circuit ST, with the result that



REPLACEMENT SHEET

28 FEB 1997

a base current I_B flows (Figure 4d) into the electronic switch T1 and brings about a corresponding collector current I_C of the electronic switch T1 (Figure 4b), which collector current I_C also flows through the primary winding N1 of the transformer TR2. The voltage across the winding N2 is approximately 1.5 volts, composed of the voltage U_D across the diode D1, the collector/emitter voltage V_{CE} of the transistor T2 and the base/emitter voltage V_{BE} of the electronic switch T1. The number of turns of the winding N3 is about a quarter of the number of turns of the winding N2, with the result that approximately 0.4 volt is produced across N3 and the diodes D2 and D3 remain inhibited. An undesired current through these diodes on account of an increased base/emitter voltage of the transistor T1 increases their voltage drop, thereby limiting the current. Another further diode would have to be connected in series otherwise.

- (2) At the instant t_1 , the control circuit ST switches the transistor T2 off (Figure 4a), with the result that the positive base current of the transistor T1 is interrupted (Figure 4d). Since, owing to the transistor capacitances that are still charged, the collector current of the transistor T1 continues to flow up to the instant t_2 (Figure 4b), until these capacitances have discharged and thus generate a negative base current which flows via the diodes D2 and D3 into the winding N3 of the transformer TR2, which winding becomes active at the instant t_2 and generates a current corresponding to the turns ratio N_2/N_3 of approximately 4 : 1. In this way, the transistor T1 is switched off by means of its own collector current which, for as long as it still flows, generates the high negative voltage.
- (3) When the transistor T1 is switched off, the collector voltage rises above its V_{CE0} value. Therefore,



REPLACEMENT SHEET

28 FEB 1997

a negative voltage must be present at its base. This is achieved by the magnetic energy stored in the transformer TR2 during the time to [sic] to t3. This energy generates a negative voltage across the winding N2 which passes via the diode D4 to the base of the transistor T1 (Figure 4d). This voltage is limited by the reverse voltage VBE of T1.

Whereas in Figure 1 the invention was described in terms of its application to a switched-mode power supply, Figure 2 shows the application to a horizontal deflection circuit and Figure 3 shows the application to a high-voltage generator of a picture reproduction device, such as, for example, a television receiving device or a monitor. The components which correspond to those in Figure 1 are provided with identical reference symbols. The functioning corresponds to the mode of operation which has been described with reference to the exemplary embodiment according to Figure 1.

If, as shown in Figure 3, the current transformer TR2 is connected directly to the operating voltage UB1 upstream of the transformer TR1, the voltage between the windings N1/N2/N3 can be reduced, as a result of which a smaller coil former can be used and, consequently, the dimensions of the transformer TR2 can be reduced. In this case, not only the current IBE, but also the current through the freewheeling diode DR flows through the transformer TR2, with the result that the base voltage is kept at a negative potential during the time interval t4 to t5, too.

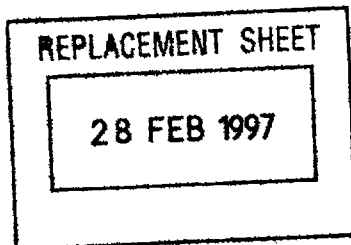
The circuit arrangement applied for has the advantage that the base current of the transistor T1 is proportional to the collector current and that the collector current generates the transistor's own turn-off current. An additional negative voltage source which ensures that the base voltage is below -2 volts is consequently not required. Only a very small number of inexpensive components are necessary, comprising a cost-effective, small transformer, four diodes and a low-power

THIS SHEET HAS BEEN
REPLACED

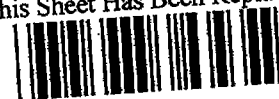


- 5 -

switching transistor for switching the base current for
the electronic switch.



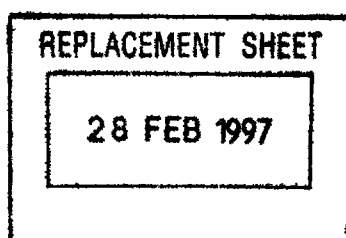
This Sheet Has Been Replaced





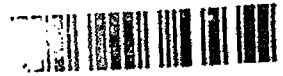
Patent Claims

1. Circuit arrangement for driving a switching transistor (T1) connected in series with a primary winding of a transformer (TR1), at the secondary windings of which transformer stabilized voltages can be picked off, characterized in that the primary winding (N1) of a current transformer (TR2) is connected in series with the primary winding (W1) of the transformer (TR1), which current transformer has a tapped secondary winding (N2, N3), the tap of the secondary winding being connected to the emitter of the switching transistor (T1), and in that the first end of the secondary winding (N1) is connected via a diode (D1) to the emitter of a driver transistor (T2), the collector of which is connected to the base of the switching transistor (T1), and in that the second end of the secondary winding (N3) is connected via at least two diodes (D2, D3) in the reverse direction to the base of the switching transistor (T1), which base is additionally connected via a further diode (D4) to the first end of the secondary winding (N2).
2. Circuit arrangement according to Claim 1, characterized in that the turns ratio (N2/N3) of the secondary windings (N2/N3) is virtually four to one.
3. Circuit arrangement according to Claim 1 or 2, characterized in that it is provided for a switched-mode power supply of a picture reproduction device.
4. Circuit arrangement according to Claim 1 or 2, characterized in that it is provided for a horizontal deflection circuit of a picture reproduction device.
5. Circuit arrangement according to Claim 1 or 2, characterized in that it is provided for a high-voltage generator of a picture reproduction device.



This Sheet Has Been Replaced





Abstract

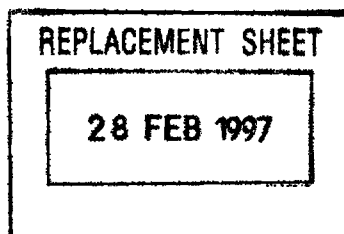
Driver circuit for a power transistor.

With the introduction of high scan and wide screen in picture reproduction devices, ever more stringent requirements are made of the loadability of switched-mode power supplies in devices of this type, (while at the same time reducing the power loss).

The circuit arrangement applied for complies with this requirement in that a further transformer in the form of a current transformer is connected in series with the switched-mode power supply transformer, the secondary winding of which current transformer has a tap which is connected to the emitter of the switching transistor. One end of the secondary winding is connected via a diode to the emitter of the driver transistor, the collector of which is connected to the base of the switching transistor. The other end of the secondary winding is connected via diodes in the reverse direction to the base of the switching transistor, which base is connected via a further diode to the first end of the secondary winding.

Television receiver and monitor.

Figure 1.



This Sheet Has Been Replaced



REPLACEMENT SHEET

28 FEB 1997

THIS SHEET HAS BEEN
REPLACED



1

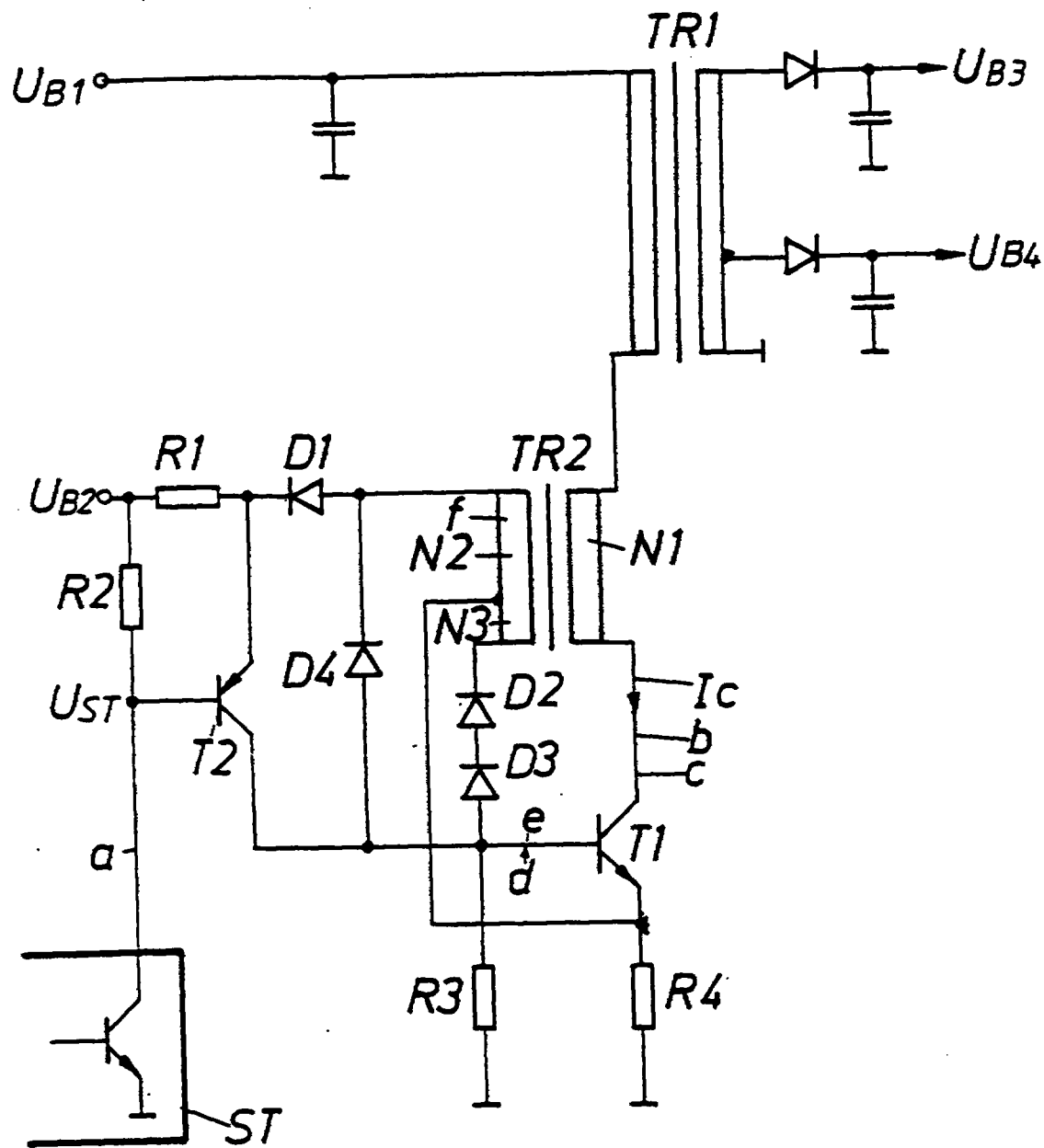
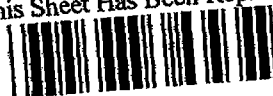


FIG.1

This Sheet Has Been Replaced



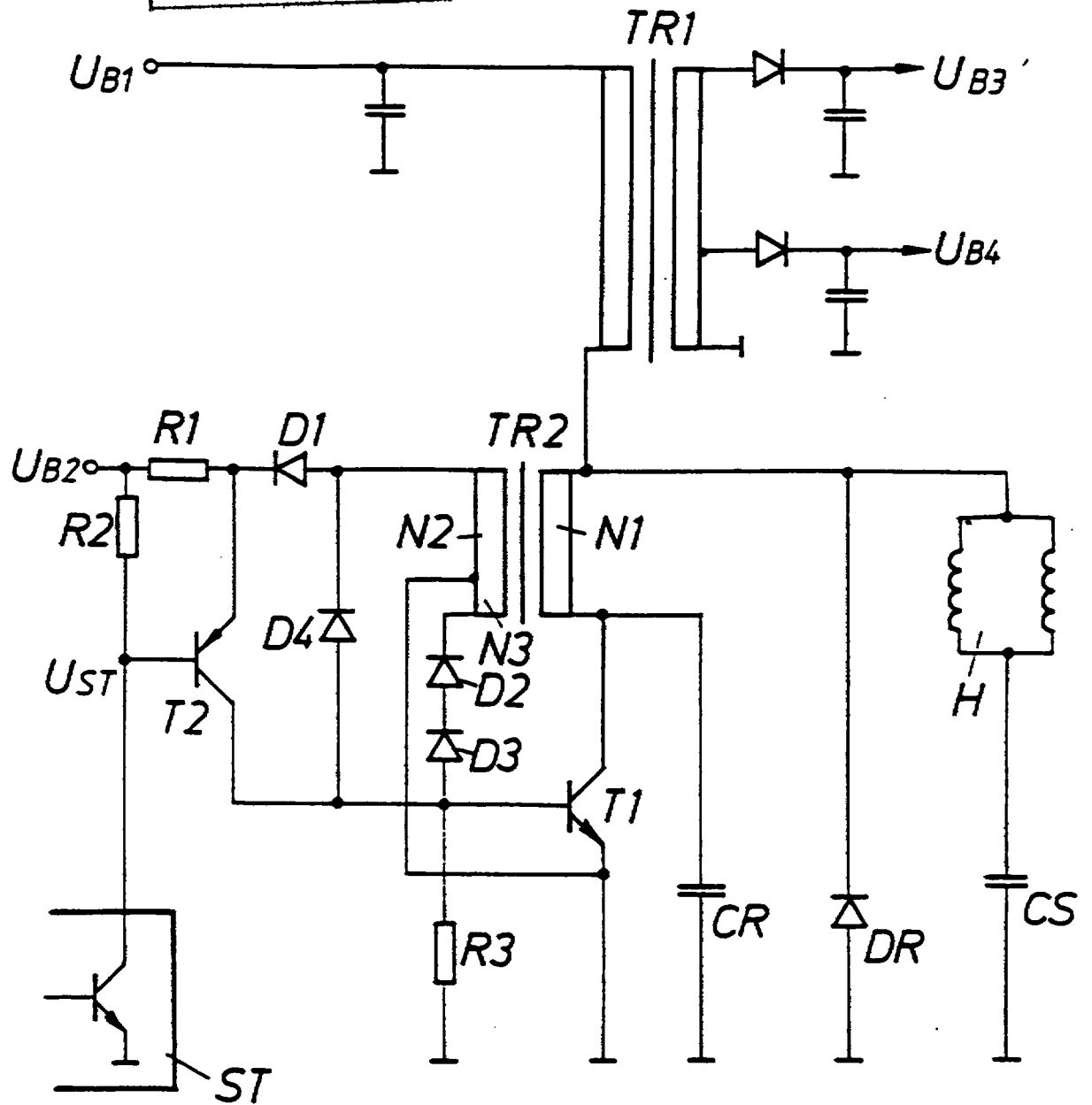


FIG. 2



28 FEB 1997

THIS SHEET HAS BEEN
REPLACED

4

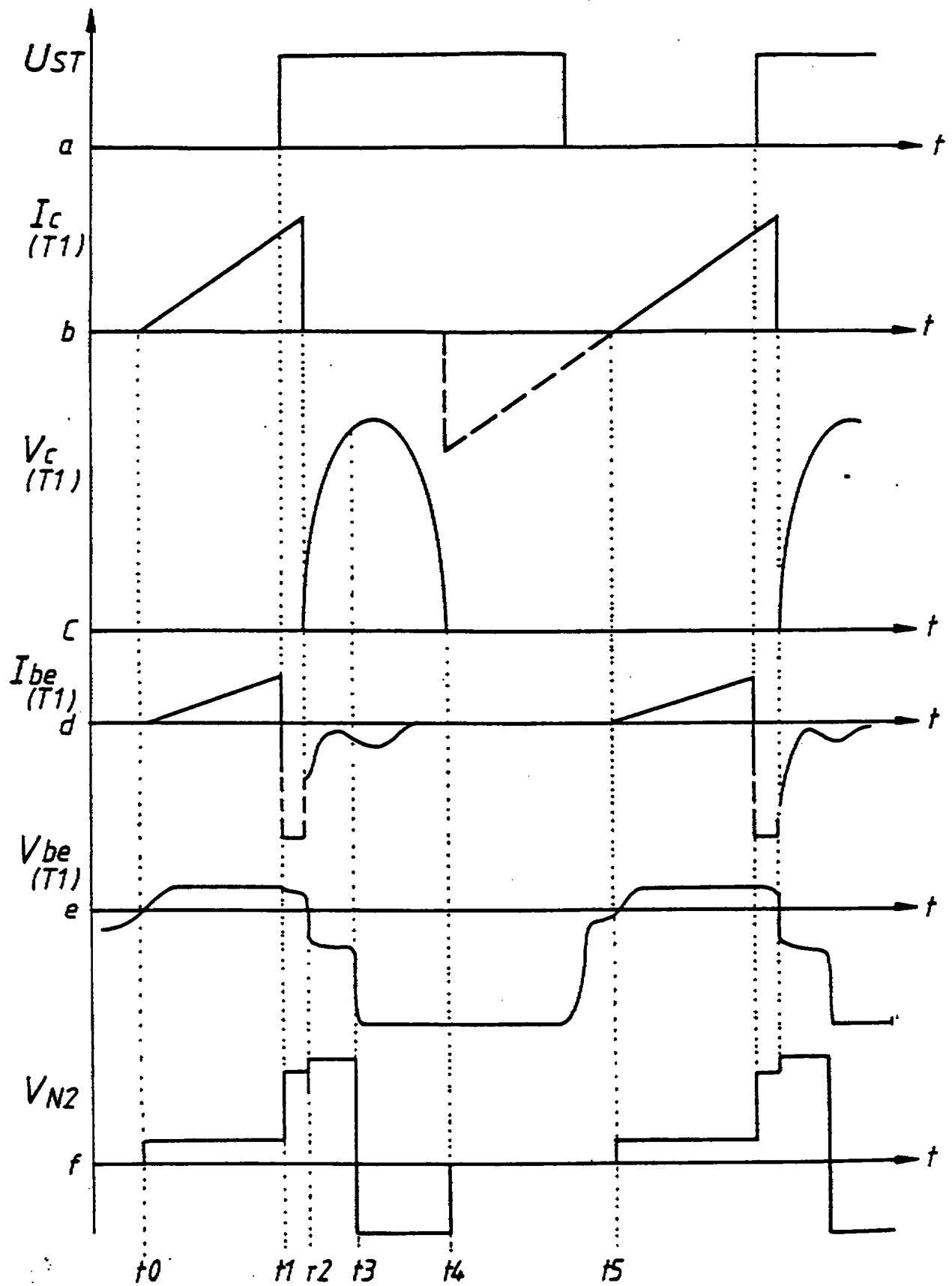
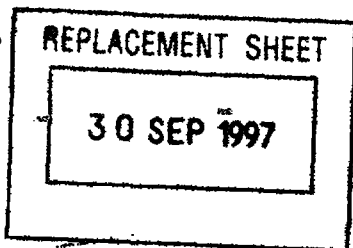


FIG. 4

This Sheet Has Been Replaced





- 1 -

POWER TRANSISTOR DRIVE CIRCUIT

REPLACEMENT SHEETS		SG
☒	Description : paged ...1 to paged	6
☒	Claim(s) : paged ...7 to paged	8
☒	Drawing(s) : paged ...1 to paged	4
☒	Abstract : paged ... to paged	
DATE OF RECEIPT		30 SEP 1997

The present invention is based on a circuit arrangement for controlling a switching transistor which is in series with a primary winding of a transformer, from the secondary windings of which, stabilised voltages can be derived. A circuit arrangement of this type is used inter alia in switched-mode power supplies, in high voltage generators or in line blanking circuits in television equipment.

A circuit arrangement in accordance with the first part of claim 1 is known from DD 280 642 A1. Another circuit arrangement, in which a primary winding of a second current transformer is connected in series with a primary winding of a first current transformer, is known from EP-A-0 043 761.

With the introduction of an increased number of lines (High-Scan) and a larger picture format (Wide-Screen), even greater demands are being made in respect of the power rating and upon the reduction of losses in circuit arrangements of the kind mentioned hereinabove.

Consequently, the object of the invention is to construct a circuit arrangement, which is described in accordance with the first part of the claim, in such a way that it can be constructed with lesser expenditure despite the greater demands. This object is achieved by the measures which are characterised in the claim.

With the help of the drawing, the invention will be described hereinafter by means of three embodiments.

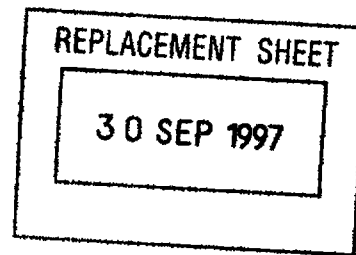


Figure 1 shows a first embodiment involving a switched-mode power supply;

Figure 2 shows a second embodiment involving a horizontal deflection circuit;

Figure 3 shows a third embodiment involving a high voltage generator;

Figure 4 shows the signals at the positions indicated in Figure 1.

In Figure 1, there is illustrated a switched-mode power supply which, in known manner, produces a plurality of regulated operating voltages UB3, UB4 from a rectified voltage UB1. To this end, an electronic switch T1, which is in series with the primary winding of the switched-mode power supply transformer TR1, is rendered conductive periodically and connects the one end of the primary winding of the transformer TR1 to earth potential, its other end being connected to the unregulated dc voltage UB1. The duty ratio of the control pulses for the electronic switch T1 from a control circuit ST is altered, with the help of a regulating circuit which will not be described in detail, in such a way that the dc output voltages UB3, UB4 that are generated at the secondary side are maintained constant.

A further current transformer TR2, whose primary winding N1 is in the collector circuit of the electronic switch T1, is connected in series with the primary winding of the

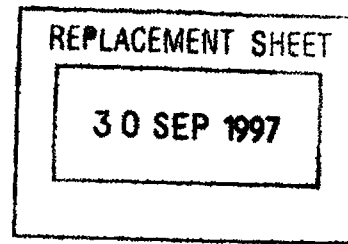
30 SEP 1997

- 3 -

transformer TR1. The secondary side of the current transformer TR2 consists of a tapped secondary winding N2, N3. The upper end of the winding N2 is connected via a diode D1 to the emitter of a transistor T2 which is connected to a positive voltage UB2 via a resistor R1. The base of the transistor T2 is connected on the one hand via the resistor R2 to the positive operating voltage UB2 and, on the other hand, to the output of the control circuit ST. The collector of the transistor T2 is connected to the base of the electronic switch T1. The transistor T2 only needs to deliver the very small base current for the electronic switch T1 and may thus be quite small. The tap on the secondary winding of the current transformer TR2 is connected to the emitter of the electronic switch T1. The lower end of the secondary winding N2 of the current transformer TR2 is connected via the diodes D2 and D3 to the base of the electronic switch T1 which is connected to the reference potential via the resistor R3. Finally, the base of the electronic switch T1 is connected via a diode D4 to the upper end of the secondary winding of the current transformer TR2.

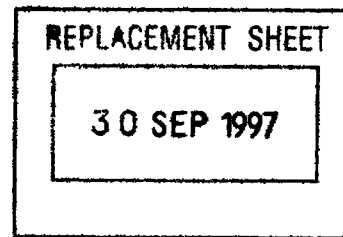
The manner of operation of the circuit that has just been described (Figure 1) will be described hereinafter with the help of Figure 4.

(1) At the time point t_0 , the PNP transistor T2 is switched on by the control circuit ST so that a base current I_B flows into the electronic switch T1 (Figure 4d), this resulting in a corresponding collector current I_C through the electronic



switch T1 (Figure 4b) which also flows through the primary winding N1 of the transformer TR2. The voltage on the winding N2 amounts to approximately 1.5 Volts which is composed of the voltage UD across the diode D1, the collector emitter voltage VCE of the transistor T2 and the base emitter voltage VBE of the electronic switch T1. The number of windings in the winding N3 amounts to approximately a quarter of the number of windings in the winding N2 so that approximately 0.4 Volts occur across N3 and the diodes D2 and D3 remain blocked. Any unwanted current through these diodes resulting from an increased base emitter voltage of the transistor T1 increases the voltage drop across them so that the current is thereby limited. Otherwise, yet a further diode would have to be connected in series.

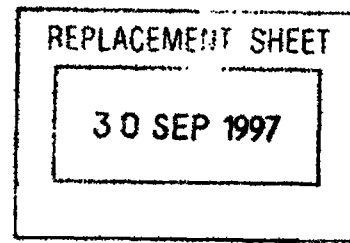
(2) At the time point t1, the control circuit ST switches off the transistor T2 (Figure 4a) so that the positive base current of the transistor T1 is interrupted (Figure 4d). Since, because of the transistor capacitances which are still charged, the collector current of the transistor T1 continues to flow (Figure 4b) up to the time point t2, until these capacitances have discharged and thus produce a negative base current which flows via the diodes D2 and D3 into the winding N3 of the transformer TR2 which is active as from the time point t2 and produces a current which corresponds to the transformation ratio $N2/N3$ of ca. 4 : 1. The transistor T1 is switched off in this manner by its own collector current which produces the high negative voltage for as long as it is still flowing.



(3) When the transistor T1 has switched off, the collector voltage climbs above its V_{CE0} value. Consequently, a negative voltage must be present on its base. This is achieved by virtue of the magnetic energy stored in the transformer TR2 during the time period t_0 to t_3 . This energy produces a negative voltage on the winding N2 which reaches the base of the transistor T1 via the diode D4 (Figure 4d). This voltage is limited by the reverse voltage V_{BE} of T1.

Whilst the invention was described in terms of its application to a switched-mode power supply in Figure 1, the utilisation in a horizontal deflection circuit is shown in Figure 2 and the utilisation in a high voltage generator for a picture reproduction apparatus, such as a television receiving device or a monitor for example, is shown in Figure 3. The components which correspond to those in Figure 1 are provided with similar reference symbols. The manner of functioning corresponds to the manner of operation which was described on the basis of the embodiment in accordance with Figure 1.

When, as is shown in Figure 3, the current transformer TR2 is connected directly to the operating voltage UB_1 prior to the transformer TR1, the voltage between the windings N1/N2, N3 can be made smaller whereby a smaller coil former can be used and hence the dimensions of the transformer TR2 can be made smaller. In this case, not only does the current I_{BE} flow through the transformer TR2, but so too does the current through the flyback diode DR so that the base



voltage is held at negative potential during the time span t_4 to t_5 too.

The circuit arrangement reported here has the advantage that the base current of the transistor T1 is proportional to the collector current and that the collector current produces the current for switching off its own transistor. By this means, an additional negative voltage source, which caters for the base voltage being below -2 Volts, is not required. Only very few and cheap components consisting of an economical small transformer, four diodes and a low power switching transistor for switching the base current for the electronic switch are needed.

REPLACEMENT SHEET

30 SEP 1997

- 7 -



Claims

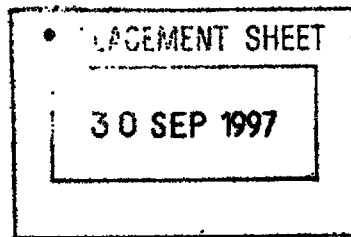
1. Circuit arrangement for controlling a switching transistor (T1) which is in series with a primary winding of a transformer (TR1), from the secondary windings of which, stabilised voltages can be derived, and including a driver transistor (T2) and a primary winding (N1) of a current transformer (TR2) which is likewise connected in series with the primary winding of the transformer (TR1), characterised in

that the current transistor (TR2) comprises a tapped secondary winding (N2, N3) wherein the tap of the secondary winding is connected to the emitter of the switching transistor (T1),

that the first end of the secondary winding (N2) is connected via a diode (D1) to the emitter of a driver transistor (T2) whose collector is connected to the base of the switching transistor (T1),

and that the second end of the secondary winding (N3) is connected via at least two diodes (D2, D3) connected in the blocking direction to the base of the switching transistor (T1) whose base is connected additionally to the first end of the secondary winding (N2) via a further diode (D4).

2. Circuit arrangement in accordance with Claim 1, characterised in that, the transformation ratio (N2/N3) of the secondary windings (N2, N3) is virtually four to one.



- 8 -



3. Circuit arrangement in accordance with Claim 1 or 2, characterised in that, it is provided for a switched-mode power supply of a picture reproduction apparatus.
4. Circuit arrangement in accordance with Claim 1 or 2, characterised in that, it is provided for a horizontal deflection circuit of a picture reproduction apparatus.
5. Circuit arrangement in accordance with Claim 1 or 2, characterised in that, it is provided for a high voltage generator of a picture reproduction apparatus.

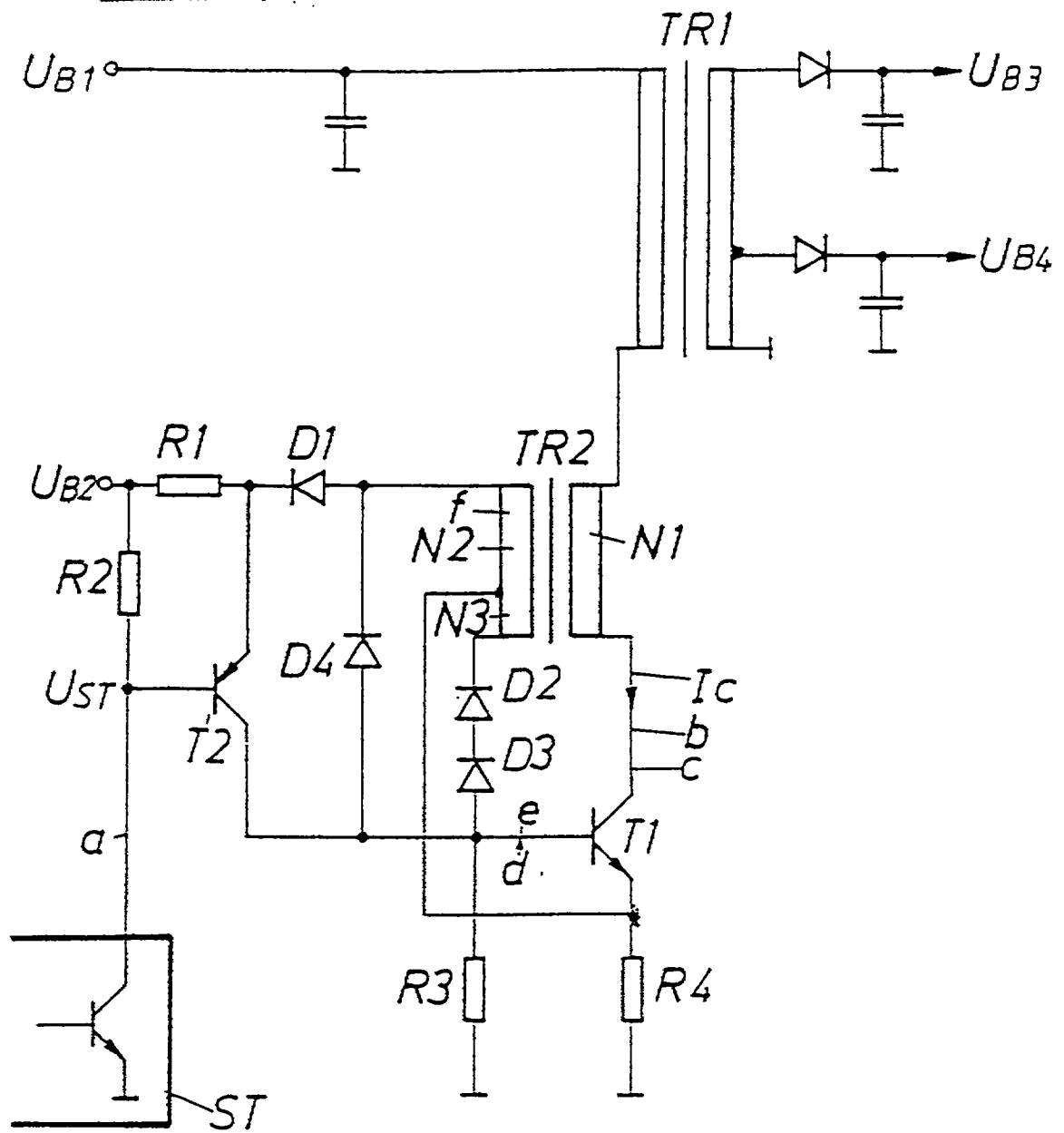


FIG.1

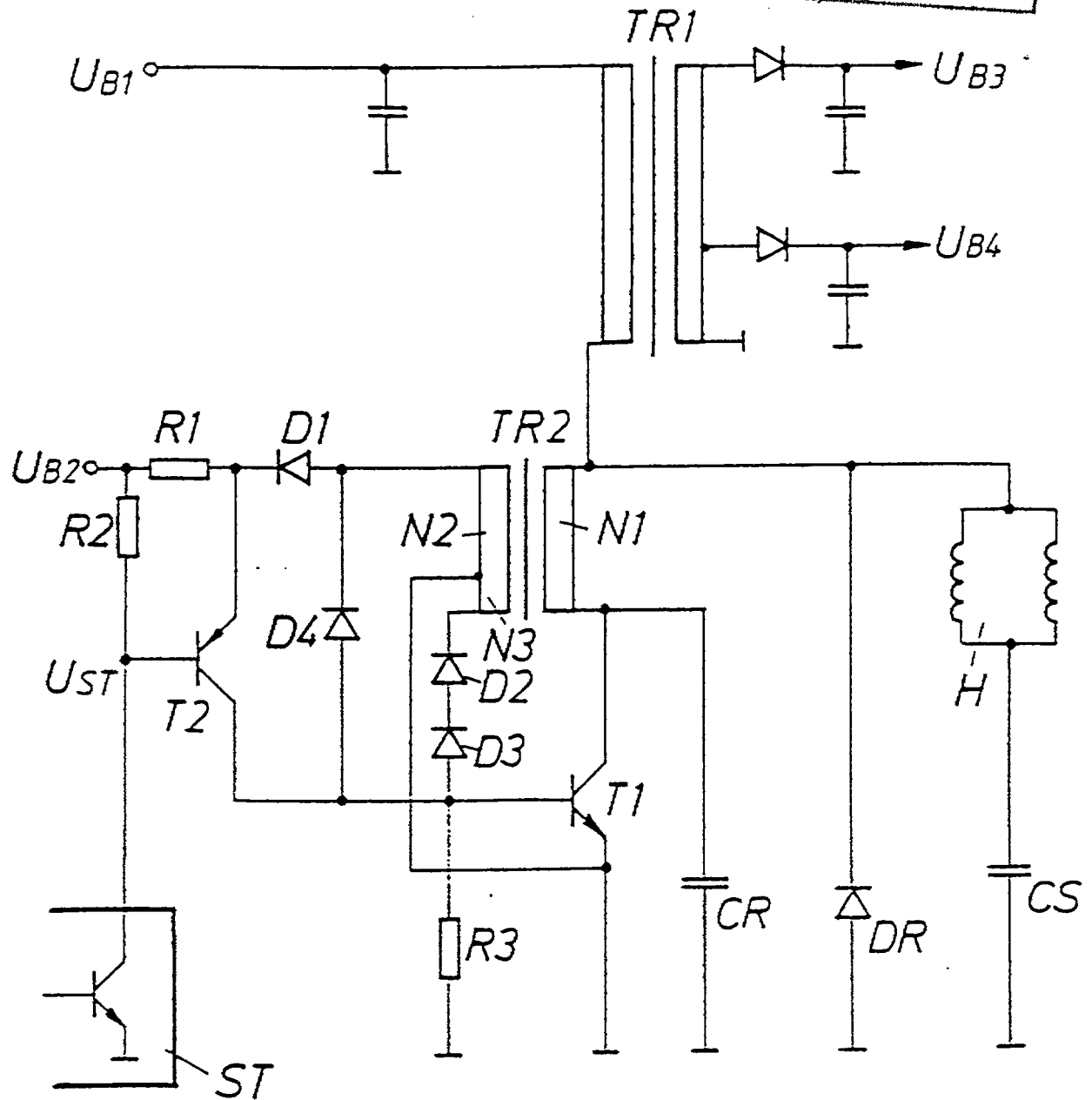
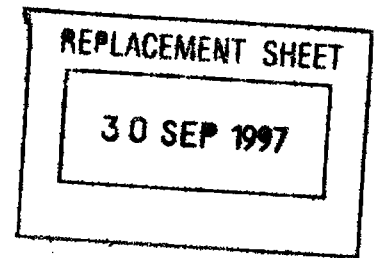


FIG. 2

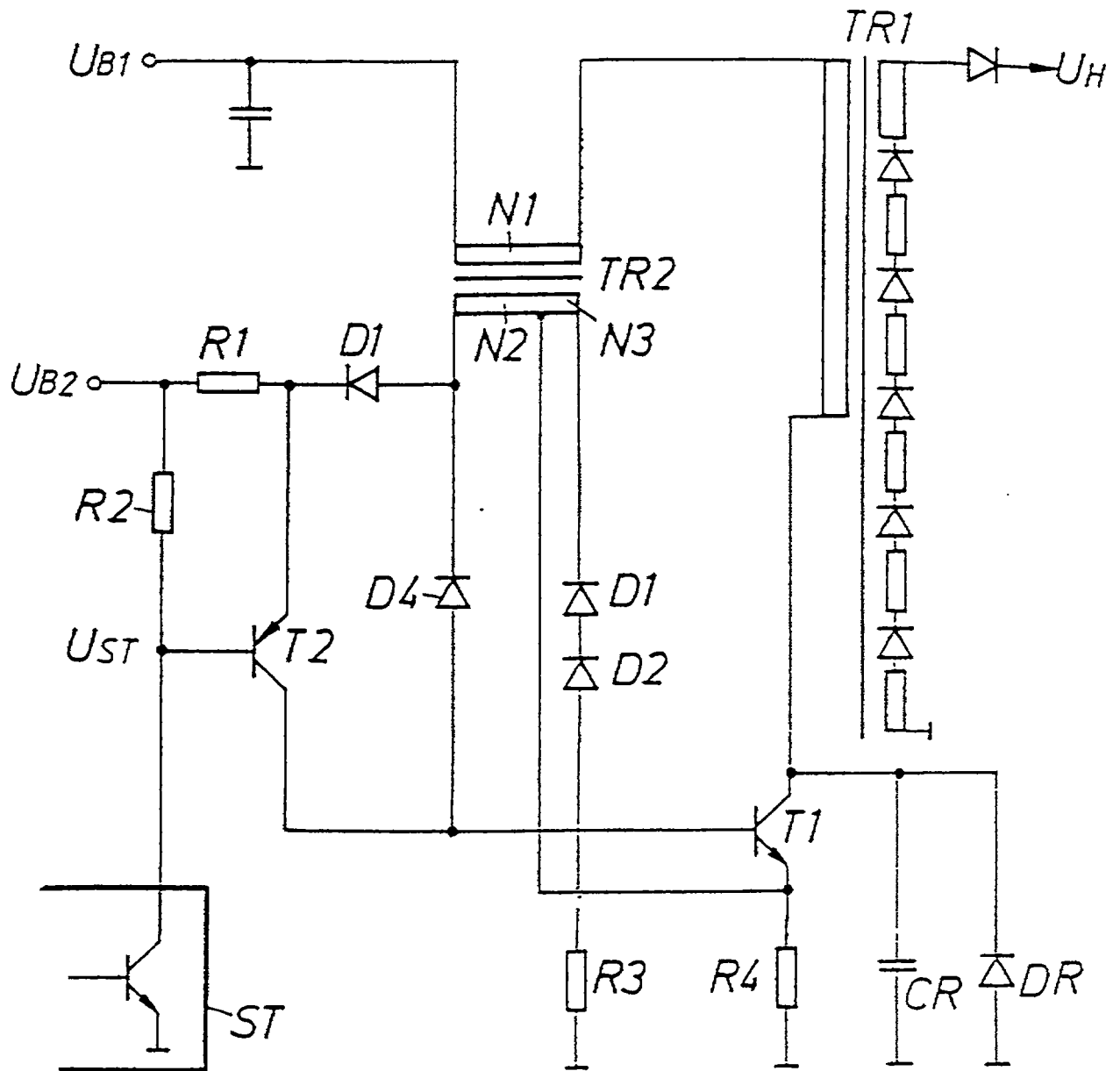


FIG.3

30 SEP 1997

- 4 -

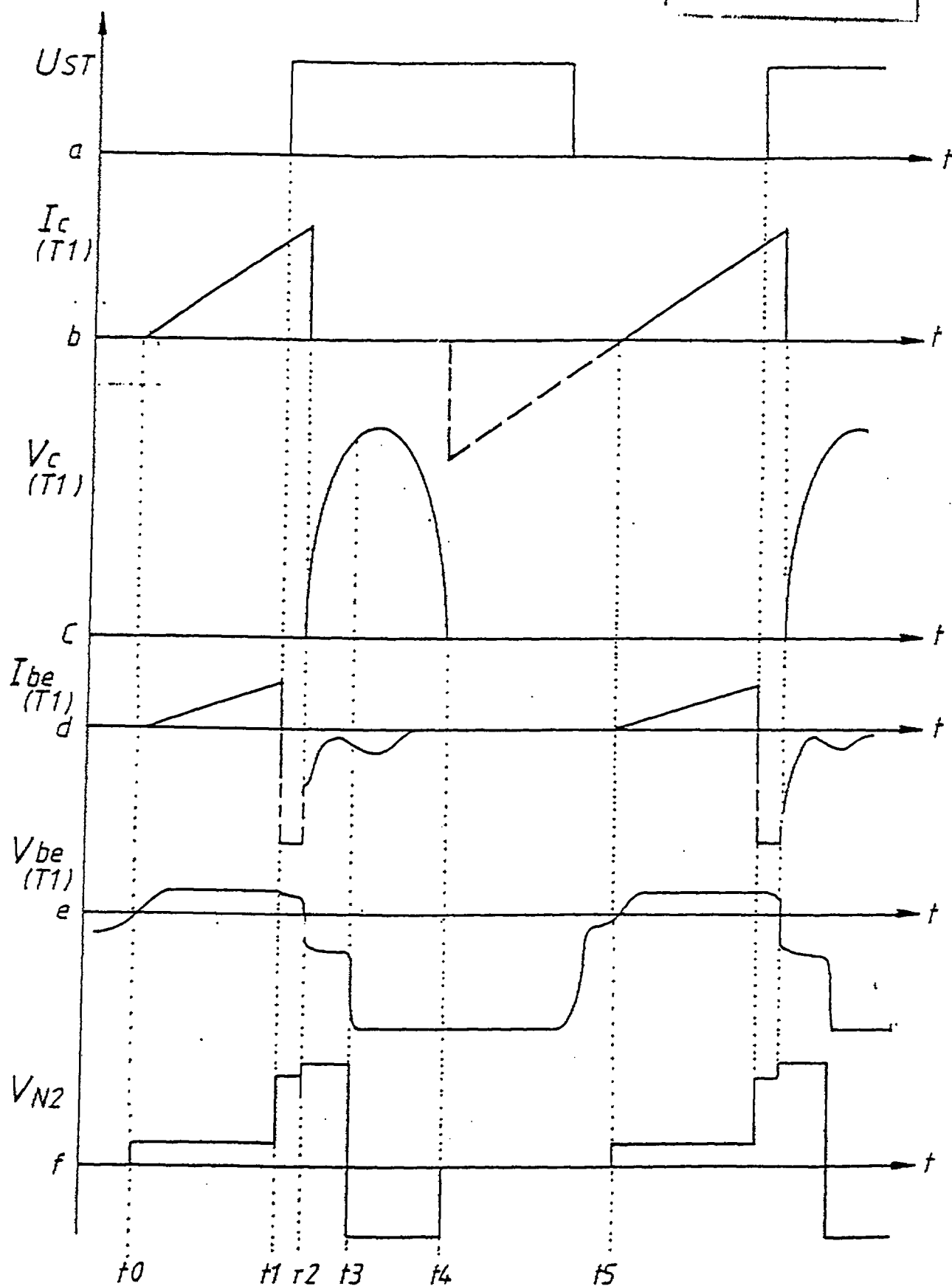


FIG. 4

THIS SHEET HAS BEEN
REPLACEDAbstract

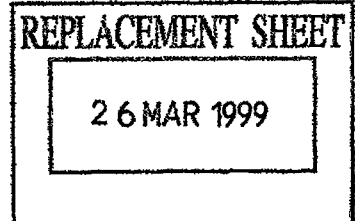
Driver circuit for a power transistor.

With the introduction of high scan and wide screen in picture reproduction devices, ever more stringent requirements are made of the loadability of switched-mode power supplies in devices of this type, (while at the same time reducing the power loss).

The circuit arrangement applied for complies with this requirement in that a further transformer in the form of a current transformer is connected in series with the switched-mode power supply transformer, the secondary winding of which current transformer has a tap which is connected to the emitter of the switching transistor. One end of the secondary winding is connected via a diode to the emitter of the driver transistor, the collector of which is connected to the base of the switching transistor. The other end of the secondary winding is connected via diodes in the reverse direction to the base of the switching transistor, which base is connected via a further diode to the first end of the secondary winding.

Television receiver and monitor.

Figure 1.



This Sheet Has Been Replaced



- 9 -

POWER TRANSISTOR DRIVE CIRCUIT

ABSTRACT

With the introduction of high scan and wide screen in picture reproduction devices, ever more stringent requirements are made of the loadability of switched-mode power supplies in devices of this type, (while at the same time reducing the power loss).

The circuit arrangement applied for complies with this requirement in that a further transformer in the form of a current transformer is connected in series with the switched-mode power supply transformer, the secondary winding of which current transformer has a tap which is connected to the emitter of the switching transistor. One end of the secondary winding is connected via a diode to the emitter of the driver transistor, the collector of which is connected to the base of the switching transistor. The other end of the secondary winding is connected via diodes in the reverse direction to the base of the switching transistor, which base is connected via a further diode to the first end of the secondary winding.

Television receiver and monitor.

Figure 1.

