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(54) **An ignition and starting system for a motor-vehicle**

Eine Anlass- und Zündanlage für einen Motorfahrzeug

Système d'allumage et de démarrage pour véhicule à moteur

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- **PATENT ABSTRACTS OF JAPAN vol. 014, no. 029 (M-922), 19 January 1990 (1990-01-19) & JP 01 267358 A (MITSUBISHI ELECTRIC CORP), 25 October 1989 (1989-10-25)**
- **PATENT ABSTRACTS OF JAPAN vol. 1998, no. 11, 30 September 1998 (1998-09-30) & JP 10 176643 A (SHINDENGEN ELECTRIC MFG CO LTD;HONDA MOTOR CO LTD), 30 June 1998 (1998-06-30)**

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Description

[0001] The present invention relates to an ignition and starting system for a motor vehicle having an internal combustion engine, to which a magneto-flywheel electrical generator is coupled, and which is adapted to be rotated by means of a starting pedal crank.

[0002] More specifically, the subject of the invention is an . ignition and starting system comprising:

- a voltage supply terminal connected to the output of the generator and to a storage battery,
- a dc/dc voltage converter having a supply input connected to the terminal, and an enabling input,
- a capacitive-discharge ignition circuit the input of which is connected to the output of the voltage converter and the output of which is coupled to a spark plug of the engine,
- an electrical rotation sensor associated with the generator,
- an ignition switch connected to the supply terminal,
- a regulated direct-current voltage supply circuit the input of which is connected to the supply terminal, and
- an electronic processing and control unit with signal inputs connected to the rotation sensor and to the ignition switch, and a supply input connected to the output of the voltage supply circuit, and with control outputs coupled to the enabling input of the voltage converter and to the ignition circuit.

[0003] In motor-vehicles with single-cylinder engines and with ignition and starting systems of the type indicated above, during normal operation, the voltage for charging the ignition capacitor is generated by the dc/dc voltage converter which receives the voltage supplied by the storage battery.

[0004] In these motor vehicles, when there is no charge or insufficient charge in the storage battery, the normal starting electric motor cannot be used for starting and moving off.

[0005] An object of the present invention is therefore to provide an ignition and starting system for a motor vehicle of the type specified above which enables starting to be brought about even when there is no charge or insufficient charge in the storage battery, by making use of the small amount of energy produced by the magneto-flywheel generator during the starting of the engine by means of the pedal crank.

[0006] This and other objects are achieved, according to the invention, by an ignition and starting system the main characteristics of which are defined in appended Claim 1.

[0007] Further characteristics and advantages of the invention will become clear from the following detailed description given purely by way of non-limiting example with reference to the appended drawings, in which:

Figure 1 is a diagram, partially in block form, of an ignition and starting system according to the invention, and

Figures 2 and 3 are flow charts which show two different modes of operation implemented by the system according to the invention for starting when there is no charge or insufficient charge in the storage battery.

[0008] Figure 1 shows an ignition and starting system, generally indicated 1, for a motor vehicle having a single-cylinder internal combustion engine (not shown) which is adapted to be rotated by means of a starting pedal crank 2. A magneto-flywheel electrical generator 3 of known type is coupled for rotation with the engine of the motor vehicle. In the embodiment shown, this generator is of the three-phase type and a rectifier and voltage regulator circuit 4, also of known type, is connected to its output terminals.

[0009] In the configuration shown, in operation, the output terminal 4a of the voltage regulator 4 is at a positive potential relative to an earth conductor GND. This terminal is connected to the positive terminal of the storage battery 5 of the motor vehicle, the negative terminal of which is connected to the earth GND.

[0010] The ignition and starting system 1 has a voltage supply terminal 6 connected to the output of the voltage regulator 4 and to the positive terminal of the battery 5.

[0011] The system 1 comprises a regulated direct-current voltage supply circuit 7 the input of which is connected to the terminal 6. An energy storage capacitor C1 is connected in parallel between the input of the voltage supply circuit 7 and earth. The input of the supply circuit 7 is connected to the terminal 6 by means of a diode 8 which, in the embodiment shown, has its anode connected to the terminal 6.

[0012] The system 1 further comprises a dc/dc voltage converter 9 having a supply input 9a connected to the terminal 6 by means of a diode 10 which has its anode connected to the terminal 6. An energy storage capacitor C2 is connected in parallel between the input of the voltage converter 9 and earth.

[0013] The output of the voltage converter 9 is connected to the input of a capacitive-discharge ignition circuit 11 comprising, in known manner, a charging capacitor 12. The output of the ignition circuit 11 is coupled to a spark plug SP of the engine of the motor vehicle by means of an ignition transformer, generally indicated T.

[0014] The ignition and starting system also comprises an electronic processing and control unit ECU which

has a plurality of inputs and outputs.

[0015] A sensor 14 (a pick-up) associated with the rotor of the magneto-flywheel generator 3 for providing electrical signals indicative of the speed of rotation of the generator and hence of the engine of the motor vehicle, as well as references usable for determining the ignition advance, is connected to the unit ECU by means of a signal-processing circuit 13.

[0016] An ignition and starting switch, indicated 15 in Figure 1, is connected to the supply terminal 6 and, when closed manually, for example, by means of a key 16, can also enable direct-current electrical loads of the motor vehicle to be supplied.

[0017] The processing and control unit ECU is connected to the switch 15 by means of a voltage presence detector circuit 17 for detecting the closed or open condition of the switch.

[0018] The unit ECU also has two outputs connected to an enabling input 9b of the voltage converter 9 and to a control input of the capacitive-discharge ignition circuit 11.

[0019] Further devices associated with the ignition and starting system which are shown in Figure 1, will be described below.

[0020] In the configuration described up to now, the ignition and starting system is arranged to enable the motor vehicle to move off even when there is no charge or insufficient charge in the battery 5. In such a condition, after closing the switch 15, the user operates the starting pedal crank 2, bringing about a corresponding rotation of the magneto-flywheel generator 3. The energy produced by this generator charges the storage capacitors C1 and C2 through the supply terminal 6 and the diodes 8 and 10. The capacitor C1 is of a size such that it can store sufficient energy to enable the voltage supply circuit 7 to supply the regulated direct-current voltage (for example, of 5V) to the processing and control unit ECU and to the other devices of the system which require this supply voltage, for a predetermined minimum period of time.

[0021] During this period of time in which the regulated supply voltage supplied by the circuit 7 persists, the unit ECU checks whether the switch 15 has been closed and checks whether the pick-up 14 is providing signals indicative of rotation of the engine.

[0022] If the switch 15 is closed and the engine and the generator 3 are rotating, the unit ECU supplies an enabling signal to the input 9b of the voltage converter 9. This converter, which receives the voltage stored in the capacitor C2 as an input, outputs a voltage for charging the ignition capacitor 12. The unit ECU then controls the ignition circuit 11 in a manner such as to cause a spark to be generated in the plug SP in order to start the engine.

[0023] The starting of the engine and the consequent rotation of the generator 3 enables a condition to be reached in which the system is electrically self-supporting.

[0024] The mode of operation described above is made possible because the supply voltages at the input of the supply circuit 7 and at the input of the voltage converter circuit 9 are decoupled from one another by means of the diodes 8 and 10. In particular, when the voltage converter 9 is enabled to operate, the diode 8 prevents it from absorbing all of the electrical energy produced by the generator 3 and ' discharging the capacitor C1 before the first spark is struck, which would bring about deactivation of the voltage supply circuit 7 and, in fact, interruption of the energy supply to the unit ECU and to the other devices of the system supplied by the circuit 7.

[0025] The diode 10 also protects the voltage converter 9 in the event of accidental connection of the battery 5 with reversed polarity.

[0026] The mode of operation described above for the situation in which there is no charge or insufficient charge in the battery is summarized in the flow chart of Figure 2.

[0027] The motor vehicle may, in known manner, have a transponder 18 (Figure 1) for receiving signals containing an identification code, emitted by a portable device. In this case, the unit ECU is connected to a code reader device 19 coupled to the transponder 18 and is advantageously arranged to acquire and to analyze the code picked up and to allow the motor vehicle to be started when the code received corresponds to a predetermined and stored code.

[0028] To permit ignition and starting of the motor vehicle in emergency conditions, that is, when there is no charge or insufficient charge in the battery, the unit ECU is advantageously arranged to operate substantially in the manner described above with the further variations which will now be described with particular reference to the flow chart of Figure 3.

[0029] In order to start the motor vehicle in an emergency situation of the type described above, the user closes the switch 15 and operates the starting pedal crank 2 (box 30 of Figure 3).

[0030] The energy thus produced by the generator 3 charges the capacitors C1 and C2. The voltage supply circuit 7 supplies the regulated voltage to the unit ECU and to other devices of the system and, in particular - amongst these - to the code reader 19.

[0031] As soon as it is supplied, the unit ECU checks whether the switch 15 has been closed (box 31). If not, it disables the ignition circuit (box 32).

[0032] If the switch 15 has been closed, the unit waits for a predetermined period of time T, for example of 250 ms, to elapse (box 33).

[0033] If the unit ECU does not receive any signal from the sensor 14 within the period of time T (generator 3 stationary), the unit ECU goes on to implement a normal ignition and starting procedure (box 40 *et seq.*) which will be described further below.

[0034] If, on the other hand, before the period T has elapsed, the unit ECU receives a signal from the pick-

up 14 indicative of rotation of the generator 3 (box 34) the unit supplies an enabling signal to the input 9b of the voltage converter 9 to allow the ignition capacitor 12 to be charged and then drives the ignition circuit 11 in a manner such as to cause a spark to be struck in the spark plug SP (box 35).

[0035] , The ignition and starting of the engine enables the condition of electrical self-supply of the entire system to be reached. The unit ECU controls the ignition circuit 11 in a manner such that the engine of the motor vehicle rotates at a limited speed which is insufficient to move the motor vehicle but enables the generator 3 to supply sufficient energy to the entire system (box 35). In these conditions, the unit ECU detects whether the coded signal has been received by the transponder 18 and, if so, acquires the code received (box 36). The unit ECU then checks whether the code received is correct (box 37) and, if so, (box 38) enables the ignition circuit 11 so as to allow the engine of the motor vehicle to rotate fast enough to move the motor vehicle.

[0036] If, on the other hand, the code picked up does not correspond to the code stored, the unit ECU inhibits the ignition circuit 11 (box 39).

[0037] Returning now to the stage corresponding to box 33 of the flow chart of Figure 3, if, as stated above, when the period of time T has elapsed, the unit ECU has not detected a rotation of the generator 3, it interprets this situation as indicative of the fact that ignition and starting have not been brought about as a result of the operation of the pedal crank 2 but, in the usual manner, by means of the ignition and starting switch which forms part of the switch 15. In this case, the unit ECU does not implement the emergency starting procedure described but implements the "normal" procedure and checks whether a code has been picked up by the transponder 18 (box 40) and checks whether or not the code picked is correct (box 41): if the code is correct, the unit ECU enables the voltage converter circuit 9 and the ignition circuit 11 to operate normally (box 42) whereas, if not, it inhibits the ignition circuit (box 43).

[0038] With reference to the stage corresponding to box 36 of the flow chart of Figure 3, the acquisition of the code picked up by the transponder 18 during the emergency starting procedure is advantageously performed within a period of time between the striking of two consecutive sparks in the ignition plug SP, to prevent the electromagnetic interference generated by the sparks from invalidating the acquisition of the code. In other words, the unit ECU is arranged to acquire the code in synchronism with the signal supplied by the pick-up 14.

Claims

1. An ignition and starting system for a motor vehicle with an internal combustion engine to which a magneto-flywheel electrical generator (3) is coupled and which is adapted to be rotated by means of a starting pedal crank (2); the system (1) comprising:

- a voltage supply terminal (6) connected to the output of the generator (3, 4) and to a storage battery (5),
- a dc/dc voltage converter (9) having a supply input (9a) connected to the terminal (6), and an enabling input (9b),
- a capacitive discharge ignition circuit (11, 12) the input of which is connected to the output of the voltage converter (9) and the output of which is coupled to a spark plug (SP),
- an electrical rotation sensor (14) associated with the generator (3),
- an ignition switch (15) connected to the supply terminal (6),
- a regulated direct-current voltage supply circuit (7) the input of which is connected to the voltage supply terminal (6), and
- an electronic processing and control unit (ECU) with signal inputs connected to the rotation sensor (14) and to the ignition switch (15), and a supply input connected to the output of the voltage supply circuit (7), and with control outputs coupled to the enabling input (9b) of the voltage converter (9) and to a control input of the ignition circuit (11, 12),

the system being **characterized in that**:

the voltage supply circuit (7) and the voltage converter (9) are coupled to the supply terminal (6) by means of respective decoupling means (8, 10) and respective energy storage capacitors (C1, C2) in a manner such that, when the engine is started by means of the pedal crank (2), the energy correspondingly supplied by the generator (3) is sufficient to enable the voltage supply circuit (7) to supply the regulated voltage for a predetermined minimum period of time and to enable the voltage converter (9) to store sufficient energy for the striking of at least one ignition spark in the engine; and **in that**

the processing and control unit (ECU) is arranged to detect a condition of closure of the switch (15) and rotation of the generator (3) and, as a result of the detection of this condition, to implement an emergency engine ignition and starting procedure in which the unit (ECU) enables the voltage converter (9) to op-

erate in order to charge the ignition capacitor (12) and subsequently to strike a spark to start the engine.

2. A system according to Claim 1, for a motor vehicle also having a transponder (18) for receiving signals containing an identification code, and in which the processing and control unit (ECU) is arranged to acquire and to analyze the signals picked up by the transponder (18) and to allow the motor vehicle to be started when the code received corresponds to a predetermined code;

the system being **characterized in that**, during the emergency ignition and starting procedure, the processing and control unit (ECU) is arranged to drive the ignition circuit (11, 12) in a manner such as to allow the engine to be started and subsequently to rotate at a limited speed which is ; insufficient to move the motor vehicle but which enables the generator (3) to supply sufficient energy to the voltage circuit (7) until the processing and control unit (ECU) has acquired and checked the code picked up by the transponder (18).

3. A system according to Claim 2, **characterized in that**, during the emergency ignition and starting procedure, the processing and control unit (ECU) is arranged to analyze and check the code between two consecutive sparks.

4. A system according to any one of the preceding claims, in which, in operation, the voltage supply terminal (6) is at a positive potential relative to the potential of an earth conductor (GND),
characterized in that the decoupling means comprise a pair of diodes (8, 10) the anodes of which are connected to the voltage supply terminal (6) and the cathodes of which are connected to the input of the voltage supply circuit (7) and to the supply input of the voltage converter (9), respectively.

Patentansprüche

1. Zünd- und Anlasssystem für ein Kraftfahrzeug mit einem Verbrennungsmotor, der mit einer Magnetschwungrad-Lichtmaschine (3) gekuppelt und so aufgebaut ist, dass er mit einer Anlasser-Pedalkurbel (2) in Drehung versetzt werden kann; wobei das System (1) enthält:

- einen Spannungsversorgungsanschluss (6), der mit dem Ausgang der Lichtmaschine (3, 4) sowie mit einer Speicherbatterie (5) verbunden ist;
- einen Gleichspannungswandler (9), der einen Versorgungseingang (9a), der mit dem Anschluss (6) verbunden ist, sowie einen Einschalteingang (9b) besitzt,
- eine Zündstufe mit kapazitiver Entladung (11, 12), deren Eingang mit dem Ausgang des Spannungswandlers (9) verbunden ist und deren Ausgang an einer Zündkerze (SP) liegt,
- einen elektrischen Drehfühler (14), der der Lichtmaschine (3) zugeordnet ist,
- einen Zündschalter 15), der mit dem Versorgungsanschluss (6) verbunden ist,
- eine Versorgungsstufe mit einer geregelten Gleichspannung (7), deren Eingang mit dem Versorgungsanschluss (6) verbunden ist, und
- eine elektronische Prozessor- und Steuerstufe (ECU) mit Signaleingängen, die mit dem Drehfühler (14) und dem Zündschalter (15) verbunden sind, sowie mit einem Versorgungseingang, der mit dem Ausgang der Spannungsversorgungsstufe (7) verbunden ist, sowie mit Steuerausgängen, die mit dem Einschalteingang (9b) des Spannungswandlers (9) und mit einem Steuereingang der Zündstufe (11, 12) verbunden sind,

wobei das System **dadurch gekennzeichnet ist, dass**:

die Spannungsversorgungsstufe (7) und der Spannungswandler (9) mit dem Versorgungsanschluss (6) über entsprechende Entkopplungseinrichtungen (8, 10) sowie entsprechende Energiespeicherkondensatoren (C1, C2) so verbunden sind, dass dann, wenn der Motor mit Hilfe der Pedalkurbel (2) angelassen wird, die von der Lichtmaschine (3) dadurch gelieferte Energie ausreicht, um die Spannungsversorgungsstufe (7) in Betrieb zu setzen, um die geregelte Spannung für ein vorgegebenes minimales Zeitintervall zu liefern und es dem Spannungswandler (9) zu ermöglichen, genügend Energie zu speichern, um zumindest einen Zündfunken im Motor zu zünden; und dass

die Prozessor- und Steuereinheit (ECU) so aufgebaut ist, um einen Zustand abzutasten, in dem der Schalter (15) geschlossen ist und sich die Lichtmaschine (3) dreht, und als Ergebnis der Abtastung dieses Zustands einen Notvorgang zum Zünden und Anlassen des Motors auszuführen, bei dem die Einheit (ECU) den Spannungswandler (9) in Betrieb setzt, um so zu arbeiten, dass der Zündkondensator (12) geladen und daraufhin ein Funke gezündet wird, um den Motor anzulassen.

2. System gemäß Anspruch 1 für ein Kraftfahrzeug, wobei das System einen Transponder (18) besitzt,

um Signale zu empfangen, die einen Erkennungskode enthalten, und bei dem die Prozessor- und Steuerstufe (ECU) so aufgebaut ist, um die vom Transponder (18) abgegriffenen Signale zu gewinnen und zu analysieren und das Kraftfahrzeug anlassen zu können, wenn der empfangene Kode einem vorgegebenen Kode entspricht;
wobei das System **dadurch gekennzeichnet ist, dass** die Prozessor- und Steuereinheit (ECU) so aufgebaut ist, dass sie während des Notvorgangs zum Zünden und Anlassen die Zündstufe (11, 12) so ansteuert, dass der Motor angelassen werden kann und sich daraufhin mit einer begrenzten Drehzahl dreht, die nicht ausreicht, um das Kraftfahrzeug in Bewegung zu setzen, bei der jedoch die Lichtmaschine (3) genügend Energie für die Spannungsstufe (7) liefert, bis die Prozessor- und Steuerstufe (ECU) den vom Transponder (18) abgegriffenen Kode gewonnen und geprüft hat.

3. System gemäß Anspruch 2, **dadurch gekennzeichnet, dass** die Prozessor- und Steuerstufe (ECU) während des Notvorgangs zum Zünden und Anlassen so aufgebaut ist, dass sie den Kode zwischen zwei aufeinander folgenden Funken analysiert und prüft.

4. System gemäß irgendeinem der bisherigen Ansprüche, bei dem im Betrieb der Spannungsversorgungsanschluss (6) auf einem positiven Potential relativ zum Massepotential (GND) liegt,
dadurch gekennzeichnet, dass die Entkopplungseinrichtungen ein Paar von Dioden (8, 10) enthalten, deren Anoden mit dem Spannungsversorgungsanschluss (6) verbunden sind und deren Kathoden am Eingang der Spannungsversorgungsstufe (7) bzw. am Versorgungseingang des Spannungswandlers (9) liegen.

Revendications

1. Système d'allumage et de démarrage pour un véhicule à moteur équipé d'un moteur à combustion interne auquel est couplé un générateur électrique à volant magnétique (3) qui est adapté pour être entraîné en rotation à l'aide d'une manivelle de pédale de démarrage (2); le système (1) comprenant:

- une borne d'alimentation en tension (6) connectée à la sortie du générateur (3,4) et à une batterie d'alimentation (5),
- un convertisseur de tension continu/continu (9) ayant une entrée d'alimentation (9a) connectée à la borne (6), et une entrée de validation (9b),
- un circuit d'allumage à décharge capacitive (11,12) dont l'entrée est connectée à la sortie du convertisseur de tension (9) et dont la sortie est couplée à une bougie d'allumage (SP),
- un capteur de rotation électrique (14) associé au générateur (3),
- un commutateur d'allumage (15) connecté à la borne d'alimentation (6),
- un circuit d'alimentation en tension continue régulée (7) dont l'entrée est connectée à la borne d'alimentation en tension (6), et
- une unité de traitement électronique et de commande (ECU) avec des entrées de signal connectées au capteur de rotation (14) et au commutateur d'allumage (15), et une entrée d'alimentation connectée à la sortie du circuit d'alimentation en tension (7), et avec des sorties de commande couplées à l'entrée de validation (9b) du convertisseur de tension (9) et à une entrée de commande du circuit d'allumage (11,12),

le système étant **caractérisé en ce que**:

le circuit d'alimentation en tension (7) et le convertisseur de tension (9) sont couplés à la borne d'alimentation (6) à l'aide de moyens de découplage respectifs (8, 10) et à des condensateurs de stockage d'énergie respectifs (Cl, C2) de telle manière que, lorsque le moteur est démarré à l'aide de la manivelle de pédale (2), l'énergie délivrée de façon correspondante par le générateur (3) est suffisante pour permettre au circuit d'alimentation en tension (7) de délivrer la tension régulée pendant une durée minimum prédéterminée et pour permettre au convertisseur de tension (9) de stocker suffisamment d'énergie en vue de l'amorçage d'au moins une étincelle d'allumage dans le moteur; et **en ce que**
l'unité de traitement et de commande (ECU) est agencée pour détecter un état de fermeture du commutateur (15) et une rotation du générateur (3) et, en résultat de la détection de cet état, de réaliser une procédure d'allumage et de démarrage de moteur d'urgence au cours de laquelle l'unité (ECU) permet au convertisseur de tension (9) de fonctionner afin de charger le condensateur d'allumage (12) et ensuite d'amorcer une étincelle pour démarrer le moteur.

2. Système selon la Revendication 1, pour un véhicule à moteur possédant également un émetteur-récepteur (18) pour recevoir des signaux contenant un code d'identification, et dans lequel l'unité de traitement et de commande (ECU) est agencée pour saisir et analyser les signaux détectés par l'émetteur-récepteur (18) et pour permettre au véhicule à moteur d'être démarré lorsque le code reçu correspond à un code prédéterminé;
le système étant **caractérisé en ce que**, du-

rant la procédure d'allumage et de démarrage d'urgence, l'unité de traitement et de commande (ECU) est agencée pour commander le circuit d'allumage (11, 12) de manière à permettre au moteur d'être démarré et ensuite de tourner à une vitesse limitée qui est insuffisante pour déplacer le véhicule à moteur, mais qui permet au générateur (3) de délivrer suffisamment d'énergie au circuit de tension (7) jusqu'à ce que l'unité de traitement et de commande (ECU) ait saisi et vérifié le code détecté par l'émetteur-récepteur (18).

3. Système selon la Revendication 2, **caractérisé en ce que**, durant la procédure d'allumage et de démarrage d'urgence, l'unité de traitement et de commande (ECU) est agencée pour analyser et vérifier le code entre deux étincelles successives.

4. Système selon l'une quelconque des revendications précédentes, dans lequel, en fonctionnement, la borne d'alimentation en tension (6) se trouve à un potentiel positif par rapport au potentiel d'un conducteur de terre (GND),

caractérisé en ce que les moyens de découplage comportent une paire de diodes (8, 10) dont les anodes sont connectées à la borne d'alimentation en tension (6) et dont les cathodes sont connectées à l'entrée du circuit d'alimentation en tension (7) et à l'entrée d'alimentation du convertisseur de tension (9), respectivement.

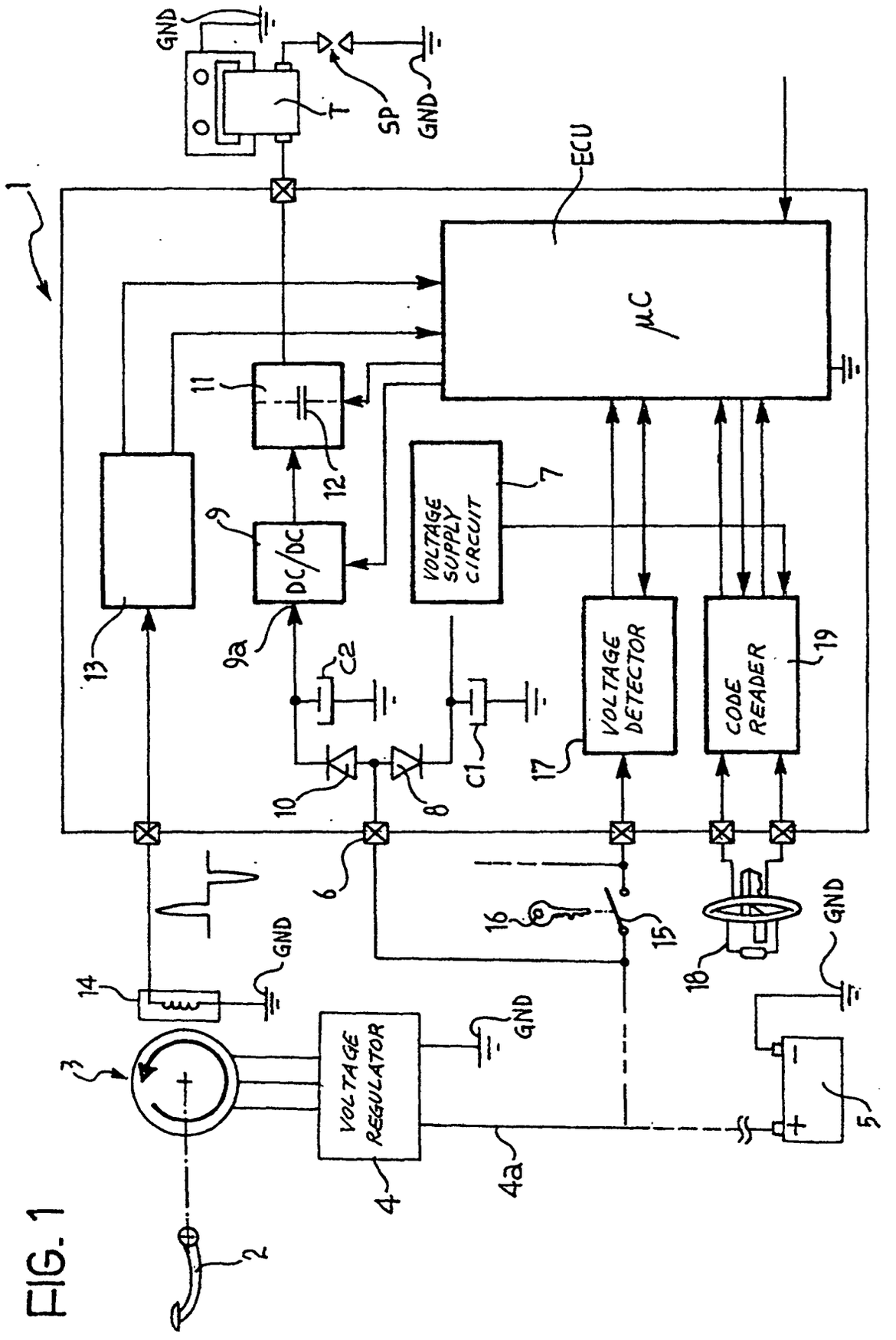

GND
T
SP
GND
ECU
μC
1
11
12
9
DC/DC
VOLTAGE SUPPLY CIRCUIT
7
13
9a
C2
C1
10
8
VOLTAGE DETECTOR
17
CODE READER
19
6
16
15
18
GND
14
GND
3
VOLTAGE REGULATOR
GND
4
4a
5
2

FIG. 1

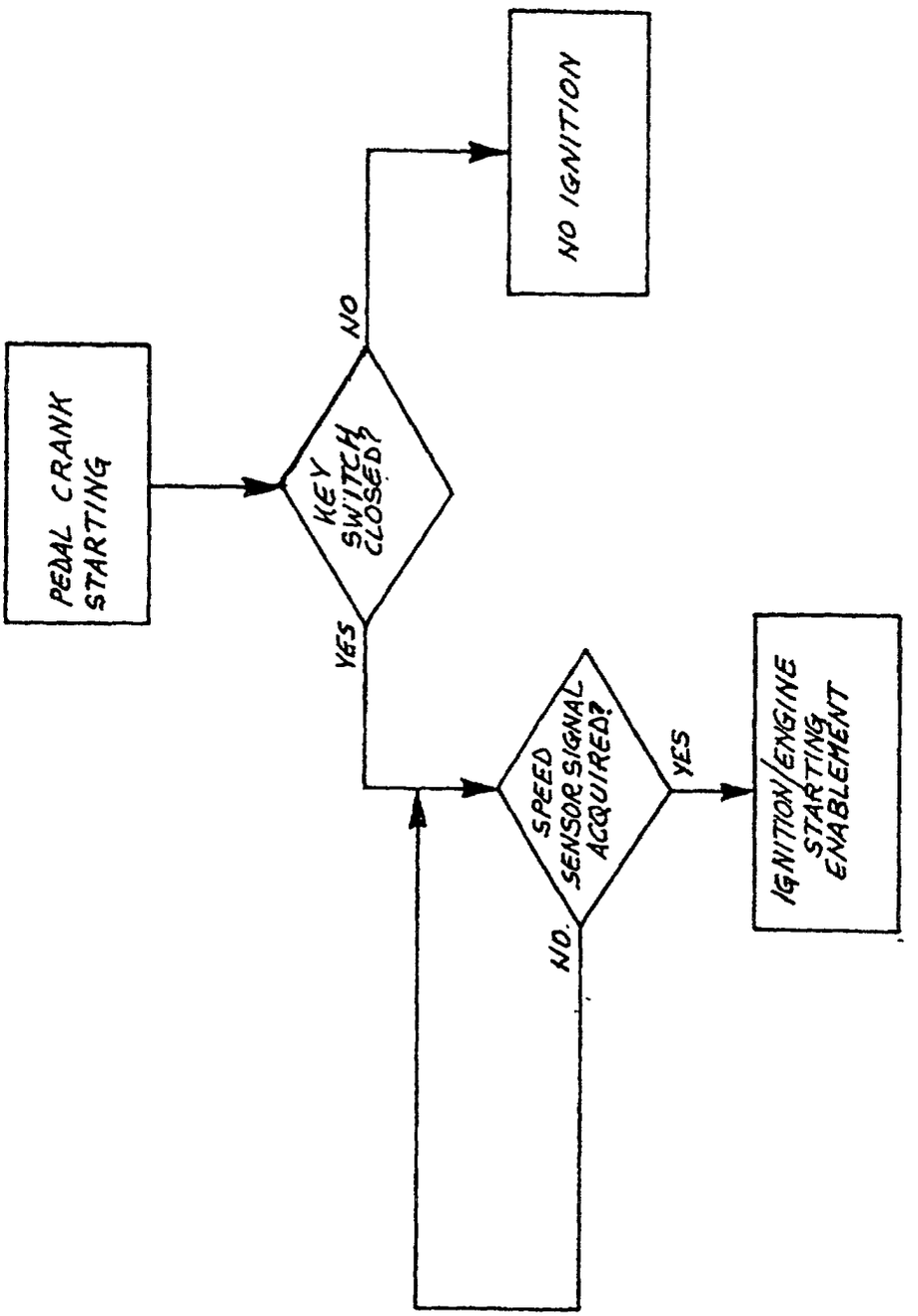
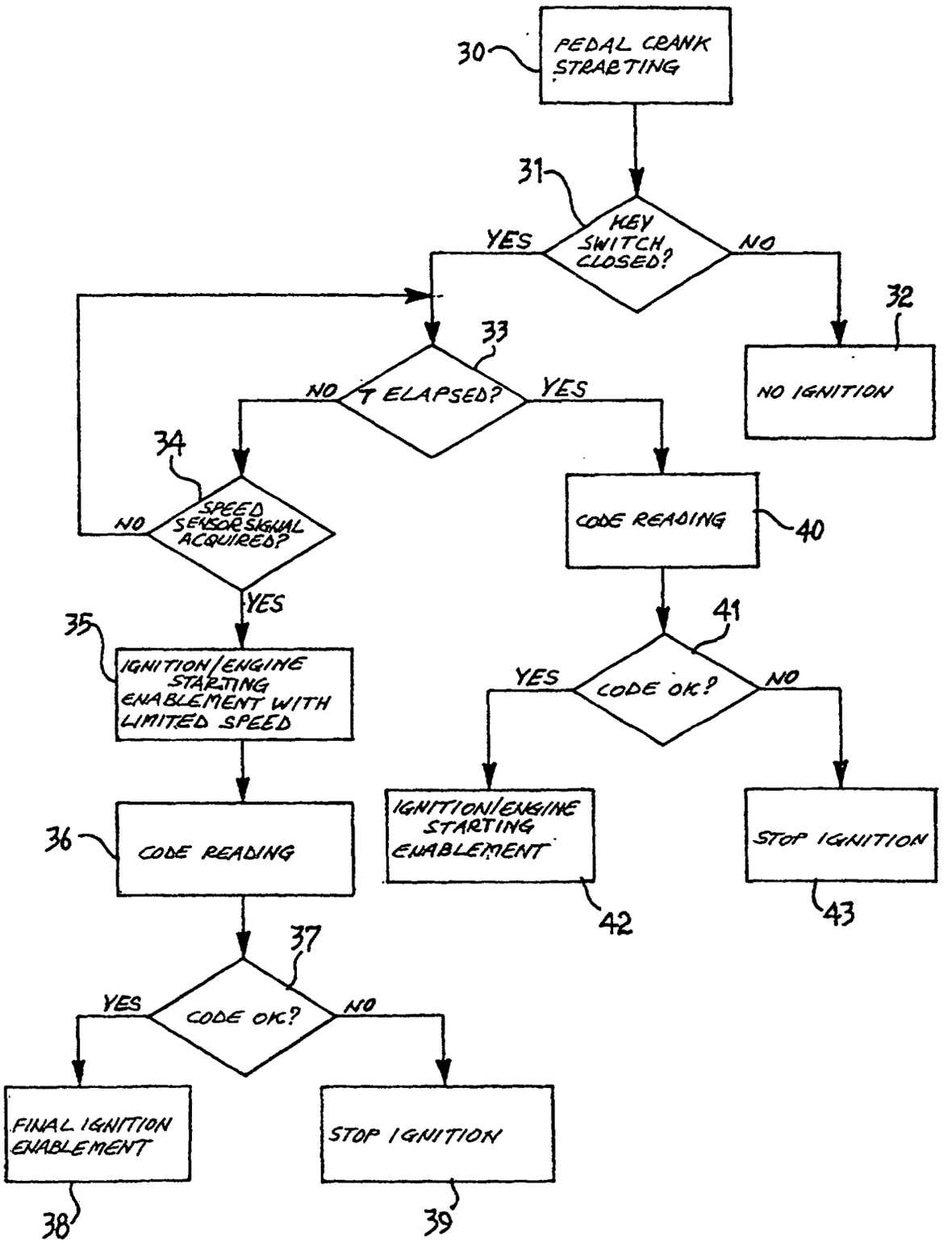

PEDAL CRANK STARTING
KEY SWITCH CLOSED?
NO
NO IGNITION
YES
SPEED SENSOR SIGNAL ACQUIRED?
NO
YES
IGNITION/ENGINE STARTING ENABLEMENT

FIG. 2

FIG. 3


30
PEDAL CRANK STARTING
31
KEY SWITCH CLOSED?
YES
NO
32
NO IGNITION
33
T ELAPSED?
NO
YES
34
SPEED SENSOR SIGNAL ACQUIRED?
NO
YES
35
IGNITION/ENGINE STARTING ENABLEMENT WITH LIMITED SPEED
36
CODE READING
37
CODE OK?
YES
NO
FINAL IGNITION ENABLEMENT
38
STOP IGNITION
39
CODE READING
40
41
CODE OK?
YES
NO
IGNITION/ENGINE STARTING ENABLEMENT
42
STOP IGNITION
43