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SPARK PLUG TESTER

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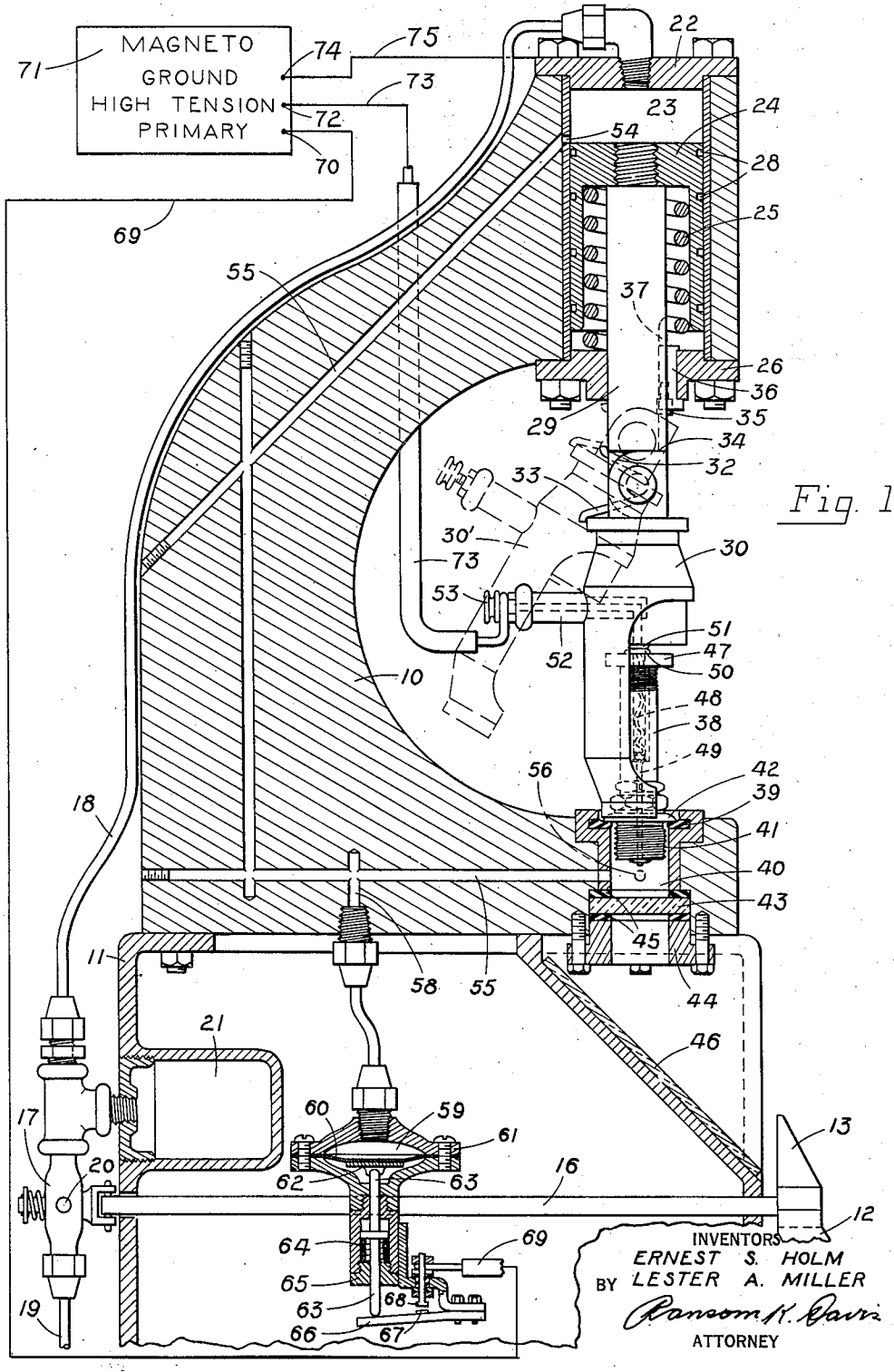


Fig. 1

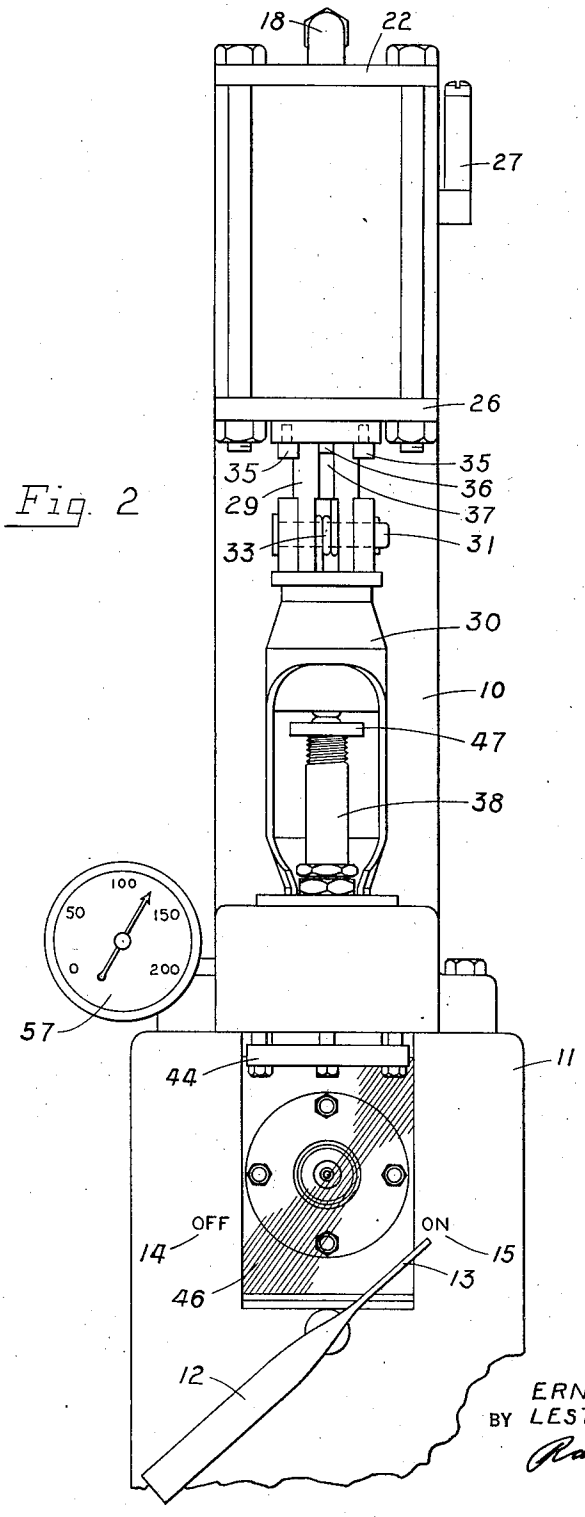
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Fig. 2



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SPARK PLUG TESTER

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11 Claims. (Cl. 175—183)

(Granted under the act of March 3, 1883, as amended April 30, 1928; 370 O. G. 757)

This invention relates to a spark plug tester, and has for an object to provide an improved spark plug tester, which, with suitable adapters, is capable of use with all types and sizes of spark plugs and which tests the plugs with the plug points under pressure conditions simulating the pressure under which the plug is to be used.

A further object of this invention is to provide a spark plug tester which may be operated very quickly both in placing the plug in testing position and in removing it therefrom, as well as in automatically providing that the predetermined minimum pressure will be present at the points when the test takes place.

A further object of this invention is to provide a plug testing device which is fully automatic except for the manual operation of inserting and removing the spark plug and turning the control valve handle.

A further object of this invention is to provide a spark plug tester which eliminates danger of injury to the operating personnel since the operator does not look directly through a glass window into the compressed air chamber and the combustion recess of the firing plug, but rather sees the reflected image of the chamber and the spark into a reflecting surface.

With the foregoing and other objects in view, the invention consists in the construction, combination and arrangement of parts, as will be described more fully hereafter.

In the drawings:

Fig. 1 is a partly diagrammatic and partly sectional view of the spark plug tester of this invention, and

Fig. 2 is a front elevational view.

The spark plug tester of this invention consists of a gooseneck frame 10 securely mounted on a hollow base 11. A manual control handle 12 having a pointer 13 adapted to indicate either the "Off" position 14 or the "On" position 15 is mounted on a connecting rod 16 extending through the base 11 to a two-way valve 17. This valve 17 connects a tubing 18 to a source of compressed air through the tubing 19 when the pointer 13 is in the "On" position 15, and when in "Off" position 14, the valve 17 shuts off the tubing 19 and connects the tubing 18 to an exhaust port 20 to the atmosphere. An expansion chamber 21 connected to tubing 18 acts as a cushion to the flow of compressed air through tubing 18.

The tubing 18 connects through a cylinder head 22 into a cylinder chamber 23 in which is located a vertically movable piston 24 urged upwardly by a compression coil spring 25 located between the bottom of the piston and a lower cylinder head 26. An oil reservoir 27 connects into the cylinder chamber 23, the piston being provided with oil grooves 28. A piston rod 29 secured to the bottom of piston 24 extends through an opening in the lower cylinder head 26. A spark plug clamp 30 is pivoted to the rod 29 by the pin 31, a curved surface 32 permitting the clamp 30 to pivot to the dash line position 30' against the clamp coil spring 33 when the cam 34 strikes the pins 35 set in cylinder head 26 as a result of upward movement of piston rod 29. A key 36 extending into a recessed groove 37 in the piston rod 29 holds the clamp 30 from accidentally rotating.

With the construction just described, the clamp 30 will go to position 30' when the compression coil spring 25 has raised the piston to the topmost position (not shown) and to the position 30 when compressed air enters cylinder chamber 23 and moves it downwardly.

A spark plug 38, to be tested, is placed on the rubber gasket 39 and has its points extended into the firing chamber 40. As will be observed, the walls of the spark plug firing chamber are unthreaded, and are of greater diameter than that of the spark plug threads 41, but of less diameter than that of the flange or skirt 42 which rests on the gasket 39. The bottom of the firing chamber 40 is closed off by a heavy explosion proof transparent panel 43 secured thereto by a gland 44 between rubber gaskets 45. Set in the base 10 below the panel 43 is a mirror 46, which may be a chromium plated metal sheet, at a suitable angle, such as 45 degrees, so as to be easily observable by an operator in front of the tester.

A spark plug adapter 47, suitable for the particular type and size of spark plug 38 being tested, is placed on the plug 38 so as to come between it and the clamp 30 as it moves from position 30'. This adapter is made of insulation material and carries a contact wire 48 whose lower end abuts against the spark plug contact stem 49, the upper end 50 abutting against a contact 51 connected through an insulator 52 to a high tension terminal 53.

As the piston 24 is moved downwardly by the compressed air to the position shown, causing the clamp 30 to engage the plug 38, a port 54 is uncovered in the side of cylinder chamber 23 and allows compressed air to enter through duct 55 to the spark plug firing chamber 40, which is now sealed by the plug 38 under the clamp 30.

A port 56 in the side of firing chamber 40 connects to an air gauge 57, enabling the operator to know what pressure is present in the firing chamber during the test.

A side duct 58 connects the duct 55 to an upper diaphragm chamber 59 above a diaphragm 60 within the diaphragm housing 61. A diaphragm plate 62 on the bottom of diaphragm 60 abuts against a pin 63 which is pressed thereagainst by a coil spring 64. The strength of this coil spring 64 may be adjusted by partially unthreading the support 65, or by substituting another spring of the desired strength. The lower end of pin 63 abuts against a spring arm 68 carrying a contact 67 and adapted to move it to circuit breaking position with relation to contact 68.

The contact 68 is connected by a conductor 69 to the primary 70 of a magneto 71 continuously driven by a separate electric motor (not shown). The high tension 72 of magneto 71 is connected by a conductor 73 to the high tension terminal 53, while the magneto ground 74 is connected by conductor 75 to the gooseneck frame 10 at any convenient position, as shown.

As the air pressure flows from the cylinder chamber 23 to both the firing chamber 40 and to the diaphragm chamber 59, it compresses diaphragm coil spring 64 until the pin 63 breaks the circuit from the primary 70 through conductor 69 and contacts 68 and 67 to the ground through base 11 and gooseneck frame 10 to conductor 75 and magneto ground 74. This circuit break does not take place until the requisite pressure is present in chambers 40 and 59, as determined by diaphragm spring 64 and measured by air gauge 57. The high voltage induced in the secondary then necessarily causes a current to flow from ground through the clamp 30 to plug skirt 42 and across the spark gap of the spark plug points within chamber 40 and through the plug stem 49 to the high tension terminal 53 and high tension conductor 73 to the high tension terminal 72 of the magneto 71.

In operation, the spark plug to be tested is placed on the gasket 39 with its plug points within the firing chamber 40. The adapter 47 is then placed on the spark plug and the operator moves handle 12 to place pointed in the "On" position 15. The valve 17 then allows air to flow through tube 18, which air is cushioned by chamber 21, and moves a piston 24 downwardly compressing spring 25 and allowing spring 33 to move clamp 30 from position 30' toward position 30 as the cam surface is relieved of pressure on the pins 35. When the clamp reaches position 30, contact 50 on adapter 47 presses against contact 51 to complete the electrical path from plug stem 49 through contact wire 48 to the high tension terminal 53 and conductor 73, the port 54 becomes uncovered by the piston 24, and allows pressure to build up through duct 55 to firing chamber 40 and diaphragm chamber 59. When the pressure in these chambers has built up to the predetermined amount, as controlled by spring 64, the primary circuit is broken by the separation of the contacts 68 and 67, inducing a high voltage in the secondary which causes the current to flow across the gap between the spark plug points through the high tension conductor 73 to the high tension terminal in the magneto.

The operator, standing in front of the tester, observes the firing through the reflector 46, reading the air gauge 57 to be sure that the plug fires properly under the desired pressure. After finishing the testing of the plug 38, he moves the handle 12 to bring the pointer 13 to the "Off" position 14, whereupon the valve 17 cuts off the pressure from tube 19 and allows the pressure in chambers 40, 59 and 54 to escape through exhaust port 20 to the atmosphere. The piston 24 then moves upwardly under the force of spring 25, moving the clamp 30 to position 30' allowing the tested plug 38 to be removed and replaced by another plug to be tested. With the new plug to be tested in position with its adapter on the gasket 39, the control handle 12 is moved to place the pointer 13 in the "on" position 15, opening valve 17 from tube 19 to tube 18 and cutting off exhaust port 20, thus repeating the cycle. The presence of expansion chamber 21 cushions the operation of clamp 30 as it moves against the plug 38.

Other modifications and changes in the proportions and arrangements of the parts may be made by those skilled in the art without departing from the nature and scope of the invention, as defined in the appended claims.

The invention described herein may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

Having thus set forth and disclosed the nature of this invention, what is claimed is:

1. In a spark plug tester, a compression chamber having an open end, a compressible gasket positioned in the chamber wall at said open end, a clamp for pressing a flange of a spark plug firmly against said gasket when the threaded end of the plug is inserted in said chamber to provide a substantially pressure-tight junction between the flange and the gasket, and pressure operated means for operating said clamp.

2. In a spark plug tester, a compression chamber having an open end, a compressible gasket positioned in the chamber wall at said open end, a clamp for pressing a flange of a spark plug firmly against said gasket when the threaded end of the plug is inserted in said chamber to provide a substantially pressure-tight junction between the flange and the gasket, and pressure operated means for operating said clamp and supplying pressure to said compression chamber.

3. In a spark plug tester, a compression chamber having an open end, a compressible gasket positioned in the chamber wall at said open end, a clamp for pressing a flange of a spark plug firmly against said gasket when the threaded end of the plug is inserted in said chamber to provide a substantially pressure-tight junction between the flange and the gasket, and pressure operated means for operating said clamp, supplying pressure to said compression chamber, and causing a high tension circuit to flow across the plug points within the chamber when the pressure within the chamber has reached a predetermined minimum.

4. In a spark plug tester, a compression chamber having an open end, a compressible gasket positioned in the chamber wall at said open end, a clamp for pressing a flange of a spark plug firmly against said gasket when the threaded end of the plug is inserted in said chamber to provide a substantially pressure-tight junction between the flange and the gasket, and pressure operated means for operating said clamp, supplying pressure to said compression chamber, and means for cushioning the operation of said clamp.

5. In a spark plug tester, a compression chamber having an open end, a compressible gasket

positioned in the chamber wall at said open end, a clamp for pressing a flange of a spark plug firmly against said gasket when the threaded end of the plug is inserted in said chamber to provide a substantially pressure-tight junction between the flange and the gasket, and pressure operated means for operating said clamp, supplying pressure to said compression chamber, means for cushioning the operation of said clamp, and means for moving said clamp to plug holding and plug releasing position.

6. In a spark plug tester, a compression chamber having an open end, a compressible gasket positioned in the chamber wall at said open end, a clamp for pressing a flange of a spark plug firmly against said gasket when the threaded end of the plug is inserted in said chamber to provide a substantially pressure-tight junction between the flange and the gasket, and pressure operated means for operating said clamp, supplying pressure to said compression chamber and causing a high tension circuit to flow across the plug points within the chamber when the pressure within the chamber has reached a predetermined minimum, means for cushioning the operation of said clamp, and means for moving said clamp to plug holding and plug releasing position.

7. A spark plug tester comprising, in combination, a base, a compression chamber having an open end in said base, a compressible gasket in the chamber wall at said open end, adapted to support the skirt of a spark plug to be tested with the plug points within the chamber, a frame mounted on said base overhanging said chamber, a spark plug clamp movably mounted on said frame, and pressure means for actuating said clamp to clamping position.

8. A spark plug tester comprising, in combination, a base, a compression chamber having an open end in said base, a compressible gasket in the chamber wall at said open end, adapted to support the skirt of a spark plug to be tested with the plug points within the chamber, a frame mounted on said base overhanging said chamber, a spark plug clamp movably mounted on said frame, and pressure means for actuating said clamp to clamping position, and supplying pressure to said compression chamber.

9. A spark plug tester comprising, in combination, a base, a compression chamber having an open end in said base, a compressible gasket in the chamber wall at said open end, adapted to support the skirt of a spark plug to be tested with the plug points within the chamber, a frame mounted on said base overhanging said chamber, a spark plug clamp movably mounted on said frame, and pressure means for actuating said clamp to clamping position and supplying pressure to said compression chamber, and causing a high tension circuit to flow across the plug points within the chamber when the pressure within the chamber has reached a predetermined minimum.

10. A spark plug tester comprising, in combination, a base, a compression chamber having an open end in said base, a compressible gasket in the chamber wall at said open end, adapted to support the skirt of a spark plug to be tested with the plug points within the chamber, a frame mounted on said base overhanging said chamber, a spark plug clamp movably mounted on said frame, pressure means for actuating said clamp to clamping position and supplying pressure to said compression chamber and causing a high tension circuit to flow across the plug points within the chamber when the pressure within the chamber has reached a predetermined minimum, and means for cushioning the operation of said clamp.

11. A spark plug tester, comprising, in combination, a base, a compression chamber having an open end in said base, a compressible gasket in the chamber wall at said open end, adapted to support the skirt of a spark plug to be tested with the plug points within the chamber, a frame mounted on said base overhanging said chamber, a spark plug clamp movably mounted on said frame, pressure means for actuating said clamp to clamping position and supplying pressure to said compression chamber, means for cushioning the operation of said clamp, and means for moving said clamp to plug holding and plug releasing position.

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