

(12)

EUROPEAN PATENT APPLICATION

(21) Application number: **81830039.4**

(51) Int. Cl.³: **F 02 D 31/00**
F 02 D 33/00

(22) Date of filing: **12.03.81**

(30) Priority: **17.03.80 IT 6740080**
16.05.80 IT 6777080

(43) Date of publication of application:
23.09.81 Bulletin 81/38

(84) Designated Contracting States:
DE FR GB SE

(71) Applicant: **FIAT AUTO S.p.A.**
Corso Giovanni Agnelli 200
I-10135 Torino(IT)

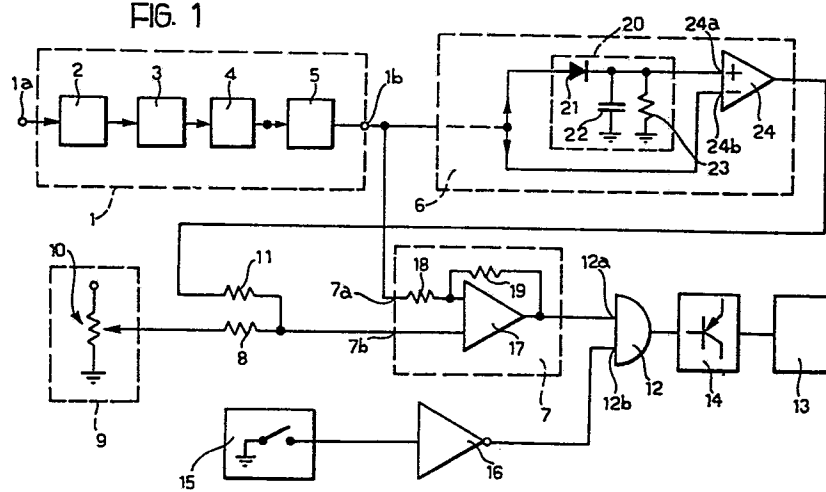
(72) Inventor: **Di Nunzio, Vittorio**
Corso Francia 278
I - 10146 Torino(IT)

(74) Representative: **Jacobacci, Filippo et al,**
c/o Jacobacci-CASETTA & PERANI S.p.A. Via Alfieri 17
I-10121 Torino(IT)

(54) **Device for controlling the fuel feed for Otto-cycle internal combustion engines for motor vehicles.**

(57) The device includes speed sensor means (1) which provide a signal (A) indicative of the speed of rotation of the engine to a first input (7a) of a comparison circuit (7). A reference signal is fed to a second input (7b) of the comparison circuit (7). The output of the comparison circuit (7) is connected to a first input (12a) of an enabling logic circuit (12), having a second input (12b) connected to means (15) for detecting the position of the accelerator pedal. The enabling logic circuit (12) is connected to shut-off means (13) disposed in the fuel feed pipe of the engine. A processing circuit (6) has its input connected to the speed sensor means (1), and its output connected to the second input (7b) of the comparison circuit (7). This processing circuit (6) generates an electrical signal having an amplitude which increases with time according to a predetermined law, when the signal provided by the speed sensor means (1) falls at a rate greater than a predetermined rate.

FIG. 1



- 1 -

Device for controlling the fuel feed for Otto-cycle
internal combustion engines for motor vehicles

The present invention relates to a device for controlling the fuel feed for Otto-cycle internal combustion engines for motor vehicles. In particular the present invention relates to a control device of the type including:

- 5 - speed sensor means arranged to provide at its output an electrical signal indicative of the speed of rotation of the engine,
- generator means arranged to generate a reference
10 electrical signal having a constant amplitude,
- a comparison circuit having first and second inputs connected respectively to the speed sensor means and the generator means and arranged to supply a control
15 signal when the signal provided by the speed sensor means exceeds the level of the signal fed to the second input of the comparison circuit,
- first electrical position-detector means arranged to detect the position of the accelerator pedal and to provide an electrical enabling signal when the acceler-

ator pedal is released,

- shut off means intended to be disposed in the fuel feed pipe of the engine, and

- an enabling logic circuit connected to the comparison circuit and to the said first position-detector means and arranged to actuate the shut off means only when the said control signal and the said enabling signal are simultaneously present at the inputs of the said logic circuit.

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Known devices of the above specified type bring about the closure of the fuel feed pipe of the engine of the vehicle when the accelerator pedal is released and the speed of rotation of the engine exceeds a predetermined minimum value during running of the vehicle.

15

The fuel feed is restored again when the speed of rotation of the engine falls below the predetermined minimum value or when the accelerator pedal is again pressed.

20

These control devices for the fuel feed allow atmospheric pollution to be reduced. Indeed, as is known, when the accelerator pedal is released during running of the vehicle, the engine emits considerable quantities of unburnt hydrocarbons. The emission of unburnt hydrocarbons is greater the higher the speed of revolution of the engine at the moment at which the accelerator pedal is released.

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The fuel-feed control devices further allow a saving in fuel, for example on all occasions when the engine is

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- 3 -

driven by the vehicle wheels through the transmission system. These conditions occur rather frequently, particularly during urban driving, for example when the vehicle slows to stop at traffic lights. Under these conditions, the accelerator pedal has barely been released before the fuel feed pipe is closed. The engine does not stall since it is driven by the transmission system. Immediately the speed of rotation of the engine falls below a predetermined minimum value the fuel feed is restored.

The adoption of fuel feed control devices is particularly convenient for carburettor engines provided with catalytic silencers. During periods in which the engine is driven by the transmission, a considerable quantity of unburnt hydrocarbons reaches the catalytic silencer. Thanks to the oxygen present in the catalytic silencer, partial combustion of these hydrocarbons occurs with an exothermic reaction which results in an increase in the temperature of the so-called catalytic bed. Such temperature increases may result in progressive damage to the catalytic bed. This disadvantage may be eliminated by means of the fuel feed control device of the type specified above, which allows the quantity of unburnt hydrocarbons passed into the catalytic silencer to be reduced.

Fuel feed control devices of the type described above made up till now, establish a minimum threshold value for the speed of rotation of the engine, above which the fuel

feed duct can be closed, and below which the feed is re-established. This threshold value is fixed.

A disadvantage of known devices is related to the fact
5 that there is a period of delay, which cannot be ignored, between the instant at which the fuel feed to the engine is re-established and the instant at which the engine again supplies driving torque. This period of delay may result in stalling of the engine, particularly when the
10 engine is uncoupled from the transmission (friction clutch disengaged) and hence is no longer driven.

According to the known art, this disadvantage was avoided by using a threshold speed value which was rather high
15 (about 2000 rpm). The use of a high speed threshold value allows stalling of the engine to be averted. However, as is clear, a high speed threshold value involves a drastic reduction in the benefits resulting from the use of the fuel feed control device, so that the use of
20 such a control device has a rather limited economic advantage.

The object of the present invention is to provide a fuel feed control device for Otto-cycle internal combustion
25 engines for vehicles, which is both simple and economical to manufacture, easy to instal, and which is free from the present disadvantages of the devices of the prior art.

30 In order to achieve this object, the present invention

provides a fuel speed control device of the type specified above, the main characteristic of which lies in the fact that it further includes a processing circuit connected to the speed sensor means and arranged to generate
5 an electrical signal having an amplitude which increases with time according to a predetermined law when the signal provided at the output of the speed sensor means falls at a rate greater than a predetermined rate; the output of the said processing circuit being connected
10 to the second input of the said comparison circuit.

Further characteristics and advantages of the present invention will emerge from the detailed description which follows with reference to the appended drawings,
15 provided purely by way of non-limiting example, in which:

Figure 1 is a circuit diagram, partly in block form, of a control device according to the invention,

Figure 2 illustrates four cartesian graphs of electrical signals present, in operation, at the output of
20 respective component circuits of the device of Figure 1,

Figure 3 is a circuit diagram, partly in block form, of a second embodiment of the device according to the invention,

Figure 4 is a series of four cartesian graphs which
25 illustrate, as a function of time, the changes in four voltage signals provided at the outputs of component circuits of the device illustrated in Figure 3,

Figure 5 is a circuit diagram, partly in block form, of a third embodiment of the device according to the
30 invention, and

- 6 -

Figure 6 is a series of seven cartesian graphs which illustrate, as a function of time, seven wave forms provided at the outputs of the component circuits making up the device of Figure 5.

5

In Figure 1, by 1 there is indicated in its entirety, an analogue circuit arranged to provide at its output an electrical signal the amplitude of which is substantially proportional to the speed of rotation of the engine of the vehicle (not shown). The analogue circuit 1 has an input terminal 1a intended to be connected to the induction coil (not shown) of the ignition circuit of the vehicle. The terminal 1a constitutes the input of a pulse shaping circuit 2 the output of which is connected to a monostable circuit 3. This latter is connected to the input of a filter 4 the output of which is connected to the input of an amplifier 5. The output of this amplifier constitutes the output of the analogue circuit 1 and is indicated by 1b.

20

The output 1b of the analogue circuit 1 is connected to the input of a processing circuit 6 and to a first input 7a of a threshold comparison circuit 7 exhibiting hysteresis. The second input 7b of this circuit is connected, through a resistor 8, to a d.c. reference voltage source 9 constituted, for example, by a potentiometer 10 the resistive element of which is connected between a d.c. voltage supply and earth.

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The output of the processing circuit 6 is connected to the input 7b of the comparison circuit 7 by means of a resistor 11. The output of the comparison circuit 7

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- 7 -

is connected to a first input 12a of a logic AND gate 12, the output of which is connected to a shut off device 13 by means of a transistorised power output stage 14. The shut off device 13 may, for example, be constituted by
5 an electrovalve disposed in the fuel feed pipe of the engine.

A position detector device 15, arranged to provide an enabling electrical signal when the accelerator pedal
10 (not shown) of the engine is released, is connected to the second input 12b of the logic AND gate 12 through an inverter 16.

The position detector device 15 may be constituted by
15 a switch associated with the accelerator pedal. Alternatively, the position detector device 15 may be constituted by a switch associated with a butterfly valve (not shown) of the carburettor, and, in general, by any device capable of providing a signal of the on/off type when
20 the accelerator pedal is pressed/released.

In the following description it will be assumed that the detector device 15 provides at its output a signal "1" when the accelerator pedal is pressed, and a signal "0"
25 when the accelerator is released.

The threshold comparison circuit 7 includes an operational amplifier 17, an input resistor 18 and a feedback resistor 19.

- 8 -

The feedback operational amplifier 17, together with the resistors 8 and 11, constitute an analogue summing circuit.

5 The processing circuit 6 includes a memory circuit 20 constituted by a diode 21 having its anode connected to the output of the amplifier 5, and a capacitor 22 and a resistor 23 connected in parallel with each other between the cathode of the diode 21 and earth. The memory circuit 20 is connected to a first input 24a of a differential amplifier 24 a second input 24b of which is connected to the output of the amplifier 5. The output of the differential amplifier 24 is connected to the input 7b of the threshold comparison circuit 7, through the resistor 11.

The operation of the embodiment of the control device according to the invention illustrated in Figure 1 will now be described with reference to the wave forms illustrated in Figure 2.

In the said Figure 2, by A, B, C and D are illustrated four wave forms provided at the outputs of the analogue circuit 1, the threshold comparison circuit 7, the logic inverter 16 and the logic AND gate 12, respectively.

A curve A shows a possible variation of the signal provided at the output of the amplifier 5 as a function of time t. The amplitude of this signal is proportional to the speed of rotation of the engine. In the graph which

illustrates the progression of curve A, two parallel lines L_2 , L_1 have been drawn which represent the levels of the upper and lower operating thresholds of the threshold comparator 7. These levels may correspond, for example, to 1700 rpm and 1300 rpm respectively.

Supposing initially that the accelerator pedal is pressed by the driver, in this situation, the output of the position detector device 15 is at level "1", and therefore the output of the inverter 16 is at the level "0" (signal C of Figure 2).

The speed of rotation of the engine increases, and correspondingly, the curve A rises. At the instant $t=t_0$, the signal A intersects the level L_2 . Consequently the output of the threshold comparison circuit 7 is brought to level "1" (signal B of Figure 2).

Supposing the accelerator pedal is released at the instant indicated by t_1 , at the instant t_1 the signal provided at the output of the logic inverter 16 passes to level "1", as indicated by the wave form C of Figure 2. During the whole period of time preceding the instant t_1 , or else for the entire period of time during which the signal A rises or is substantially constant, the inputs $24a$, $24b$ of the differential amplifier 24 are fed with the same signal. Indeed, the memory circuit 20 is arranged to reproduce at its output the same signal which is received at its input, as long as this signal increases or is substantially constant. Consequently

for $t < t_1$, there is no signal present at the output of the differential amplifier 24 and only the constant reference voltage provided by the potentiometer 10 is present at the input 7b of the threshold comparator 7.

5

Subsequent to the instant t_1 , the signal A, which is proportional to the speed of the engine, starts to fall. The rate at which the signal falls depends on numerous factors. For example, after release of the accelerator pedal, the rate at which the signal A falls will be greater or smaller according to whether or not the brakes are applied.

10

Two different situations must therefore be distinguished.

15

If, after the instant t_1 , the signal A falls (branch A_1 of the curve A of Figure 2) with a time constant less than the discharge time constant of the R-C circuit constituted by the capacitor 22 and the resistor 23, the diode 21 isolates this R-C circuit from the output of the amplifier 5. The capacitor 22 discharges through the resistor 23 and the voltage thereacross, the variation of which is indicated by S in Figure 2, is fed to the input 24a of the differential amplifier 24. This differential amplifier 24 provides at its output an increasing signal the instantaneous amplitude of which corresponds to the difference between the instantaneous amplitudes of the curve S and the branch A_1 of the curve A. This signal is superimposed on the constant reference fed to the input 7b of the threshold comparison circuit 7.

20

25

30

Hence, from the instant t_1 the level of the lower

- 11 -

operating threshold of the comparator 7 ceases to be constant, and starts to increase in accordance with the curve indicated by T in Figure 2.

- 5 At the instant t_1 , the output of the logic AND gate 12 will have changed to level "1" bringing about, through the power stage 14, the actuation of the shut off device 13 disposed in the fuel feed pipe of the engine.
- 10 At the instant t_2 the branch A_1 of the curve A intersects the curve T, and consequently the output of the threshold comparison circuit 7 changes again to level "0" (signal B of Figure 2). Correspondingly the output of the logic AND gate 12 (signal D of Figure 2) changes to level "0",
- 15 resulting in the deactivation of the shut off means 13. The engine feed is re-established.

Summing up what has been explained above, when the speed of rotation of the engine falls with a time constant

20 less than that of the R-C circuit 22, 23, the processing circuit 6 causes a progressive increase in the level of the lower operating threshold of the threshold comparison circuit 7. This increase in the lower operating threshold is greater the more rapid the fall in speed of the

25 engine. Without the use of the processing circuit 6, the restoration of the fuel feed would occur at the instant indicated by t_3 in Figure 2. The effect of the use of the processing circuit 6 is thus to advance the

• restoration of the fuel feed to an extent which is

30 greater the faster the fall in speed of the engine.

- 12 -

This ensures that the fuel feed is restored in time, before the engine can stall.

The control device according to the invention operates
5 in a rather different manner from that indicated above when, subsequent to the instant t_1 , the speed of rotation of the engine falls with a time constant greater than the discharge time constant of the R-C circuit 22,23.

Supposing, in fact, that from the instant t_1 , the curve
10 A of Figure 2 decreases along the branch A_2 located above the curve S which corresponds to the discharge of the said R-C circuit, in this situation the diode 21 remains conductive, and the memory circuit 20 continues to reproduce at its output the signal provided to it by
15 the amplifier 5, that is, the signal A. As a result, the differential amplifier 24 provides a zero signal at the input $7b$ of the comparison circuit 7. Therefore the level of the lower operating threshold of this comparison circuit 7 remains, again subsequent to the instant t_1 ,
20 constant at the level L_1 . Correspondingly, the output of the threshold comparison circuit 7 (signal B) and the logic AND gate 12 (signal D) will change to level "0" only at the instant indicated by t_4 in Figure 2.

25 The processing circuit 6 is thus arranged to maintain the level of the lower operating threshold of the threshold comparison circuit 7 unaltered when the speed of rotation of the engine increases, is constant, or decreases with a time constant greater than the time
30 constant of the R-C circuit 22, 23.

- 13 -

As has been described above, if, instead, the speed of rotation of the engine decreases with a time constant less than that of the said R-C circuit, the processing circuit 6 superimposes on the level of the lower operating threshold L_1 , a signal of an amplitude which increases in time to a proportionally larger extent the greater the decrease in the speed of rotation of the engine.

10 The processing circuit 6 thus enables the setting of a lower operating threshold of the comparison circuit 7 which has a value less than the threshold values which could be set for the control devices of the prior art.

15 When, with the accelerator pedal released, the speed of rotation of the engine falls slowly, the control device according to the invention provides for the restoration of the feed only when the speed of the engine has reached a threshold value less than that of the devices of the prior art. Consequently the device
20 according to the invention allows the emission of unburnt hydrocarbons and the heating of the catalytic silencer to be greatly reduced. A greater fuel saving is also possible.

25 Figure 3 shows a second embodiment of the device according to the invention. In this Figure, the same elements already described with reference to Figure 1 have been given the same reference numerals.

In the variant illustrated in Figure 3, the processing circuit 6 further includes a generator circuit 25 having its input connected to the output of the logic inverter 16, and its output connected to the input 7b of the threshold comparison circuit 7 through a resistor 26.

5 The generator circuit 25 is arranged to generate a signal of increasing amplitude when its input is fed with a signal at level "1". This circuit may be constituted, for example, by a ramp voltage generator circuit.

10

In operation, immediately the accelerator pedal is released, the detector device 15 activates the generator circuit 25 through the logic inverter 16. The generator circuit provides a signal of increasing amplitude to the input 7b of the threshold comparison circuit 7. Consequently, as is seen from Figure 4, from the instant t_1 at which the accelerator pedal is released, the level of the lower operating threshold of the comparison circuit 7 ceases to be constant and starts to increase.

15

20 If the speed of rotation of the engine decreases with a time constant less than that of the R-C circuit 22, 23, the level of the lower operating threshold of the comparator 7 increases according to the curve T' of Figure 4. If, however, the speed of the engine falls with a

25 time constant greater than that of the said R-C circuit, the lower operating threshold of the comparator 7 increases according to the curve T'' of Figure 4.

In each case, the effect of the generator circuit 25 is

30 to bring about a progressive increase in the level of

- 15 -

the lower operating threshold of the threshold comparator 7 when the accelerator pedal is released.

As is known, when the accelerator pedal is released
5 during running of the vehicle, progressive drying of the induction manifold of the engine occurs, this manifold previously having been wetted by the fuel. The drying of the induction manifold occurs progressively, on average in about 15 seconds. Immediately the accelerator
10 pedal is released, and the fuel feed pipe closed, the induction manifold is again partially wetted by the fuel. If the deactivation of the shut off device of the fuel feed pipe occurs a few seconds after its activation, the fuel feed will be restored very quickly. On the other
15 hand, if this shut off device is deactivated after the manifold has completely dried, the fuel feed will be restored after a certain delay. This delay could result in stalling of the engine. The control device illustrated in Figure 3 provides for the gradual raising of the level
20 of the lower operating threshold of the comparison circuit 7 so as to ensure that the fuel feed is restored earlier and earliest as the induction manifold dries. In the case of Figure 4, the fuel feed is restored at the instant t'_2 , rather than at the instant t_2 .

25

Figure 5 illustrates a further embodiment of the device according to the invention. In this Figure, the elements common to the embodiments previously described have been indicated by the same reference numerals.

30

In the embodiment illustrated in figure 5, the processing circuit 6 further includes a control circuit 27 having a first input 27a connected to the output of the amplifier 5, and a second input 27b connected to the output of a device 28 for detecting the position of the friction-clutch control pedal. The detector device 28 may, for example, be constituted by a switch associated with the friction-clutch control pedal, and arranged to provide at its output a signal at level "0" when this pedal is released (friction clutch engaged) and a signal at level "1" when this pedal is depressed (friction clutch dis-engaged).

The output of the control circuit 27 is connected to a third input 12e of the logic AND gate 12. The control circuit 27 includes a threshold comparison circuit 29 having a first input 29a connected to the output of the amplifier 5, and a second input 29b connected to a d.c. reference voltage supply constituted, for example, by a potentiometer 30 connected between a voltage supply source and earth. The output of the threshold comparison circuit 29 is connected to a first input 31a of a logic OR gate 31 which has a second input 31b connected to the detector device 28 via a logic inverter 32.

The operation of the Figure 5 embodiment of the device according to the invention is essentially similar to that of the embodiments described above. In Figure 6 are illustrated the wave forms A to G of signals provided at the respective outputs of the analogue

circuit 1, the threshold comparison circuit 7, the logic inverter 16, the logic AND gate 12, the logic inverter 32, the threshold comparator 29, and the logic OR gate 31.

5

In operation, when the vehicle is running, immediately at the instant t_1 at which the accelerator pedal is released, the speed of rotation of the engine starts to fall. At the instant t_1 , as described above, the shut
10 off device 13 is activated. If, in these circumstances, the friction clutch is engaged, the engine does not stop since it continues to be driven by the transmission shaft. If, however, under these conditions the friction clutch is disengaged, the vehicle engine could stop
15 before the fuel feed has been restored. The embodiment of the device according to the invention illustrated in Figure 5 allows this eventuality to be avoided.

Supposing the friction clutch is disengaged at instant
20 t_5 which is subsequent to the instant t_1 . At the instant t_5 the output of the logic inverter 32 changes to level "0". If, at this moment, the speed of rotation of the engine resides above the operating threshold value of the comparison circuit 29, the output of this comparison
25 circuit 29 and of the logic OR gate 31 remain at level "1". In this situation the operation of the control device proceeds exactly in the manner already illustrated above. Whenever, before the control device has allowed the fuel feed to be restored, the speed of rotation of
30 the engine falls below the operating threshold of the

- 18 -

comparison circuit 29 (at the instant t_6 ; Figure 6) the outputs of the comparison circuit 29 and of the logic OR gate 31 change to level "0". Consequently, the output of the logic AND gate 12 changes suddenly to level "0" advancing the restoration of the fuel feed. This prevents the engine from stopping before the fuel feed has been effectively restored.

Whenever, between the instants t_1 and t_2 (t'_2) the friction clutch is not disengaged, the device illustrated in Figure 5 functions exactly in the same manner as the device illustrated in Figure 3.

The device illustrated in Figure 5 allows the restoration of the fuel feed to be advanced whenever, in the period in which the fuel feed is interrupted, the friction clutch is disengaged and the speed of rotation of the engine falls below the operating threshold of the comparator 29.

The device illustrated may be used to advantage for controlling the fuel feed to carburettor, Otto-cycle, internal combustion engines. It may also, however, be used with injection engines. When the device is used for this latter type of engine, the position detector device 15 may be constituted by an electrical air-flow meter disposed in the induction manifold. A threshold comparison circuit connected to the output of the flow meter may, in this case, provide a signal of the on/off type when the accelerator pedal is pressed/released.

Moreover, the shut off device may be constituted by the injectors of the engine themselves.

Naturally, the principle of the invention remaining the
5 same, the embodiments and the details of its realisation
may be varied widely with respect to that described and
illustrated purely by way of non-limiting example,
without thereby departing from the scope of the present
invention.

CLAIMS

1. Fuel feed control device for Otto-cycle internal combustion engines for motor vehicles, including:

- 5 - speed sensor means (1) arranged to provide at its output an electrical signal (A) indicative of the speed of rotation of the engine,
 - generator means (9) arranged to provide at its output an electrical reference signal having a constant amplitude,
 - a comparison circuit (7) having first and second
10 inputs (7a, 7b) connected respectively to the speed sensor means (1) and to the generator means (9), and arranged to provide a control signal (B) when the signal (A) provided by the speed sensor means (1) exceeds the level of the signal fed to the second input (7b) of the
15 comparison circuit (7),
 - first electrical position detector means (15) arranged to detect the position of the accelerator pedal and to provide an electrical enabling signal (C) when the accelerator pedal is released,
 - 20 - shut-off means (13) intended to be disposed in the fuel feed pipe of the engine,
 - an enabling logic circuit (12) connected to the comparison circuit (7) and to the said first position-detector means (15), and arranged to actuate the shut-
25 off means (13) only when the said control signal (B) and enabling signal (C) are present simultaneously at the inputs to the said logic circuit (12),
- characterised in that it further includes a processing

- 21 -

circuit (6) connected to the speed sensor means (1) and arranged to generate an electrical signal having an amplitude which increases in time according to a predetermined law when the signal (A) provided at the output of the speed sensor means (1) falls at a rate greater than a predetermined rate; the output of the said processing circuit (6) being connected to the second input (7b) of the said comparison circuit (7).

10 2. Device according to Claim 1, characterised in that the said processing circuit (6) is arranged to generate an electrical signal having an amplitude which increases with time in dependence on the rate of decrease, during operation, of the amplitude of the signal (A) emitted
15 by the speed sensor means (1).

3. Device according to Claim 2, characterised in that the said processing circuit (6) is arranged to generate an electrical signal having an amplitude which increases
20 with time in dependence on the length of time during which the signal (A) emitted by the speed sensor means (1) falls.

4. Device according to Claim 2 or 3, characterised in
25 that the said processing circuit (6) includes:

- a memory circuit (20) connected to the speed sensor means (1) and arranged to:

(a) provide at its output an electrical signal having an initial amplitude equal to the instantaneous amplitude of the signal (A) emitted by the speed sensor means
30

(1) and decreasing in time with a predetermined time constant, when the signal (A) emitted by the speed sensor means (1) falls with a time constant less than the said predetermined time constant;

5 (b) reproduce at its output the signal (A) emitted by the speed sensor means (1), when the amplitude of the said signal (A) is increasing, is constant, or decreases with a time constant greater than the said predetermined time constant,

10 - a differential amplifier circuit (24) having first and second inputs (24a, 24b) connected respectively to the output of the speed sensor means (1) and the output of the memory circuit (20).

15 5. Device according to Claim 4, characterised in that the said processing circuit (6) further includes a generator circuit (25) having its input connected to the said detector means (15, 16) and its output connected to the said second input (7b) of the comparison
20 circuit (7); the said generator circuit (25) being arranged to generate an electrical signal having an amplitude which increases in time according to a predetermined law from the instant (t_1) at which, in operation, the signal (C) emitted by the said first position
25 detector means (15, 16), indicates that the accelerator pedal has been released.

6. Device according to Claim 5 characterised in that the said processing circuit (6) further includes:

30 - second electrical position-detector means (28)

- 23 -

intended to be associated with the friction-clutch control pedal, and

- a control circuit (27) connected to the speed sensor means (1), to the said second electrical position-detector means (28), and to the said enabling logic circuit (12); the said control circuit (27) being arranged to provide an inhibit signal (G) to the said enabling logic circuit (12) when the signals (A; E) emitted by the speed sensor means (1) and by the second electrical position-detector means (28) indicate that the speed of rotation of the engine is less than a predetermined value and that the friction-clutch control pedal has been depressed.

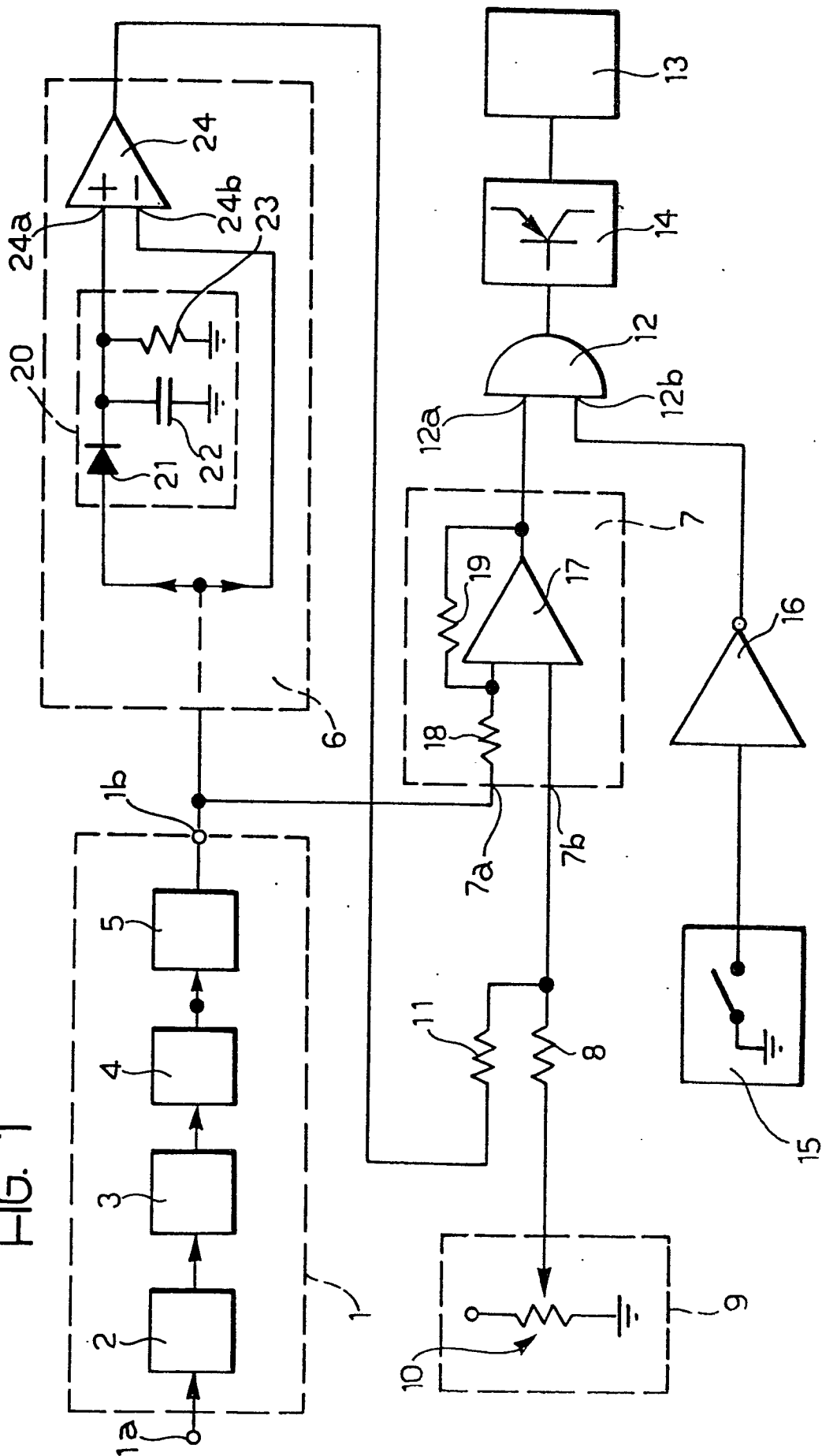
7. Device according to Claim 6, characterised in that the said control circuit (27) includes a threshold comparator circuit (29) connected to the speed sensor means (1), and a logic OR circuit (31) having first and second inputs (31a, 31b) connected respectively to the output of the said threshold comparator circuit (29) and to the said second electrical position-detector means (28); the output of the said logic OR circuit (31) being connected to a third input (12c) of the said enabling logic circuit (12).

8. Device according to any of claims 4 to 7, characterised in that the said memory circuit (20) includes a diode (21) having its anode connected to the output of the speed sensor means (1), and an R-C circuit (22, 23) having a predetermined time constant; the said R-C

circuit (22, 23) including a resistor (23) and a capacitor (22) connected in parallel with each other between the cathode of the said diode (21) and earth.

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FIG. 1



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FIG. 2

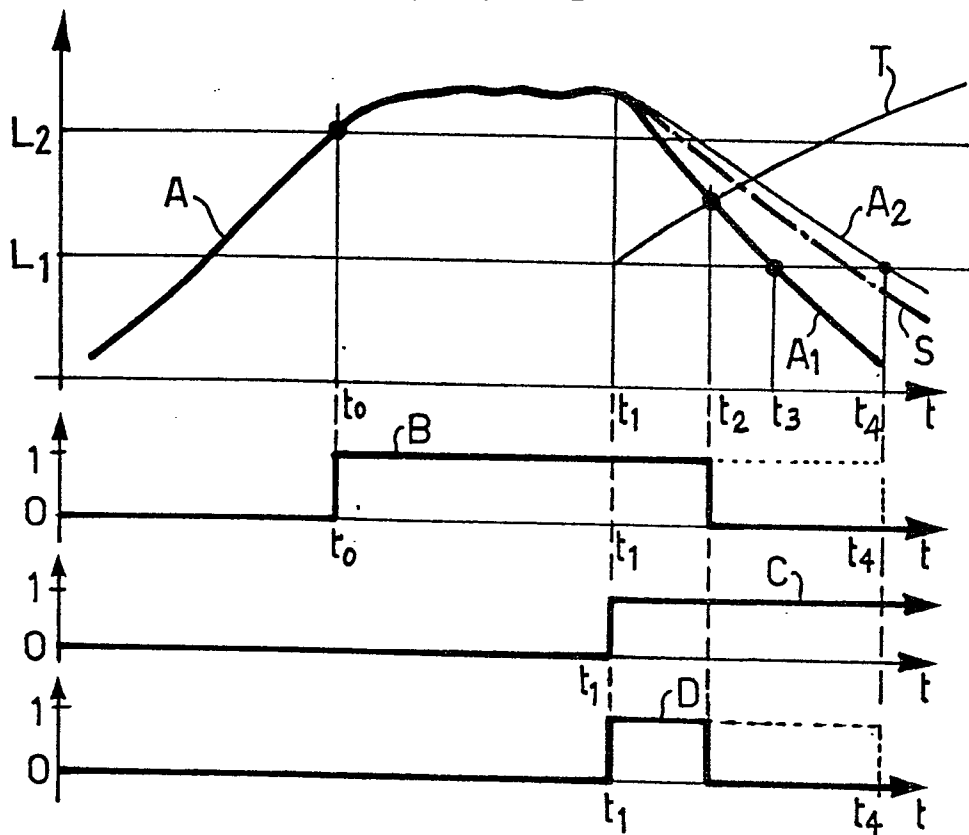
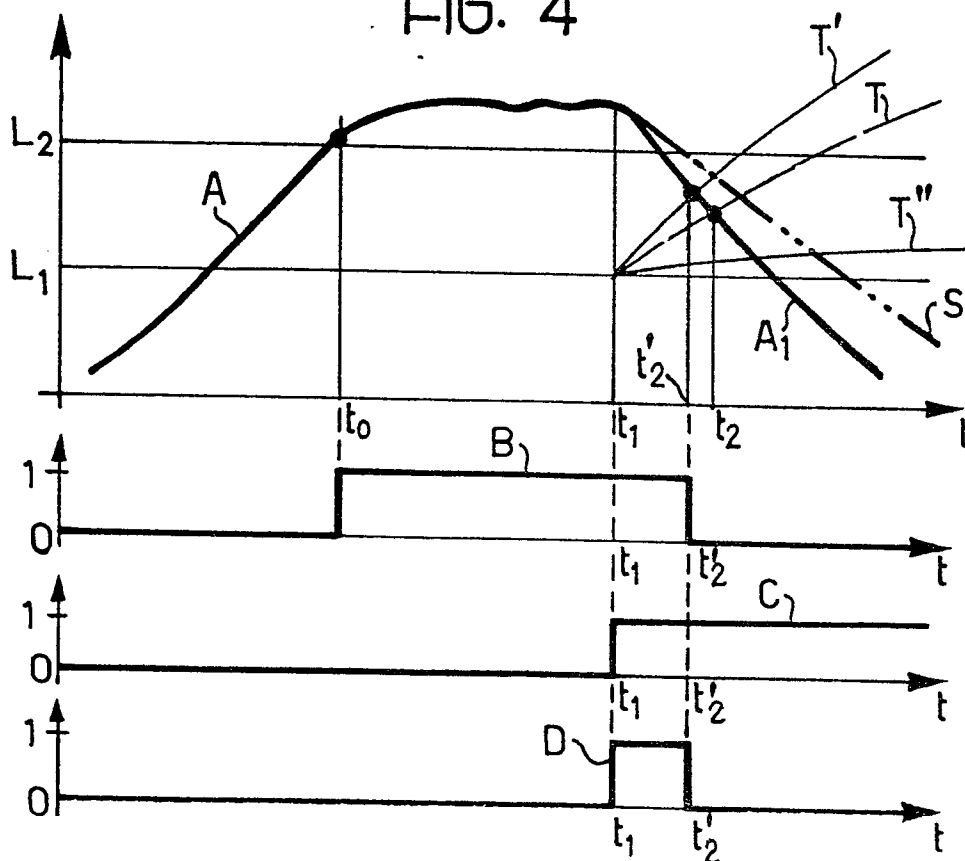
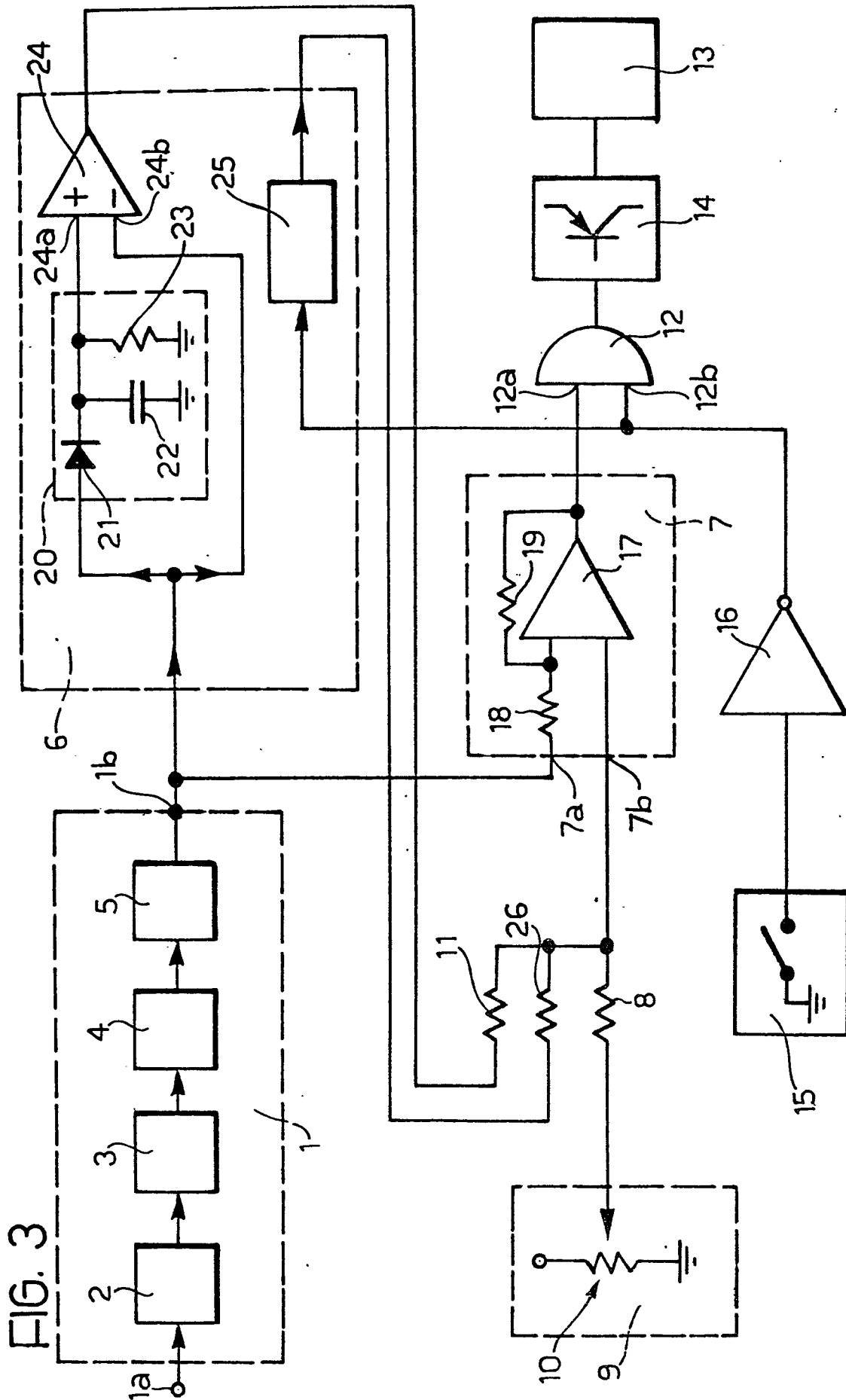


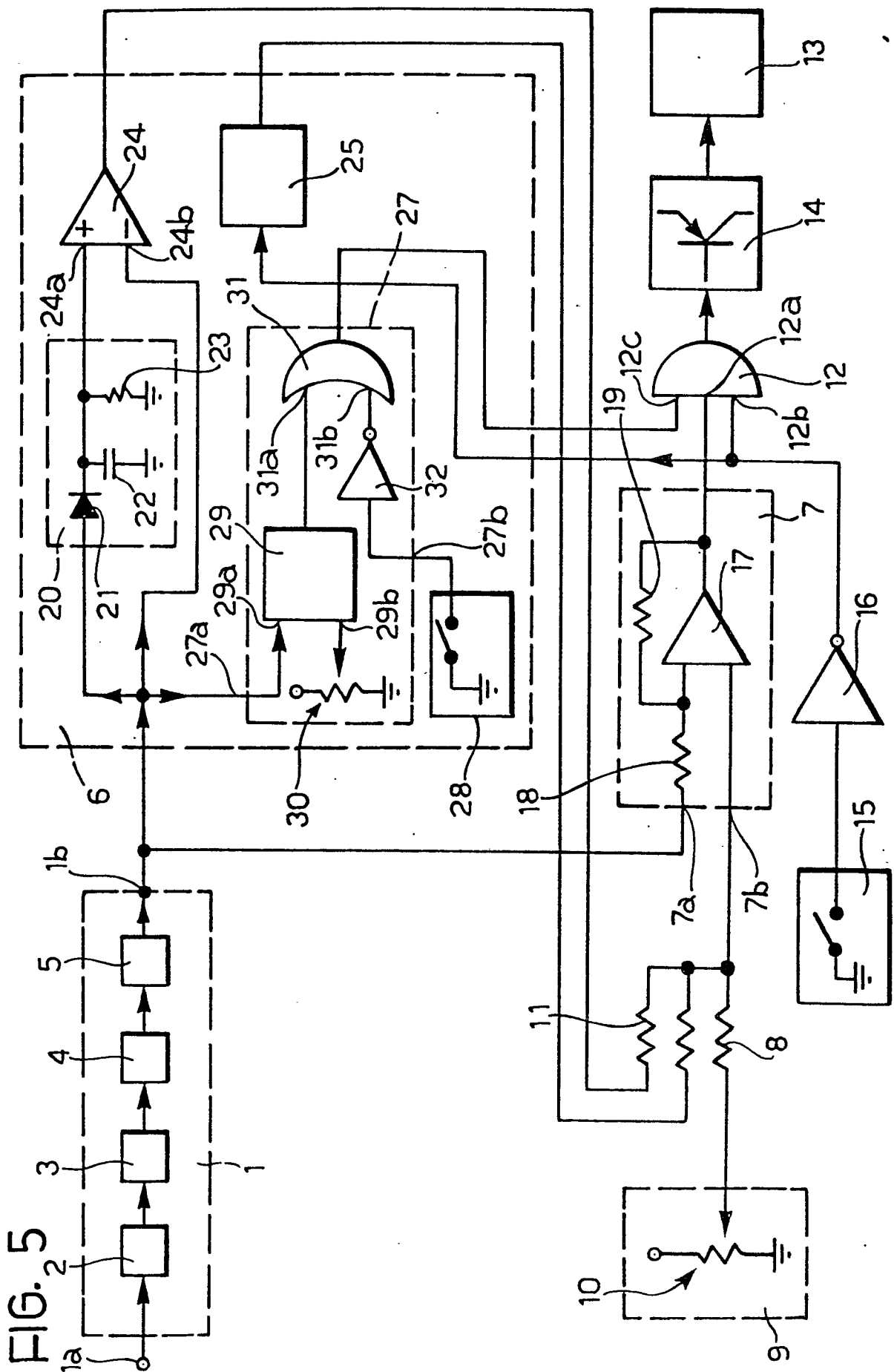
FIG. 4



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4/5



5/5

FIG. 6

