June 28, 1949. J. L. ARTHUR 2,474,510

IGNITION SYSTEM

Filed Nov. 13, 1944 2 Sheets-Sheet 1

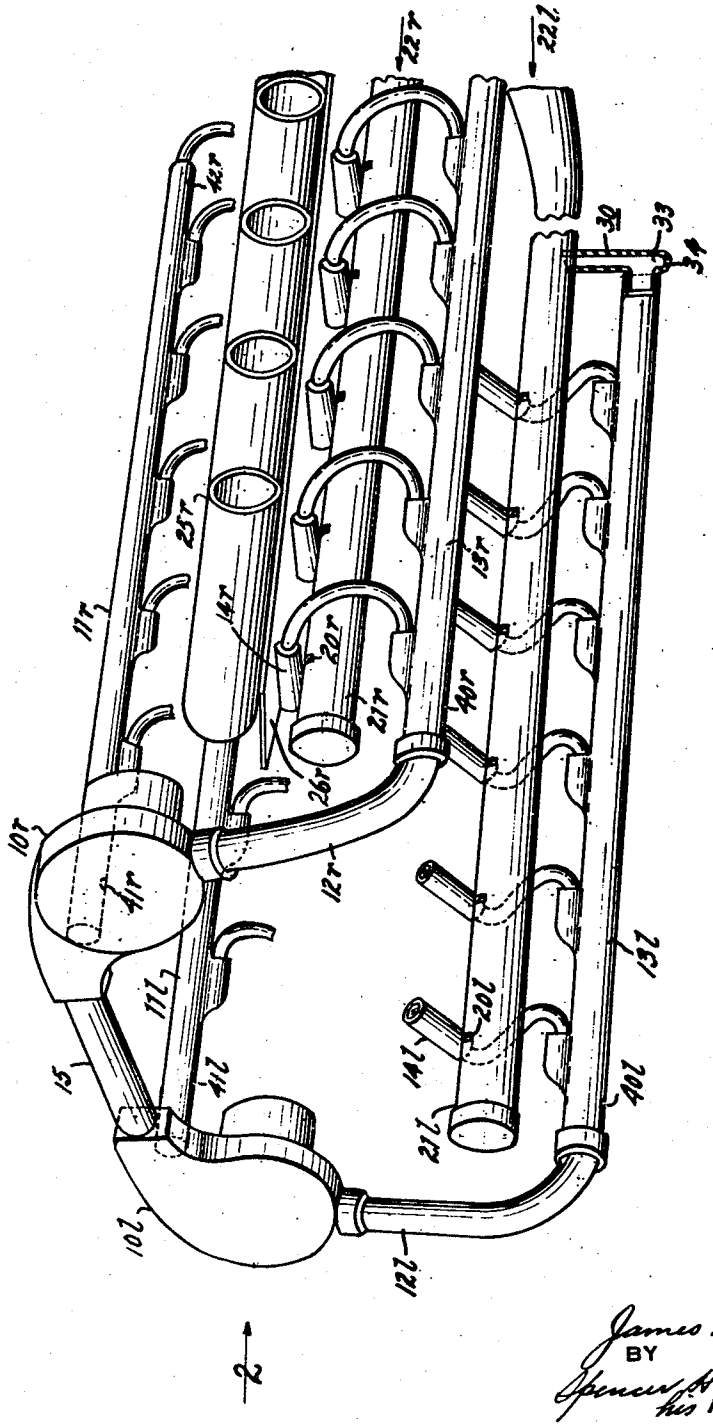


Fig. 1

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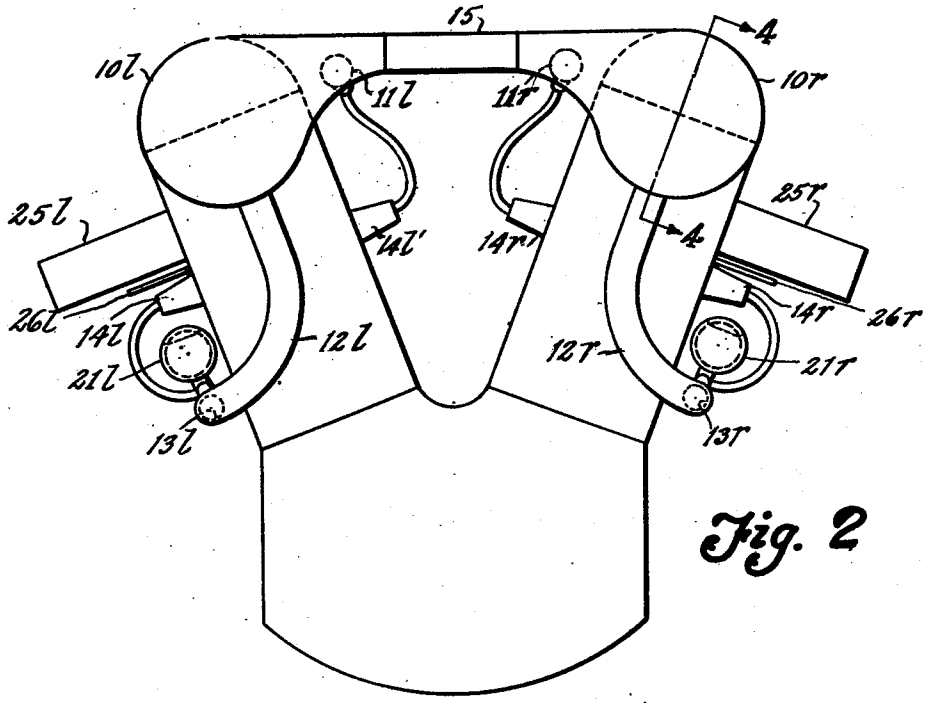


Fig. 2

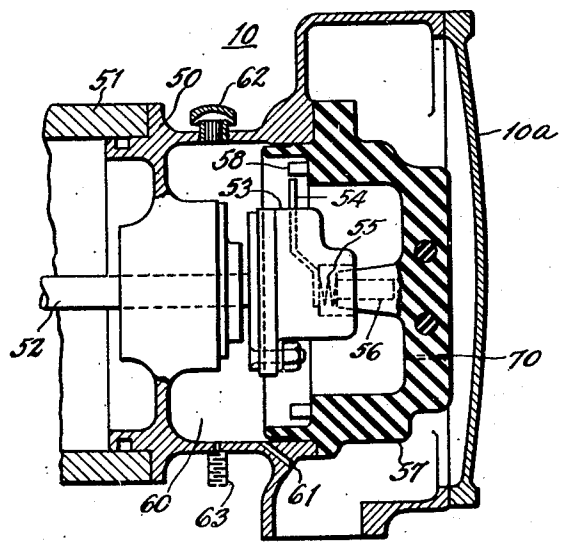


Fig. 4

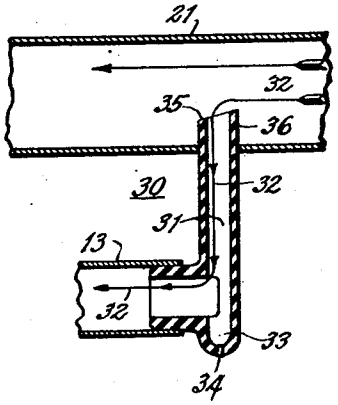


Fig. 3

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UNITED STATES PATENT OFFICE

2,474,510

IGNITION SYSTEM

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2 Claims. (Cl. 123—148)

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This invention relates to the ignition wiring of an air-plane engine.

An object of the invention is to provide for the circulation of fresh air through the wiring manifolds and distributor housings for the purpose of cooling those manifolds subjected to relatively high temperature and for the purpose of preventing the collection of moisture in all the manifolds and housings by causing the air to absorb moisture and carry it away and for the purpose of carrying away from the distributors the nitrous oxide vapors created therein. If the distributors are supercharged, the air escaping from the vents in the distributor caps mingles with the air circulating through the distributor housings surrounding the caps. If the distributors are not supercharged, some of the air of the circulatory system is caused to flow into the distributors and out through suitable escape vents.

Further objects and advantages of the present invention will be apparent from the disclosed embodiment thereof, reference being made to the accompanying drawings.

In the drawings:

Fig. 1 is a perspective view of a wiring system embodying the present invention.

Fig. 2 is an end elevation in the direction of arrow 2 of Fig. 1.

Fig. 3 is a fragmentary sectional view showing the connection between a fresh air duct and one of the cable manifolds.

Fig. 4 is a sectional view of a distributor and housing, on line 4—4 of Fig. 2.

Referring to Fig. 1 which shows the system as applied to a V-type engine, 10r and 10l refer to the distributor housings from which extend cable manifold 11r and 11l for carrying wires from distributor caps in the housings to spark plugs 14r' and 14l' nearest to the inlet valves of the cylinders of the engine. Flexible manifold sections 12r and 12l connect housings 10r and 10l respectively with cable manifolds 13r and 13l respectively for carrying wires from the distributor caps in the housings to spark plugs, such as 14r and 14l, respectively, nearest to the exhaust valves of the cylinders. The distributor in housing 10l distributes sparking impulses to all of the "inlet" spark plugs and the distributor in housing 10r distributes sparking impulses to all of the "exhaust" spark plugs. Therefore a cross manifold 15 connecting housings 10r and 10l is provided for carrying the crossover cables.

The "exhaust" plugs 14r are cooled by jets of fresh air issuing from slits 20r in a manifold 21r into which fresh air enters, as indicated by arrow

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22r, by ramming pressure as the airplane moves. Similarly arrow 22l indicates fresh air entering a manifold 21l. Some of this air escapes through slits 20l to cool the "exhaust" plugs 14l. These "exhaust" plugs are protected to some extent from the heat of exhaust pipes such as 25r by a baffle plate such as 26r. Plugs 14l are below a similar baffle plate 26l (Fig. 2).

The manifolds 13r and 13l are located below the air manifolds 21r and 22l respectively and are connected with them in the same manner. Referring to Fig. 3 it will be seen that the front end of one of the "exhaust" plug cable manifolds 13 is connected with an air manifold 21 by a flexible rubber member 30 known as a transfer tube which provides a duct 31 through which fresh air passes from manifold 21 into manifold 13 as indicated by the arrows 32. The tube 30 provides a water trap 33 having a small drain hole 34. The upper end surface 35 of the tube 30 is inclined downwardly in the general direction of air flow in the manifold 21 so that the surface 36 may be more effective in preventing the entrance of excessive moisture into the tube 30.

Although the fresh air entering the manifolds 13r and 13l may already carry some moisture, this air is soon heated as it is forced under ramming pressure through these manifolds. The air, on expanding, becomes capable of absorbing more moisture which it picks up as it passes through the system of manifolds and housings and escapes through several drain passages and vents. Manifolds 13r and 13l having drain holes 40r and 40l at the ends thereof which would be lowest when the airplane is on the ground. Manifolds 11r and 11l have drain holes 41r, 42r and 41l, 42l (latter not shown) near the ends thereof.

Referring to Fig. 4 which shows, in longitudinal section, one of distributors and its housing, the housing 10 comprises a main body 50 supported by an extension 51 of the engine cam shaft housing and supporting a shaft 52 driven by the engine and carrying a nonconducting rotor block 53 in which is embedded a metal distributing arm 54 to which sparking impulses are conducted by a spring 55 from a center contact 56 in a distributor cap 57, said contact 56 being connected in any suitable manner with a high tension source such as the secondary of an ignition transformer coil of a magneto: The arm 54 sweeps past metal posts 58 each connected with a spark plug cable.

The housing 10 and the cap 57 provide a distributor chamber 60 in which ozone is generated by sparks jumping between the arm 54 and the posts 58. Ozone unites with nitrogen of the air

to form nitrous oxide which, on combining with a sufficient amount of moisture, would form nitric acid. To prevent an appreciable accumulation of nitrous oxide and the consequent formation of nitric acid, air must be allowed to circulate into and out of the chamber 60.

If the equipment is not to be subjected to relatively high altitude, the chamber 60 is not maintained under relatively high air pressure from a supercharger or other source. In that case, some of the air circulating through the housing 10, flows into the chamber 60 through a passage 61 and out through a vent at the top provided by a flame screen plug 62 and out through a drain at the bottom provided by a flame screen plug 63. If the chamber 60 is supercharged, the plugs 62 and 63 are not used and the tapped hole for the plug 62 receives a pipe connection with the engine supercharger or other air pressure source; plug 63 is replaced by a plug having a $\frac{1}{32}$" drain hole for venting the chamber 60; and the distributor cap 57 has a vent 70 through which air can escape from the chamber 60 carrying with it the nitrous oxide fumes which are swept out of the housing 10 by the air circulating through it and into the manifold 11 and finally out through the drain holes 41 and 42 therein.

The present invention takes advantage of the air under pressure in the air manifolds 21*r* and 21*l* makes it serve several purposes. This air cools particularly the cables in the manifolds 13*r* and 13*l* so that their temperature does not become excessive; it sweeps out the moisture which tends to collect in the cable manifolds and distributor housings; and it sweeps out nitrous oxide fumes, either by passing through non-supercharged distributor chambers or by picking up the fumes escaping from the vents in the distributor caps covering the distributing chambers which are super-charged.

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

What is claimed is as follows:

1. In combination with an ignition wiring system for a V-type internal combustion engine of a vehicle; a pair of ignition distributors; a housing for enclosing each distributor; a spark plug against each inlet valve of the engine; a spark plug adjacent each exhaust valve of the engine; a cross manifold connected to both housings and first and second cable manifolds extending respectively from the housings for enclosing cables leading from one of the distributors to spark plugs adjacent the inlet valves; third and fourth cable manifolds connected respectively with the housings for enclosing cables leading from the other distributor to spark plugs adjacent the exhaust valves; two fresh air manifolds adjacent the exhaust valves for receiving fresh air when the vehicle moves and having passages for directing air upon the spark plugs adjacent the exhaust valves to cool the same; tubes each for transferring some of the air from a fresh air manifold respectively to the third and fourth cable manifolds and passages provided by the first and second cable manifolds to allow air to escape after it has circulated through the third and fourth manifolds, the housings and the first and second manifolds.

2. In combination with an ignition wiring system for an internal combustion engine of a vehicle; an ignition distributor; a housing for enclosing the ignition distributor; a spark plug adjacent each inlet valve of the engine; a spark plug adjacent each exhaust valve of the engine; a cable manifold extending from the housing for enclosing cables leading from the distributor to the spark plugs adjacent the inlet valves; a second manifold connected with the housing for enclosing cables leading from the distributor to spark plugs adjacent the exhaust valves; a fresh air manifold adjacent the exhaust valves for receiving fresh air when the vehicle moves and having outlets for directing air upon the spark plugs adjacent the exhaust valves to cool the same; means for conducting some of the air from the fresh air manifold to the second mentioned cable manifold; and openings provided by the first mentioned cable manifold to allow air to escape after it has been circulated through the second manifold, the housing and the first manifold.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
1,613,053	Neighbour	Jan. 4, 1927
2,113,939	Granville	Apr. 12, 1938
2,207,368	Arthur	July 9, 1940
2,213,478	Swanson	Sept. 3, 1940
2,286,233	Scott	June 16, 1942
2,289,959	Gregory	July 14, 1942
2,310,575	Cattaneo	Feb. 9, 1943
2,322,448	Johnson	June 22, 1943
2,411,936	Paton	Dec. 3, 1946
2,414,000	Spengler	Jan. 7, 1947