

1,401,313.

Patented Dec. 27, 1921.

2 SHEETS—SHEET 1.

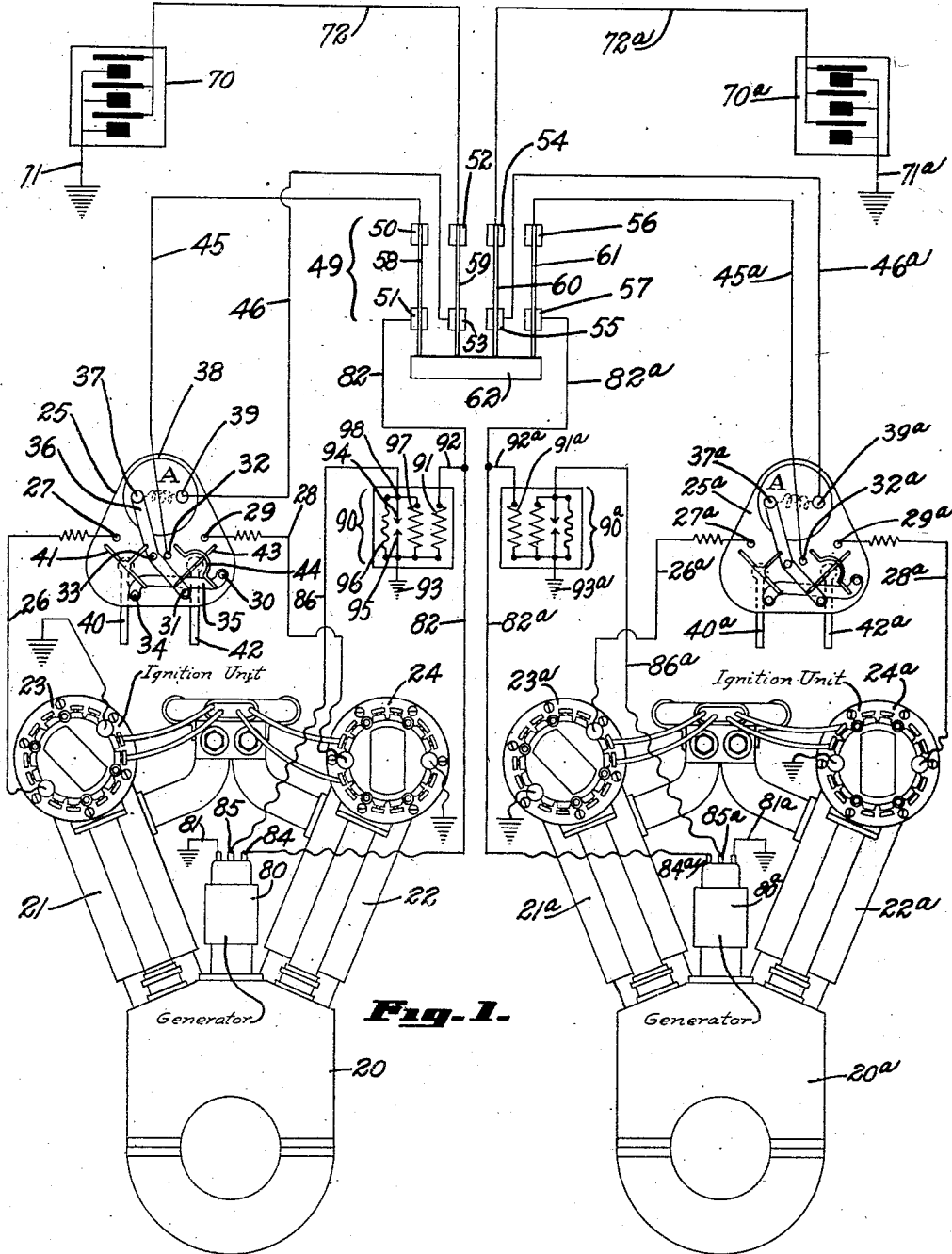


Fig. 1.

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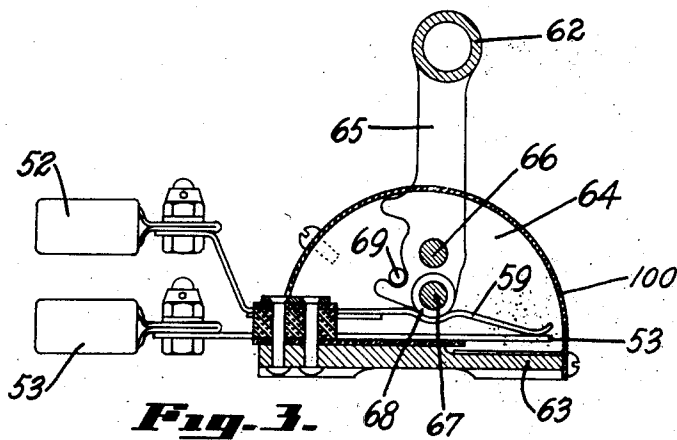
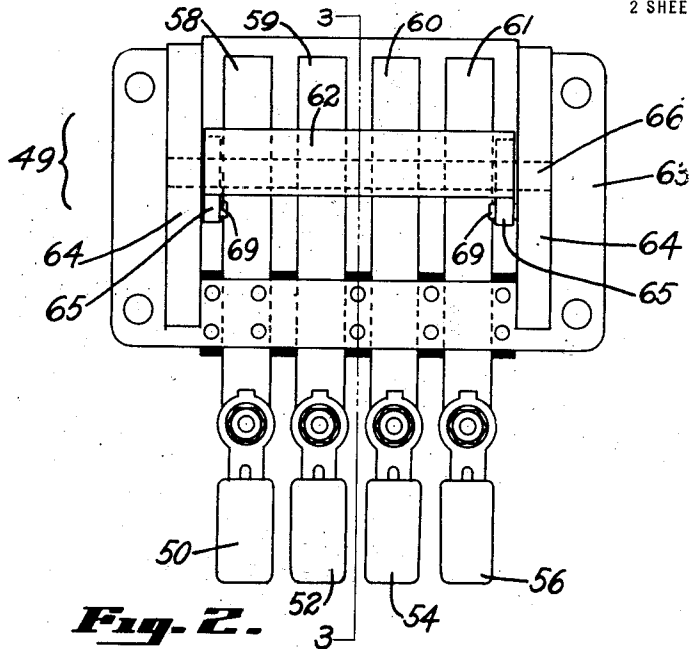
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IGNITION SYSTEM.
APPLICATION FILED OCT. 23, 1918.

1,401,313.

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2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

WILLIAM A. CHRYST, OF DAYTON, OHIO, ASSIGNOR TO THE DAYTON ENGINEERING LABORATORIES COMPANY, A CORPORATION OF OHIO.

IGNITION SYSTEM.

1,401,313.

Specification of Letters Patent.

Patented Dec. 27, 1921.

Application filed October 23, 1918. Serial No. 259,379.

To all whom it may concern:

Be it known that I, WILLIAM A. CHRYST, a citizen of the United States of America, residing at Dayton, county of Montgomery, State of Ohio, have invented certain new and useful Improvements in Ignition Systems, of which the following is a full, clear, and exact description.

This invention relates to ignition systems for internal-combustion engines and the like.

It is an object of this invention to provide an ignition system for a self-propelled vehicle having a plurality of propulsion units, each of which includes an internal-combustion or explosion engine. This invention relates particularly to aircraft wherein a plurality of internal-combustion engines are used. In case the operation of one engine should become faulty or should cease altogether, it is highly important that all of the engines be stopped immediately to prevent the destruction of the aeroplane, due to the vibration caused by unbalanced forces. The invention includes an emergency switch placed within easy reach of the operator whereby the stopping of the engines may be accomplished in the quickest possible time. More particularly the invention includes a common operating member which can be operated by a quick movement of the hand to disconnect the ignition units of the engines from the sources of current. The said ignition system may include a plurality of ignition units for each of the engines, each of the ignition units supplying ignition for the entire engine separately from the other. The ignition system may also include a plurality of current sources for the ignition units of each of the engines. But in any case said system includes an emergency switch operated by a single member for cutting off or for rendering the ignition systems of all the engines simultaneously inoperative.

Further objects and advantages of the present invention will be apparent from the following description, reference being had to the accompanying drawings, wherein a preferred embodiment of the present invention is clearly shown.

In the drawings:—

Figure 1 is a wiring diagram of the ignition system for a self-propelled vehicle, having two propulsion units including in-

ternal-combustion engines which are shown diagrammatically in Fig. 1 in end elevation;

Fig. 2 is a plan view of the emergency switch included in the present invention; and

Fig. 3 is a sectional view taken on line 3—3 of Fig. 2.

Referring to the drawings, 20 and 20^a designate internal-combustion engines each provided with a plurality of cylinders arranged in rows 21 and 22 with axes of the cylinders parallel and in the same plane, and the planes of the different rows of cylinders making an angle with each other, said angle having its vertex in the axis of the crank shaft. The angle between the rows of cylinders 21 and 22 illustrated is 45° the engine being generally known as the 45° V-type. Each of the engines is provided with similar ignition circuits and a description of the circuit for engine 20 will serve as well for engine 20^a. The parts of the circuit for engine 20^a which correspond to similar parts of the circuit of engine 20 are given the same reference numeral but with the affix "a."

Engine 20 is provided with ignition units 23 and 24, each of which is adapted to supply complete ignition for the engine. Each of the units 23 and 24 include engine driven members which are adapted to be driven by driving connections from the engine, not shown. The particular construction of each of these ignition units and of the driving connections therefor, does not form a part of the present invention but is particularly described and claimed in the co-pending application of William A. Chryst and John H. Hunt, Serial No. 208,639, filed December 22, 1917.

All of the ignition units have ground connections and the ignition units 23 and 24 of each engine are connected with an ignition switch 25.

Ignition unit 23 is connected by wire 26 with terminal 27 of switch 25. Unit 24 is connected by wire 28 with switch terminal 29. Switch 25 includes stationary contacts 30, 31, 32, 33 and 34. 30 and 34 are connected by a strip 35. 31 and 33 are connected by strip 36 which is insulated from strip 35, and said strip connects terminal 33 with terminal 37 of the ammeter 38.

Switch lever 40 carries movable switch member 41 shown in Fig. 1 in the open position, which, when closed, is adapted to connect together stationary contacts 27, 33 and 34. Switch lever 42 carries movable contact 43 adapted, in the closed position of the switch, to connect contacts 29 and 31. Switch member 42 also carries a movable switch contact 44 insulated from contact 43, and adapted in the closed position to connect contacts 30 and 32. Contact 32 is connected by wire 45 to terminal 50 of the emergency switch 49. An ammeter terminal 39 is connected by wire 46 with terminal 53 of the emergency switch 49.

A storage battery 70 having ground connection 71 is connected by means of wire 72 with the emergency switch terminal 52.

Engine 20 is provided with a generator 80, mechanically connected therewith by a gearing not shown. Generator 80 has a ground connection 81 and is connected by wire 82 with emergency switch terminal 51.

90 is a regulator of the vibratory type and includes a voltage controlling coil 91, connected by wire 92 to the ungrounded side of the generator circuit and grounded at 93 and adapted to cause the separation of contacts 94 and 95 to interpose resistances 96 and 97 in the generator shunt field circuit. The shunt field winding is not shown but is connected with the ungrounded terminal 84 of generator and with terminal 85 which is connected by wire 86 with regulator terminal 98. The shunt field circuit proceeds normally across contacts 94 and 95, when closed, to ground 93, but when said contacts 94 and 95 are opened, as explained in the foregoing, resistances will be interposed so as to have a regulative effect upon the generator. The regulator may be placed within the generator housing, but is shown diagrammatically as a separate unit.

The operation of the system will now be described: Emergency switch contacts 50 and 51, and 52 and 53 are normally closed by switch numbers 58 and 59. Before the engine 20 becomes self-operative current may be supplied to ignition unit 23 from battery 70 by moving switch number 40 to closed position, 42 being in open position, when contact number 41 will contact with contacts 27, 33 and 35. The ignition circuit will be as follows: Battery 70, wire 72, switch terminal 52, contact 59, terminal 53, wire 46, ammeter 38, bar 36, contact 33, member 41, contact 27, wire 26, ignition unit 23 to ground, and wire 71 to battery 70. If switch member 42 be closed and 40 left open, current will flow from bar 36 to contact 31, contact member 43, contact 29, wire 28, ignition unit 24 to ground, and wire 71 to battery 70.

After the engine becomes self-operative both switch members 40 and 42 are moved

to closed position and the generator will deliver current to the battery and to both ignition units. The ignition and battery charging circuits are as follows: Generator 80 wire 82, terminal 51, contact 58, terminal 50, wire 45, contact 32, member 44 contact 30, bar 35, contact 34, contact member 41 in which current divides, part going to contact 27 and wire 26 to ignition unit 23, and part going to contact 33 where this current divides, part going to contact 31, across member 43 to contact 29, and thence through wire 28 to ignition unit 24, while the other part flows through bar 36 to ammeter 38, and thence through wire 46, terminal 53, contact 59, terminal 52 and wire 72 to battery 70.

It is not essential that switch member 40 be first moved to closed position while switch member 42 remains in open position. The engine 20 may be provided with ignition for starting just as well by first turning member 42 to closed position while member 40 remains in open position. With member 42 in closed position contacts 29 and 31 will be bridged by contact 43 thereby establishing a circuit between battery 70 and ignition unit 24, as follows: grounded battery 70, wire 72, contact 52, contact 59, contact 53, wire 46, terminal 39, ammeter 38, terminal 37, strip 36, contact 31, contact 43, contact 29, wire 28, grounded ignition unit 24.

The switch unit including levers 40 and 42 is arranged so that by turning either lever 40 or 42 to circuit closing position, one of the units 23, 24 will be connected with the battery but the battery will not be connected with the generator. Then after the engine becomes self-operative, the battery is connected with the generator and all of the ignition units are rendered operative by the movement of lever remaining in open position to circuit closing position.

As already explained the ignition and battery charging circuits for engine 20^a are the same as for engine 20. Wires 72^a, 45^a, 46^a, and 82^a which correspond respectively to wires 72, 45, 46 and 82 of the circuit described, are connected to terminals 54, 56, 55 and 57 of the emergency switch 49. If switch contacts 58, 59, 60 and 61 are moved to opened position by controlling member 62, the ignition and battery charging circuits of the engines 20 and 20^a will be simultaneously and concomitantly interrupted, and the engines will cease to operate.

The construction of the emergency switch 49 will now be described. Switch 49 comprises a base 63 upon which are mounted the switch terminals 50 to 57, to which reference has been made, which are insulated from one another and from the base 63. Terminals 50, 52, 54 and 56 are provided with spring contacts 58, 59, 60 and 61, respectively, which cooperate with terminals

51, 53, 55 and 57, respectively. Base 63 is provided with ears 64 which support a rod 66 upon which are mounted the arms 65 of the controlling member 62. The said arms 65 are connected by a rod 67 upon which is mounted a roller 68 which is adapted to contact with the depressed portions of contact members 58, 59, 60 and 61 and cause them to be yieldingly maintained in engagement with their respective terminals. Pin 69 serves to limit the movement of controlling member 62. A cover 100 may be provided. These depressions serve to maintain the lever 65 yieldingly in contact making position.

If, for example, the system described is installed in an aeroplane, the emergency switch 49 is placed within easy reach of the pilot. Should the operation of one of the engines cease, before the aeroplane could shake itself to pieces in mid-air from vibration caused by the unbalancing of forces acting upon the frame, the pilot would be able by a swift movement of the hand simultaneously to interrupt the ignition circuits of all of the engines. The engines would cease to be self-operative and the craft could glide to a place of safety.

While the form of mechanism herein shown and described constitutes a preferred form of embodiment of the invention, it is to be understood that other forms might be adopted, all coming within the scope of the claims which follow.

35 Claims:

1. In an ignition system for self-propelled vehicles, the combination with a plurality of propulsion units, each of which includes an internal combustion engine; of a plurality of ignition units operably associated with each engine; sources of current for the ignition units of each engine including a storage battery and a generator either of which supply ignition, and said generator adapted to charge said battery; manual means for controlling the current supply to certain ignition units from the battery or generator; and an emergency switch adapted to cut off the battery or generator sources of current from the ignition units of all the engines and at the same time to cut off the batteries from the generators.

2. In an ignition system for self-propelled vehicles, the combination with a plurality of propulsion units, each of which includes an internal combustion engine; of a plurality of current sources for the ignition units of each engine; switches for making circuit connections between the current sources and ignition units so that ignition current may be supplied from one of the sources to certain of the ignition units or from all of the sources to all of the ignition units as desired; and an emergency switch for cutting off all of the sources of

current from all the ignition units of all of the engines.

3. In an ignition system for self-propelled vehicles, the combination with a plurality of propulsion units, each of which includes an internal combustion engine; of a plurality of ignition units operably associated with each engine; a plurality of current sources for the ignition units of each engine including a storage battery and a generator for charging the storage battery and such battery and generator each adapted to supply ignition current; switches for making electrical connections such that the batteries may supply ignition current to certain of the ignition units or either the batteries or said generators may supply ignition current, and for establishing connections whereby the batteries may be charged by the generators; a common emergency switch for disconnecting the current sources from all the ignition units of all the engines and, at the same time, for disestablishing the charging circuits between the generators and the batteries.

4. In an ignition system for self-propelled vehicles, the combination with a plurality of propulsion units, each of which includes an internal combustion engine; of a plurality of ignition units operably associated with each engine; a plurality of current sources for supplying ignition current to the ignition units of the engines; and a common emergency switch including a plurality of pairs of cooperating contacts in the separate circuits from the sources of current to the different ignition units and a common operating member adapted to simultaneously open and close all of the pairs of contacts of the emergency switch.

5. In an ignition system for self-propelled vehicles, the combination with an internal-combustion engine having a plurality of ignition units each for supplying complete engine ignition; of a generator driven by the engine; a storage battery; a switch unit having a plurality of levers, the movement of any one of which to circuit closing position will connect the battery with one of the ignition units, while the movement of all the switch levers to circuit closing position will render all of the ignition units operative and will connect the battery with the generator; and an emergency switch having a single lever, the movement of which to open position will disconnect the battery from the generator and will render all of the ignition units inoperative.

In testimony whereof I affix my signature.

WILLIAM A. CHRYST.

Witnesses:

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