Dec. 16, 1958 S. M. UDALE 2,864,356

IGNITION DISTRIBUTORS

Filed Dec. 19, 1957 2 Sheets-Sheet 1

FIG. 1.

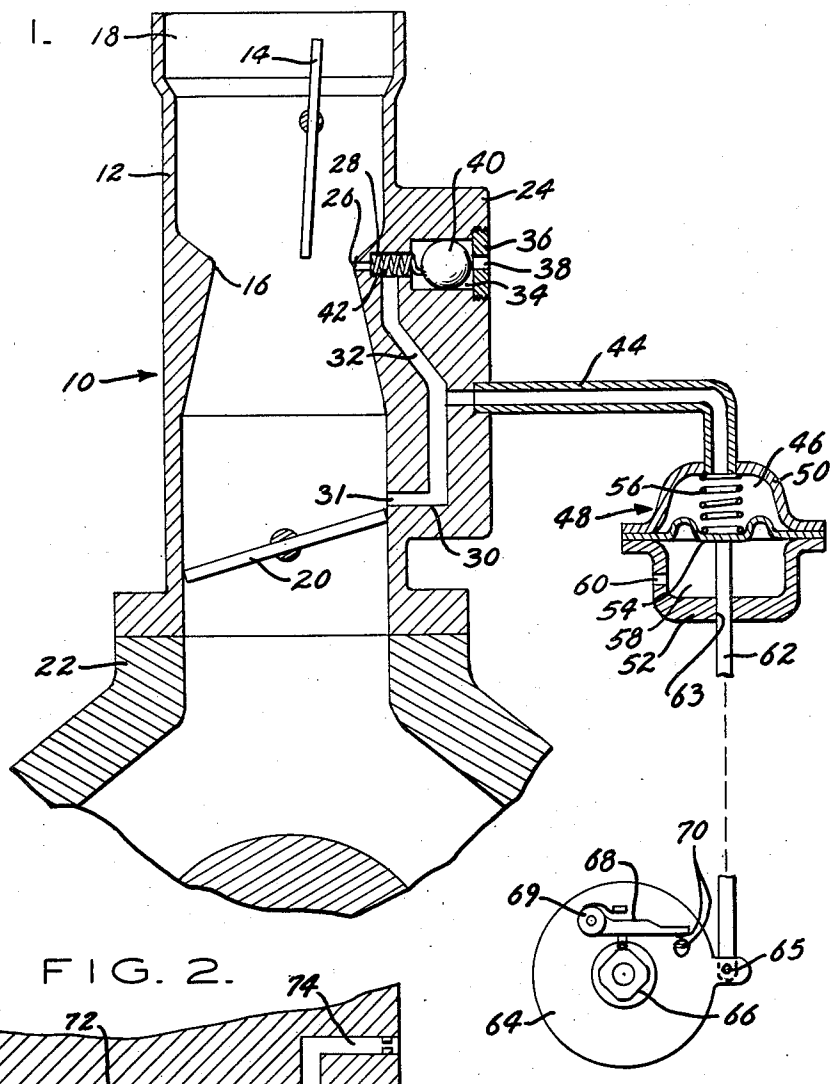
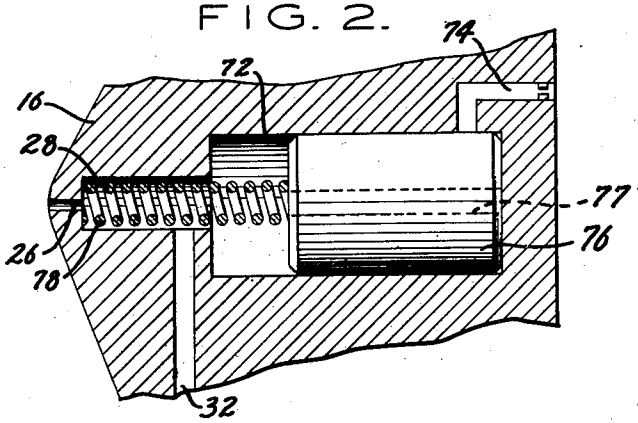


FIG. 2.



INVENTOR.
STANLEY M. UDALE
BY Whittemore, Hulbert & Belknap
ATTORNEYS

Dec. 16, 1958 S. M. UDALE 2,864,356

IGNITION DISTRIBUTORS

Filed Dec. 19, 1957 2 Sheets-Sheet 2

FIG. 3.

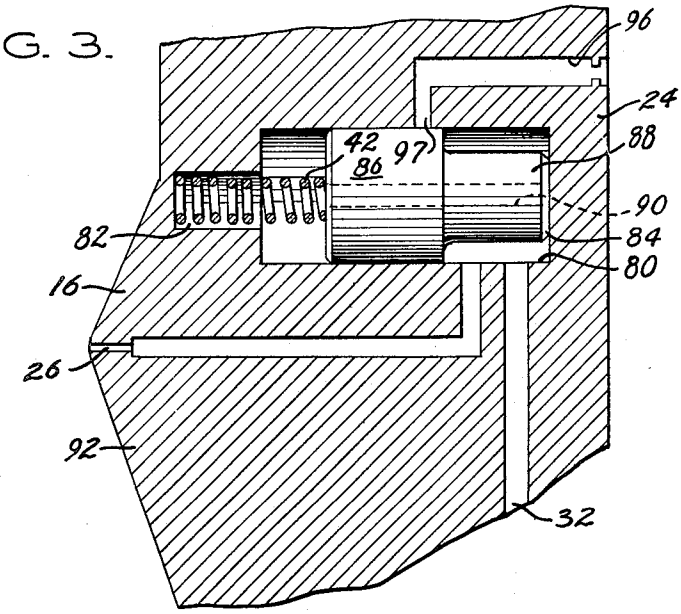
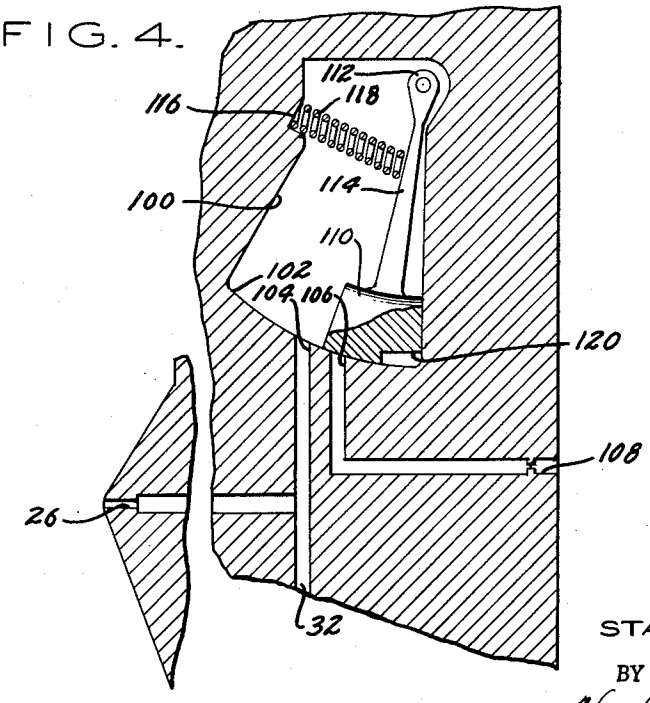


FIG. 4.



INVENTOR.
STANLEY M. UDALE
BY Whittemore, Hulbert & Belknap
ATTORNEYS

United States Patent Office 2,864,356 Patented Dec. 16, 1958

2,864,356

IGNITION DISTRIBUTORS

Stanley M. Udale, Detroit, Mich., assignor to Holley Carburetor Company, Van Dyke, Mich., a corporation of Michigan

Application December 19, 1957, Serial No. 703,935
19 Claims. (Cl. 123—117)

The present invention relates generally to ignition distributors, and more specifically to the type referred to as pressure actuated distributors, which actually employ vacuum as the actuating force or the controllable actuating force to advance or retard the spark.

As the speed of the vehicle increases, the degree of spark advance also increases to some predetermined maximum. If it is desired to accelerate while cruising at a substantial speed, it becomes advantageous to be able to retard the spark in order to have it fire as close to top dead center of the stroke of the piston as possible.

A similar condition exists when the automobile is climbing a hill.

Present distributors fail to provide any means for retarding the spark under such conditions. It is accordingly an object of the present invention to provide means for retarding the spark when the automobile undergoes acceleration or when the automobile is in an inclined position as a result of being located on a positive grade.

It is a further object of the present invention to provide automatic means which will eliminate the undesirable "knock" when the engine is placed under a heavy load.

Other objects and features of the invention will become apparent as the description proceeds, especially when taken in conjunction with the accompanying drawings, illustrating preferred embodiments of the invention, wherein:

Figure 1 is an elevational view of structure embodying the present invention, sectioned substantially through the center.

Figures 2, 3 and 4 are fragmentary sections of modifications of the invention.

The present invention is illustrated and described as associated in an automotive vehicle with an internal combustion engine provided with a conventional carburetor directing fuel flow to the engine manifold. It will of course be appreciated that the invention may be practiced in connection with engines other than those supplied with fuel through a carburetor such for example as engines having fuel injection.

In the illustrated embodiment of the invention however, a carburetor is indicated generally at **10** being substantially comprised of a body **12**, a choke valve **14**, venturi **16**, air intake passage **18**, and throttle plate **20**. The carburetor is shown mounted on a suitable intake manifold **22**. In the preferred embodiment of the invention the body **12** of the carburetor is provided with a laterally extending boss **24** containing operating parts of the device.

Located within the throat of the venturi **16** is a restricted port **26** leading to an enlarged chamber **28**. A short passage **30** is provided in the boss **24** having a port **31** located in the induction passage **18** at a point directly above an edge of the throttle plate **20** and in position to be traversed by the edge of the throttle plate when the throttle is moved from closed toward open position. The short passage **30** and the chamber **28** are in constant communication by a conduit **32**.

Located in the boss **24** outwardly from the chamber **28** is an enlarged chamber **34** the outer end of which is closed by a plug **36** having a port **38** therein venting the chamber **34** to atmosphere. Located within the enlarged

chamber **34** is a ball **40** having clearance with respect to the sides of the chamber **34**. A compression spring **42** having one end seated within the smaller chamber **28** and the other end engaging the ball biases the ball against the plug **36** and in seating relation on the port **38**.

A conduit **44** leads from the passage **32** to the chamber **46** of a vacuum actuated motor indicated generally at **48**. This assembly comprises housing portions **50** and **52** between the edges of which is clamped a flexible diaphragm **54**. A spring **56** is placed within the chamber **46** in such a manner as to bias the diaphragm **54** downwardly with the parts in the position shown in Figure 1. The chamber **58** formed between the diaphragm **54** and the housing portion **52** is vented to atmosphere as indicated at **60**. A rod **62** has one end secured to the diaphragm **54** and its lower end extends through and is guided in an opening **63** provided in the housing portion **52**. The opposite end of the rod **62** is pivotally connected to an angularly adjustable breaker plate **64** as indicated at **65**. The breaker plate is of the type generally found in conventional ignition distributors and is associated with a cam **66** which is rotatable by the engine. Mounted on the breaker plate **64** is the usual breaker arm **68** which is pivoted thereto as indicated at **69** and which carries one of the pair of contacts **70** adapted to be opened and closed by camming of the breaker arm by the cam **66**. The other of the contacts **70** is of course carried by the breaker plate **64**.

Operation

With the parts in the position illustrated in Figure 1 the throttle plate **20** is completely closed, the choke valve is fully open, and the engine may be assumed to be operating under curb idle conditions. At this time the restricted port **26** in the venturi and the port **31** are both exposed to a pressure not substantially below atmospheric and accordingly, relatively high pressure approaching atmospheric exists within the chamber **46**. The rod **62** is accordingly in its furthest downward position and the breaker plate **64** is in its position of furthest clockwise angular adjustment. The cam **66** is rotating in clockwise direction.

As the throttle plate **20** is opened, the port **31** is transferred to the downstream side of the throttle plate **20** and is accordingly subjected to manifold vacuum which at this time is relatively high. On the other hand, the vacuum existing in the throat of the venturi is relatively low so that air is bled through the restricted port **26** to the chamber **28**, thus producing a resultant vacuum somewhat less than manifold vacuum which is applied through the conduit **44** to the motor **48**. This reduces the pressure existing in the chamber **46** and results in upward movement of the diaphragm **54**, counterclockwise rotation of the breaker plate **64**, and a corresponding spark advance. As the engine speed increases the air flow through the venturi increases with a resultant increase in venturi suction. This reduces the bleed action of the port **26** and accordingly a higher vacuum is applied to the chamber **46** with further upward movement of the diaphragm and further counterclockwise rotation of the breaker plate **64**, thus further advancing the spark.

Assume now that the automobile is cruising at a substantial speed and that it starts to undergo acceleration. At the instant that acceleration is started the mass of the ball **40** with its resulting inertia causes the ball to move away from the port **38** against the action of the spring **42**, thereby admitting air at atmospheric pressure into the chamber **34**. Since the ball has appreciable clearance within the chamber, this atmospheric air is admitted to the chamber **28** and thus reduces the vacuum determined by the values existing within the venturi and to manifold. Accordingly, the vacuum applied to the motor

48 is correspondingly reduced, thereby causing the breaker plate to be rotated clockwise by virtue of the spring 56. Clockwise rotation of the breaker plate 64 tends to retard the spark so that detonation will take place closer to or at the top dead center of the engine piston stroke.

It will of course be apparent that the ball 40 remains unseated only during actual acceleration.

Modified constructions

In Figures 2–4 there are illustrated modifications relating to the atmosphere bleed valve construction which in Figure 1 comprises the ball valve 40 and valve port 38.

Referring first to Figure 2 wherein parts identical with those shown in Figure 1 bear the same reference numerals, the reduced chamber 28 which communicates with the throat of the venturi 16 through the restricted port 26 is in this instance in communication with an enlarged chamber 72 the outer end of which is closed. The chamber 72 is preferably of cylindrical shape and has a restricted passage 74 communicating with a side of the chamber 72 and extending to atmosphere. Slidably mounted within the chamber 72 is an elongated cylindrical valve 76 having an axial passage 77 extending completely therethrough. The valve 76 is normally maintained in the closed position illustrated in the figure by a compression spring 78.

With the parts in the position shown the chamber 72 to the left of the valve 76 is in communication with the reduced chamber 28 where the existing value of vacuum is determined by the vacuum prevailing at the venturi port 26 and the manifold vacuum port 38, shown in Figure 1. Upon acceleration of the vehicle to the right as seen in Figure 2, inertia tends to cause relative movement between the valve 76 and the chamber 72 such that the valve 76 moves to the left as seen in the figure, uncovering the inner end of the atmospheric passage 74. Atmospheric pressure is then transmitted through the passage 77 and chamber 72 where its bleed action reduces the value of the vacuum transmitted through the passages 32 and 44 to the distributor adjusting motor 48. In this embodiment of the invention it will be observed that the valve 76 is a balance valve so far as the fluid pressure is concerned.

Referring now to Figure 3, parts identical with those shown in Figure 1 are again supplied with identical reference numerals and will not be described again. In this embodiment of the invention there is provided an enlarged chamber 80 having at one end thereof a reduced extension 82. Movable longitudinally in the enlarged chamber 80 is a valve member 84 having an enlarged portion 86 and a reduced portion 88. Extending longitudinally from end to end through the valve member 84 is an elongated passage 90. A passage 92 leads from the venturi port 26 to the portion of the enlarged chamber 80 surrounding the reduced portion 88 of the valve. The passage 32 which extends to the manifold vacuum port 31 and also to the conduit 44 leading to the distributor adjusting rotor 43, also communicates with this portion of the chamber. A restricted passage 96 is provided having a port communicating with a side of the enlarged chamber 80 at a position in which it is closed by the enlarged portion 86 of the valve when the valve is in the right hand position as illustrated in Figure 3.

When the vehicle undergoes acceleration, the inertia of the valve 84 causes it to move to the left in the chamber 80 thus uncovering the port 97 at the inner end of the atmosphere vent passage 96. Air under atmospheric pressure is thus bled into the chamber 80 to the right of the enlarged portion of the valve and reduces the value of the manifold and venturi vacuum available to the motor.

Referring now to Figure 4 there is illustrated another embodiment of the atmospheric bleed valve, parts identical with those of Figure 1 being supplied with the same reference characters. In this figure there is provided a chamber 100 having an arcuately curved surface 102 in which is a port 104 at the upper end of passage 32, and a port 106 at the inner end of the restricted atmospheric bleed passage 108. Within the chamber 100 is a valve member 110 mounted for swinging movement about the axis of a pivot support 112 by an elongated arm 114. Connected between the arm 114 and a spring seat 116 in a wall of the chamber 100 is a compression spring 118 applying a force tending to retain the valve member 110 in the position shown. In its illustrated position the valve member 110 overlies the port 106 but leaves the port 104 open. At the underside of the valve member 110 there is provided a groove 120.

The valve member 110 is thus in effect a pendulum. Upon acceleration of the vehicle to the right as seen in Figure 4, inertia causes the valve to move to the left first covering port 104 and then sequentially uncovering ports 106 and 104, at which time atmospheric pressure is admitted through the passage 108, ports 106 and 104, to the passage 32, thus bleeding air to reduce the pressure attributable to the manifold and venturi vacuum.

In the several embodiments of the invention it will be observed that the movable atmospheric bleed valve is positioned in such a way that it is responsive to forward and upward inclination of the vehicle such as exists when the vehicle is located on a positive grade. Thus, the atmospheric bleed valve is responsive to forward acceleration of the vehicle and to instantaneous grade inclination of the vehicle.

It is pointed out that in all cases the present invention produces a modification of distributor regulation as presently controlled by a vacuum determined jointly by manifold and venturi vacuum. The amount of modification of course is dependent upon the shape and size of valve ports and other considerations which will be selected in accordance with the characteristics of the engine speed.

The drawings and the foregoing specification constitute a description of the improved ignition distributors in such full, clear, concise and exact terms as to enable any person skilled in the art to practice the invention, the scope of which is indicated by the appended claims.

What I claim as my invention is:

1. An ignition distributor for an internal combustion engine in a motor vehicle including a member adjustable to advance or retard the spark, first means responsive to engine speed and load effective to advance said spark, and second means responsive jointly to vehicle acceleration and instantaneous grade inclination of the vehicle to superimpose a spark retarding effect on the action of said first means.

2. An ignition distributor for an internal combustion engine in a motor vehicle including a member adjustable to advance or retard the spark, first means responsive to engine speed and load effective to advance said spark, and second means responsive to vehicle acceleration to superimpose a spark retarding effect on the action of said first means.

3. An ignition distrbutor for an internal combustion engine in a motor vehicle including a member adjustable to advance or retard the spark, first means responsive to engine speed and load effective to advance said spark, and second means responsive to instantaneous grade inclination of the vehicle to superimpose a spark retarding effect on the action of said first means.

4. An ignition distrbutor for an internal combustion engine in a motor vehicle, said distributor having a movable member adjustable to selectively advance and retard the spark, a motor connected to said member, control means responsive to engine load and engine speed for controlling said motor to position said member, and additional means responsive to acceleration of the vehicle to modify the operation of said control means to retard the spark during acceleration.

5. An ignition distributor for an internal combustion engine in a motor vehicle, the engine having a carburetor including a venturi connected to the intake manifold of

the engine, said distributor having a member adjustable to advance or retard the spark, a vacuum actuated motor operatively connected to said member effective when connected to a source of increasing vacuum to advance the spark, a passage connecting the motor to a source of vacuum variable in accordance with engine performance, and an atmospheric bleed connection to said passage responsive jointly to vehicle acceleration and grade inclination to open said bleed connection during acceleration and/or position of the vehicle on a predetermined positive grade.

6. An ignition distributor for an internal combustion engine in a motor vehicle, the engine having a carburetor including a venturi connected to the intake manifold of the engine, said distributor having a member adjustable to advance or retard the spark, a vacuum actuated motor operatively connected to said member effective when connected to a source of increasing vacuum to advance the spark, a passage connecting the motor to a source of vacuum variable in accordance with engine performance, and an atmospheric bleed connection to said passage responsive to vehicle acceleration to open said bleed connection during acceleration.

7. An ignition distributor for an internal combustion engine in a motor vehicle, the engine having a carburetor including a venturi connected to the intake manifold of the engine, said distributor having a member adjustable to advance or retard the spark, a vacuum actuated motor operatively connected to said member effective when connected to a source of increasing vacuum to advance the spark, a passage connecting the motor to a source of vacuum variable in accordance with engine performance, and an atmospheric bleed connection to said passage responsive to grade inclination to open said bleed connection during position of the vehicle on a predetermined positive grade.

8. An ignition distributor for an internal combustion engine in a motor vehicle, the engine having a carburetor including a venturi connected to the intake manifold of the engine, said distributor having a member adjustable to advance or retard the spark, a vacuum actuated motor operatively connected to said member effective when connected to a source of increasing vacuum to advance the spark, a passage connecting the motor to a source of vacuum variable in accordance with engine manifold vacuum and venturi vacuum, and an atmospheric bleed connection to said passage responsive jointly to vehicle acceleration and grade inclination to open said bleed connection during acceleration and/or position of the vehicle on a predetermined positive grade.

9. An ignition distributor for an internal combustion engine in a motor vehicle, the engine having a carburetor including a venturi connected to the intake manifold of the engine, said distributor having a member adjustable to advance or retard the spark, a vacuum actuated motor operatively connected to said member effective when connected to a source of increasing vacuum to advance the spark, a passage connecting the motor to a source of vacuum variable in accordance with engine manifold vacuum and venturi vacuum, and an atmospheric bleed connection to said passage responsive to vehicle acceleration to open said bleed connection during acceleration.

10. An ignition distributor for an internal combustion engine in a motor vehicle, the engine having a carburetor including a venturi connected to the intake manifold of the engine, said distributor having a member adjustable to advance or retard the spark, a vacuum actuated motor operatively connected to said member effective when connected to a source of increasing vacuum to advance the spark, a passage connecting the motor to a source of vacuum variable in accordance with engine manifold vacuum and venturi vacuum, and an atmospheric bleed connected to said passage responsive to grade inclination to open said bleed connection during position of the vehicle on a predetermined positive grade.

11. In a vacuum spark advance system for the distributor of an internal combustion engine in a motor vehicle having a carburetor including a venturi connected to the engine intake manifold, a vacuum operated motor effective when connected to a source of increasing vacuum to adjust the distributor to advance the spark, a passage connecting said motor to a vacuum source variable in accordance with manifold and venturi vacuum, an atmospheric bleed connection to said passage, and means responsive to vehicle acceleration and grade inclination to open said bleed connection during acceleration and/or position of the vehicle on a predetermined positive grade.

12. In a vacuum spark advance system for the distributor of an internal combustion engine in a motor vehicle having a carburetor including a venturi connected to the engine intake manifold, a vacuum operated motor effective when connected to a source of increasing vacuum to adjust the distributor to advance the spark, a passage connecting said motor to a vacuum source variable in accordance with manifold and venturi vacuum, and an atmospheric bleed connection to said passage responsive to vehicle acceleration to open said bleed connection during acceleration.

13. In a vacuum spark advance system for the distributor of an internal combustion engine in a motor vehicle having a carburetor including a venturi connected to the engine intake manifold, a vacuum operated motor effective when connected to a source of increasing vacuum to adjust the distributor to advance the spark, a passage connecting said motor to a vacuum source variable in accordance with manifold and venturi vacuum, and an atmospheric bleed connection to said passage responsive to grid inclination to open said bleed connection during position of the vehicle on a predetermined positive grade.

14. In a pressure distributor in a motor vehicle engine including a vacuum motor connected to engine manifold and venturi responsive to air flow to the engine, a vehicle acceleration and altitude responsive atmospheric bleed connection to said motor, said connection comprising a valve including a valve port and a normally closed inertia valve member, resilient means urging the valve member toward closed position, said valve member being mounted for opening movement in the direction relative to said port in which inertia resulting from acceleration of the vehicle tends to move said valve member.

15. Structure as defined in claim 14 in which said valve comprises a chamber connected to the manifold and venturi connection, said port connecting said chamber to atmosphere, said valve member is in said chamber, and spring means urging said valve member toward port closing position.

16. Structure as defined in claim 15 in which said valve member is mounted for movement in valve opening direction toward the rear of the vehicle.

17. Structure as defined in claim 16, and guide means for said valve member disposed to cause gravitational forces to have valve opening components when the vehicle is inclined on a positive grade.

18. An ignition distributor for an internal combustion engine in a motor vehicle including a member adjustable to advance or retard the spark, and inertia actuated means responsive to vehicle acceleration and to effect movement of said member in a direction to retard the spark.

19. An ignition distributor for an internal combustion engine in a motor vehicle including a member adjustable to advance or retard the spark, and pendulum means responsive to instantaneous positive grade inclination of the vehicle to effect movement of said member in a direction to retard the spark.

References Cited in the file of this patent

UNITED STATES PATENTS

2,432,166	Mallory	Dec. 9, 1947
2,630,815	Worthing	Mar. 10, 1953