

[54] APPARATUS FOR IMMEDIATE SPOTTING OF MECHANICAL AND ELECTRICAL DEFECTS, IN EXPLOSION ENGINES

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[58] Field of Search..... 73/115, 117.2, 116

[56] References Cited

UNITED STATES PATENTS

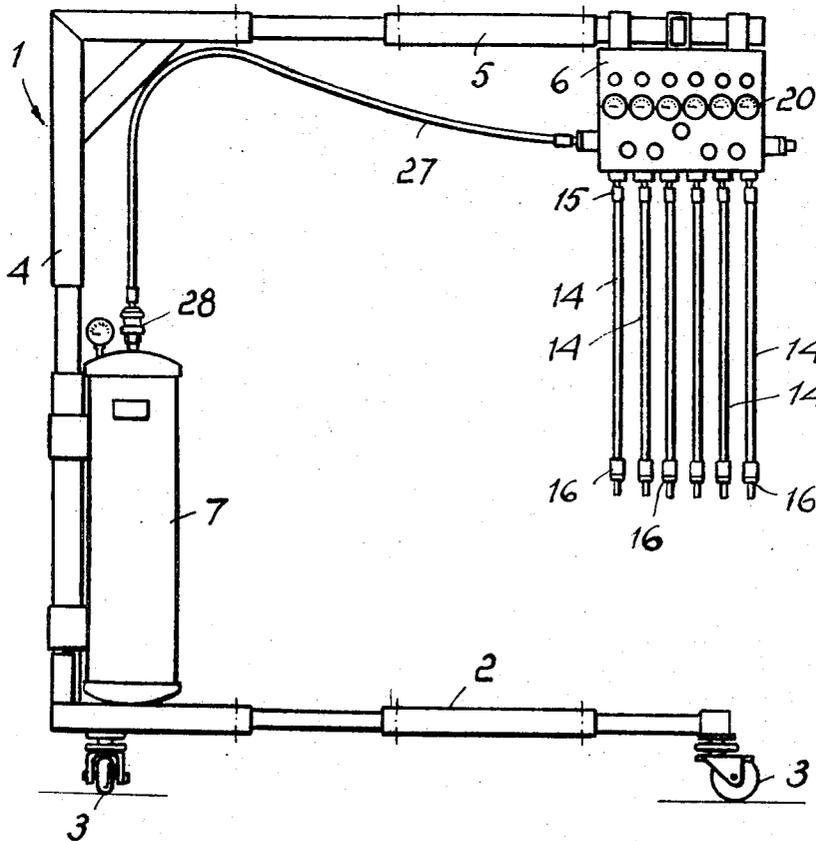
3,320,801	5/1967	Rhindress, Jr.	73/116
2,362,446	11/1944	Bodine, Jr.	73/115

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[57] ABSTRACT

Apparatus for the immediate identification of mechanical and electrical faults particularly for explosion engines comprising a plurality of connectors connected to a compressed air distribution duct and provided each with a respective flexible duct. The latter terminates with an externally threaded connector with the same pitch as the thread of the sparking plugs of an explosion engine. A pressure gauge is connected to at least one of the connectors and a first non-return valve provided between the connector and the pressure gauge. A second non-return valve is arranged between the distribution duct and a point of the connector upstream of said first non-return valve. The apparatus also comprises connecting means between the distribution duct and the compressed air receiver and a shut-off valve in such connecting means.

6 Claims, 6 Drawing Figures



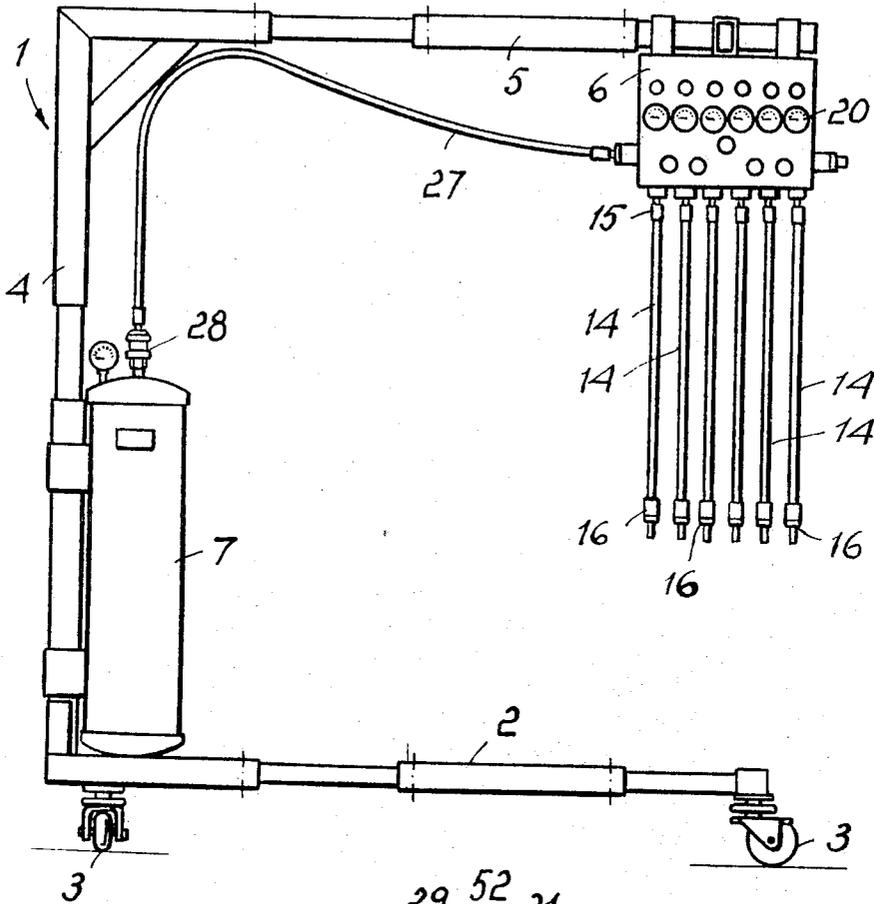


FIG. 1

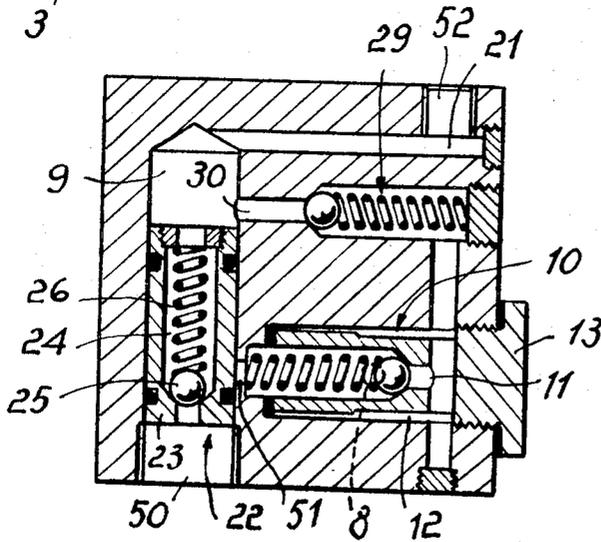


FIG. 4

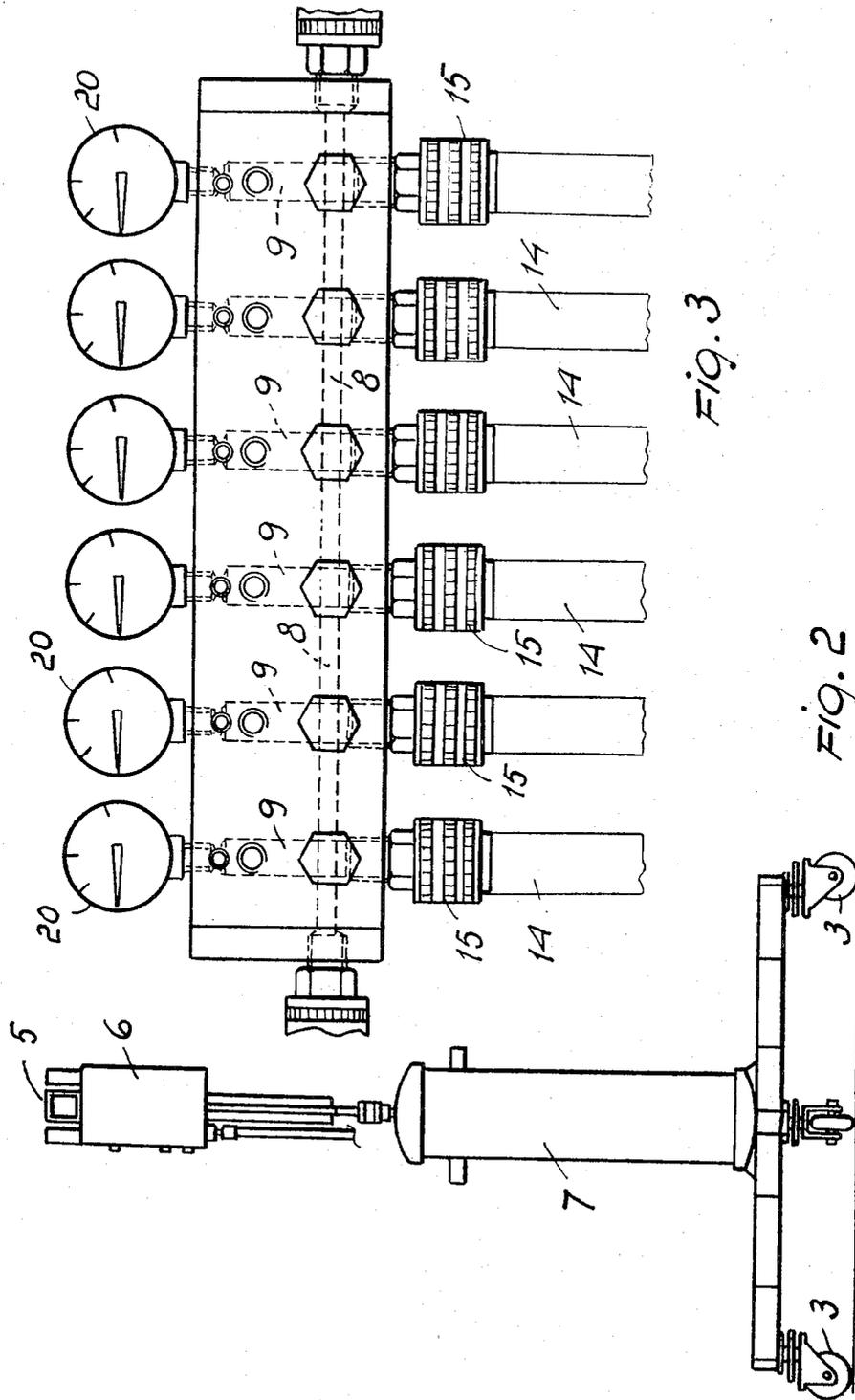


FIG. 3

FIG. 2

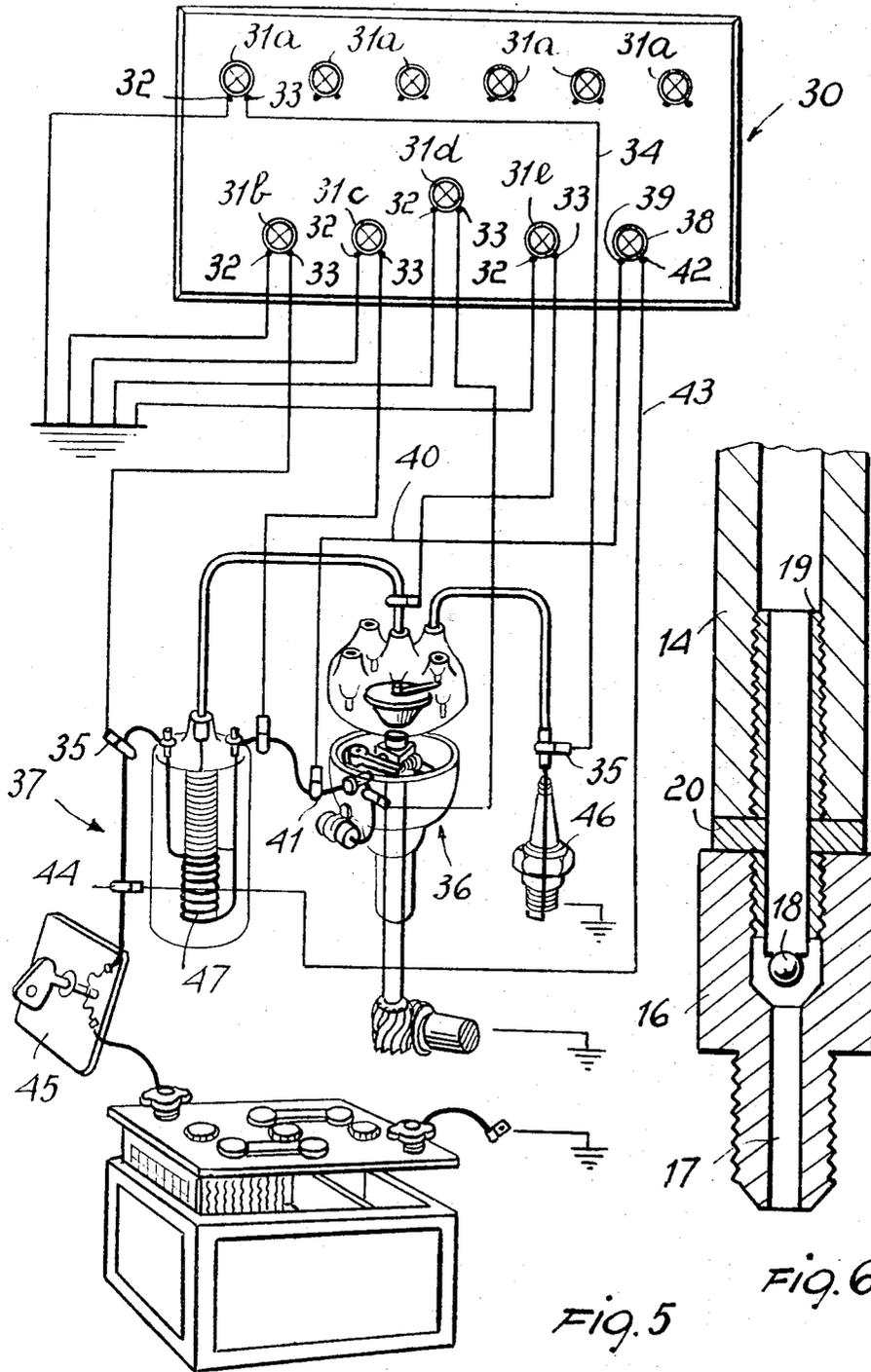


FIG. 5

FIG. 6

APPARATUS FOR IMMEDIATE SPOTTING OF MECHANICAL AND ELECTRICAL DEFECTS, IN EXPLOSION ENGINES

BACKGROUND OF THE INVENTION

The present invention relates to an apparatus for the immediate identification of mechanical and electrical faults, for explosion engines.

In the automobile field, electronic apparatus is used for the diagnosis and tuning of engines.

These known devices however give rise to certain disadvantages in that the checks can be carried out only where such apparatus is installed, and moreover are carried out with the engine running. Furthermore the apparatus is very sophisticated and hence complex, and in many cases gives readings which go beyond the perception of normal faults.

SUMMARY OF THE INVENTION

The main object of the present invention is to eliminate the aforementioned disadvantages of known types, by providing an apparatus which enables faults to be immediately identified and is usable anywhere, even with the engine not running.

Another object is to provide an apparatus of easy construction and low cost.

These and other objects are attained by an apparatus for the immediate identification of mechanical and electrical faults, particularly for explosion engines, according to the invention comprising a trolley stand and a compressed air receiver supported by said trolley stand, and comprising a distribution duct, a plurality of connectors connected to said distribution duct, a plurality of flexible ducts fixed to said connectors and terminating in end connectors threaded externally with the same pitch as the thread of the sparking plugs of an explosion engine, at least one pressure gauge connected to at least one of said connectors, a first non-return valve between said connector and said pressure gauge capable of opening when the pressure upstream of said connector rises, a second non-return valve between said distribution duct and a point of the connector upstream of said first non-return valve, connecting means between said distribution duct and said compressed air receiver and a shut-off valve in said connecting means.

According to a particular aspect, the apparatus according to the invention includes a device for checking electrical circuits of explosion engines, comprising: a plurality of indicator lamps, a first contact connected to earth and a second contact connected to said indicator lamps, a plurality of electric wires connected at one end to a second contact and at the other end to a mobile terminal, said mobile terminal being connectible to a point of an explosion engine electrical circuit to be checked, an indicator lamp with two poles having a first and a second terminal, and a first and a second conductor terminating in mobile terminals and connected, respectively, to said first and second terminal of said indicator lamp with two poles.

BRIEF DESCRIPTION OF THE DRAWINGS

The invention will be more evident from the description of a preferred but not exclusive embodiment of the apparatus according to the invention, illustrated by way of non-limiting example in the accompanying drawing, in which:

FIG. 1 shows a trolley stand supporting a box comprising the apparatus and a compressed air receiver;

FIG. 2 is a view from the right of FIG. 1;

FIG. 3 shows the working unit of a pneumatic circuit;

FIG. 4 is a sectional view along lines IV—IV of FIG. 3;

FIG. 5 shows the device for checking the electrical circuit of an explosion engine; and

FIG. 6 is a sectional view on an axial plane through an end connector.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

With reference to the aforementioned Figures, the apparatus according to the invention comprises a trolley stand 1 consisting of a base 2 mobile on wheels 3, an upright 4 and a crosspiece 5 supporting the working unit 6 of the apparatus formed from a body comprising various ducts and valves as will be seen hereinafter, and a compressed air receiver 7 supported by said trolley stand 1. A distribution duct 8 is formed in said working unit 6, which also comprises a plurality of connectors 9 consisting of a cylindrical cavity extending essentially vertically and emerging at the base of said working unit 6 by way of a threaded connector 50, each of said connectors 9 comprising a first valve 22 which will be described hereinafter, and being connected by means of a bore 51 and a second non-return valve 10 to a duct 11 which is in communication by way of a cavity 12 with said distribution duct 8, said cavity 12 being essentially in the form of a cylindrical crown and formed by a variation in diameter of a plug member 13 comprising said second non-return valve 10 and disposed essentially perpendicularly to said connector 9.

A plurality of flexible ducts or hoses 14 are removably connected, by means of connector elements 15, in a position which can be conventionally called upstream of said connectors 9, said flexible ducts 14 comprising, at their free end, end connectors 16 externally threaded with a pitch equal to that of the thread of the sparking plugs of an explosion engine. Said end connectors 16 comprise internally an axial bore 17, and a sphere 18 arranged to close said axial bore 17 in a non-hermetic manner, and are connected by an externally threaded tube 19 which in its central zone comprises a hexagonal shoulder 20'.

A plurality of pressure gauges 20 are connected by a duct 21 and threaded connector 52 to said connector 9.

In said connector 9 can slide said first non-return valve 22, consisting of a cylindrical body 23 comprising an axial cavity 24, and a sphere 25 thrust by a spring 26 and arranged to close said axial cavity 24, said non-return valve 22 being able to open when the pressure upstream of said connector 9 rises.

The apparatus according to the invention also comprises connection means consisting of a flexible duct 27, connecting said distribution duct 8 to said receiver

7, and a shut-off valve 28 at the outlet of said receiver, for opening or closing said receiver 7.

A third non-return valve 29 is connected by a duct 30 to said connector 9, and by said duct 11 and said cavity 12 to said distribution duct 8.

With reference to FIG. 5 the device for checking electrical circuits of explosion engines comprises a plurality of indicator lamps consisting of lamps 31 each provided with a first contact 32 connected to earth and a second contact 33 connected by an electric wire 34, provided with a mobile spring clip terminal 35, to a point in the electrical circuit 37 of an explosion engine, and an indicator lamp with two poles consisting of a lamp 38 having a first terminal 39 connected by a first conductor 40 to a point 41 on the low tension side at the distributor inlet and a second terminal 42 connected by a second conductor 43 to a point 44 at the outlet of the control panel 45 of the motor vehicle.

More particularly the points in the electrical circuit 37 connected by way of the mobile terminal 35 and electric wire 34 to the indicator lamps indicated overall by the reference numeral 31 are the following:

The conductor at the inlet to the sparking plugs 46 for the six lamps 31a, the conductor at the inlet of the coil 47 for the lamp 31b, the low tension conductor at the outlet of the coil 47 for the lamp 31c, the conductor at the inlet of the condenser for the lamp 31d and the high tension conductor at the inlet of the distributor 36 for the lamp 31e.

The operation of the apparatus according to the invention is as follows. Examining firstly the method of identification of mechanical faults it will be noted that this operation requires two tests. The first test consists of a measurement of the maximum pressure inside the explosion chambers of the cylinders. To do this the sparking plugs 46 are removed from their seats and the end connectors 16 are connected into said seats. Then the engine is made to move by means only of the starter motor. The pistons, during the compression stage, produce an increase in pressure downstream of the connector 9 by way of the flexible ducts 14. Thus the cylinder 23 is thrust to its limit and the spheres 25 are lifted so enabling the pressure gauges 20 to register.

During the decompression stage, the sphere 18 of the end connectors 16 closes the axial bore 17, the closing of which, although not being perfectly tight, will be sufficient to maintain the maximum pressure value on the pressure gauges for a time sufficient to enable it to be read.

The second test is in practice a test of tightness of the explosion chambers, and is carried out in the following manner. The shut-off valve 28 is opened, so enabling the receiver 7 to supply compressed air through the flexible duct to the distribution duct 8. At this point the piston in that explosion chamber for which the tightness test is to be carried out is put under compression by pushing the vehicle by hand, after having put it into top gear.

The compression caused by the piston thrusts the cylinder 23, the compressed air arriving at the distribution duct 8 through the duct 11, and opening the second non-return valve 13, will thus be able to enter the connector 9 and put the explosion chamber under pressure. The faults are identified in positions corresponding to air leakage. The third non-return valve 29 enables the pressure in the pressure gauge to be automatically discharged at the end of the operation.

With regard to the operation of the device for checking the electrical circuit, if a lamp 31 does not light this indicates a fault in that section of the circuit preceding the point of fixing of the relative mobile terminal 35, whereas if the lamp 38 lights this indicates a fault in the distributor in that such a fault indicates that a contact has been unduly connected to earth. One of the two poles which were positive now becomes negative, because of which the lamp 38 now lights.

The invention so conceived is susceptible to numerous modifications all of which fall within the scope of the inventive idea.

I claim:

1. An apparatus for the immediate identification of faults, particularly for explosion engines, comprising a trolley stand and a compressed air receiver supported by said trolley stand; a valve body supported by said trolley stand; a distribution duct formed in said valve body and a flexible duct between said distribution duct and said compressed air receiver; a shut-off valve arranged in said flexible duct; a plurality of connectors formed in said valve body each being in the shape of a cylindrical cavity emerging at its lower end from said valve body and having a first passage bore near said lower end and a second passage bore near its upper end; a plurality of flexible ducts fixable to said lower ends of said connectors and terminating in end connectors threaded externally with the same pitch as the thread of the sparking plugs of an explosion engine; a plurality of pressure gauges each connected to the upper end of said cylindrical cavity of said connector; a plurality of first non-return valves each slidably housed in said cylindrical cavity of said connector and capable of opening when the pressure upstream of said lower end of said connector rises; a plurality of second non-return valves each arranged between said distribution duct and said first passage bore of said connector and capable of opening when said shut-off valve is opened; a plurality of third non-return valves each between said distribution duct and said second passage bore of said connector and capable of opening under the air pressure in said pressure gauge.

2. An apparatus as claimed in claim 1, in which said first non-return valve comprises a hollow cylindrical member sliding in said cylindrical cavity of said connector when the pressure upstream of said lower end of said connector rises between a first lower position in which it closes said first passage bore and lets said second passage bore free and a second upper position in which it closes said second passage bore and lets said first passage bore free a spring situated in said hollow cylindrical member, and a valve plug element located mobile within said hollow cylindrical member and thrust by said spring in order to close or open the cavity of said hollow cylindrical member.

3. An apparatus as claimed in claim 1, in which said second non-return valve comprises a receiving cavity formed in said valve body, a first end of said receiving cavity being connected to said cylindrical cavity of said connector by way of said first passage bore, a second end of said receiving cavity being connected to said distribution duct, a plug element mounted fixed within said receiving cavity, a valve seat within said plug element in communication with said first and second end of said receiving cavity, a spring situated in said valve seat and a valve element located mobile within said valve seat and urged by said spring in order to shut off

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the flow between said cylindrical cavity of said connector and said distribution duct when said shut-off valve is closed.

4. An apparatus as claimed in claim 1, wherein said third non-return valve comprises a receiving cavity formed in said valve body, a spring situated in said receiving cavity, and a valve element mounted mobile within said receiving cavity and urged by said spring in order to permit the flow from said gauge at the end of the operation.

5. An apparatus as claimed in claim 1, further comprising end connectors externally threaded with the same pitch as the thread of the sparking plugs of an explosion engine, an axial bore formed in said end connector and connected to said flexible ducts by way of a tubular connecting element, a substantially spherical valve element arranged to close in a non-hermetic manner either said axial bore of said tubular connector on decompression or compression of a piston of an explo-

sion engine respectively.

6. An apparatus as claimed in claim 1, further comprising a device for checking electrical circuits of explosion engines, comprising a plurality of first indicator lamps, a first contact and a second contact for each of said indicator lamps, said first contact being grounded, a plurality of mobile terminals, a plurality of electric wires each connected to one end to said mobile terminal and at the other end to said second contact, said mobile terminal being connectable to a point of an explosion engine electric circuit to be checked, a second indicator lamp having a first and a second terminal, a first conductor between said first terminal of said second indicator lamp and a point on the low tension side at the distributor inlet, a second conductor between said second terminal of said second indicator lamp and a point at the outlet of the control of the motor vehicle.

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