Oct. 26, 1943. R. HUFFORD 2,332,515

COMBINATION VACUUM GOVERNOR AND SPARK CONTROL

Filed July 10, 1941 2 Sheets-Sheet 1

FIG. 1

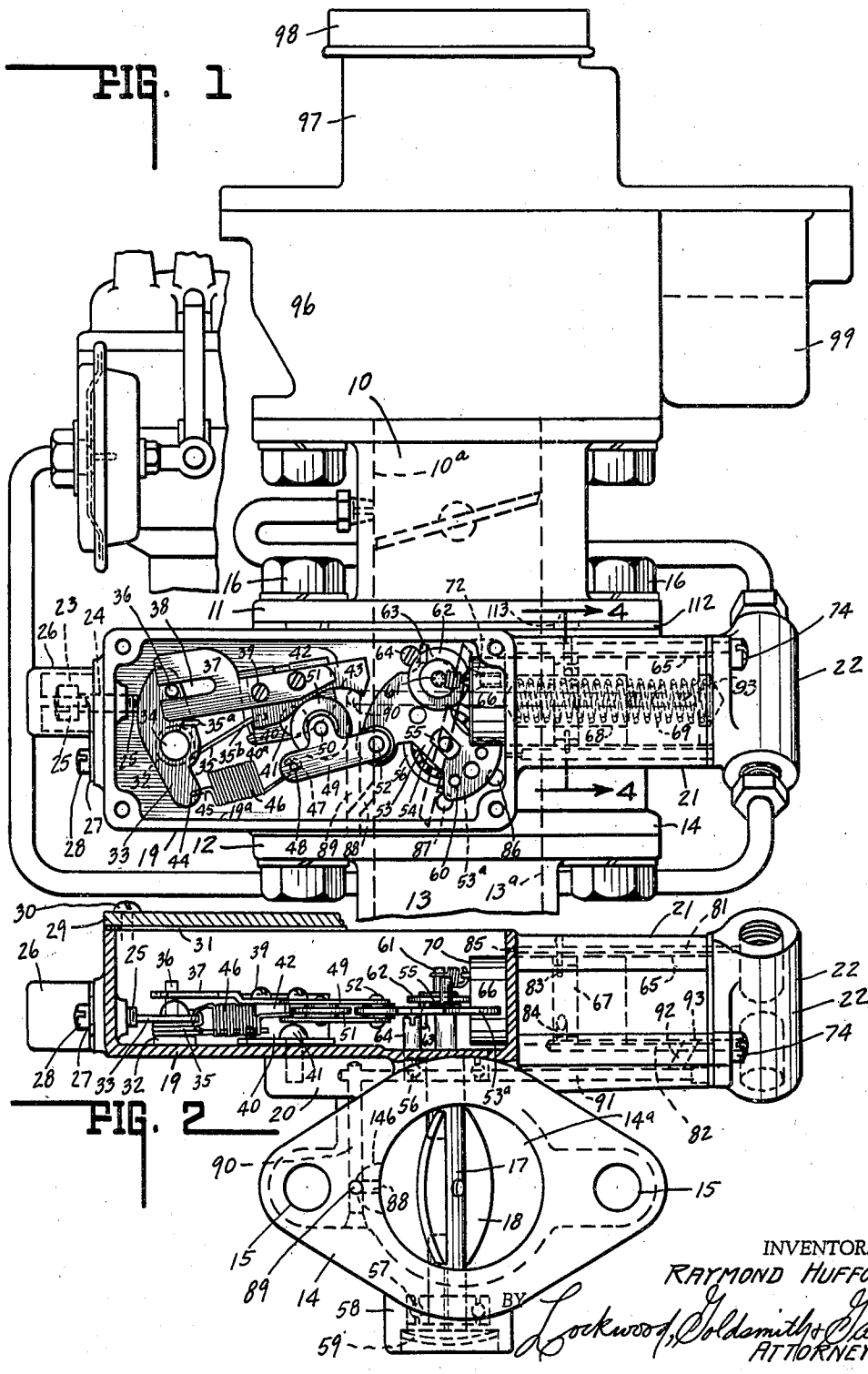


FIG. 2

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Filed July 10, 1941 2 Sheets-Sheet 2

FIG. 3

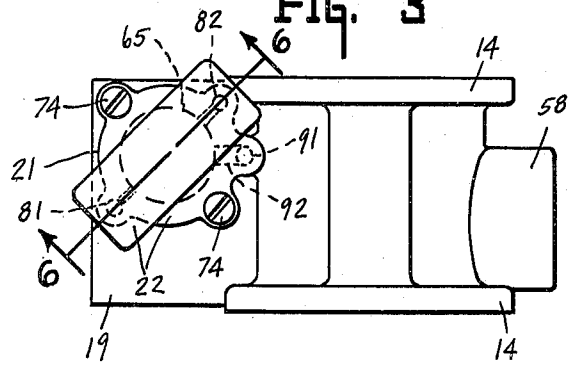


FIG. 4

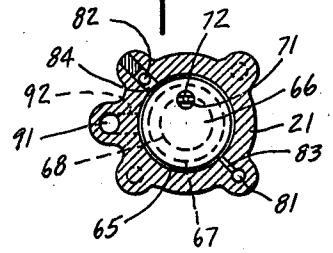


FIG. 6

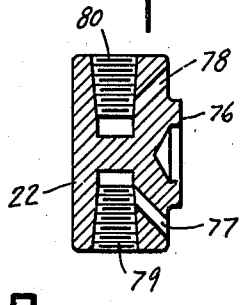


FIG. 5

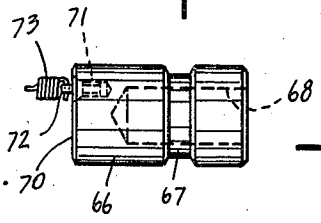


FIG. 7

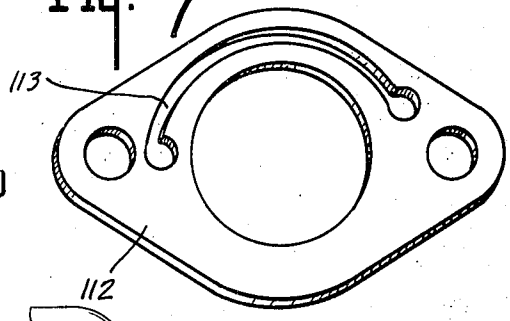
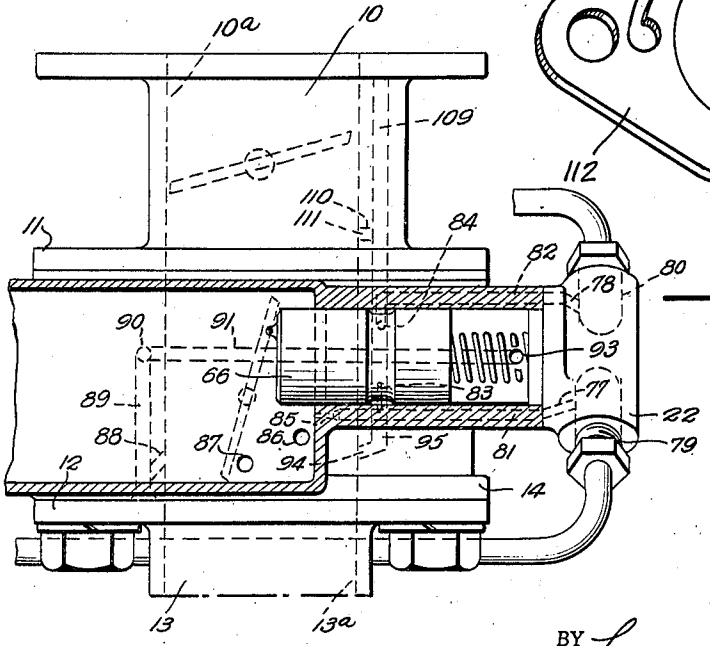


FIG. 8



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COMBINATION VACUUM GOVERNOR AND SPARK CONTROL

Raymond Hufford, Anderson, Ind.

Application July 10, 1941, Serial No. 401,856

13 Claims. (Cl. 123—1)

This invention relates to a combination governor and included control for a vacuum operable spark controlling device. This application is a continuation-in-part of the copending Serial No. 236,395, filed October 27, 1938, entitled "Suction governor," now Patent No. 2,287,036, dated June 23, 1942, and application Serial No. 237,415, filed October 28, 1938, entitled "Spark control," allowed October 23, 1940, now Patent No. 2,248,996, dated July 15, 1941.

In the last mentioned patent, Figs. 1 and 2, of the drawings show a spark control device carried by a governor device and the statement was made in said second patent that said governor device was like that shown in the first patent mentioned above.

In this spark control patent, the chief characteristic thereof was that there was a continuous application of pressure (and suction was considered a pressure) upon a control for a vacuum operable spark controlling device and that the effective pressure was varied automatically upon certain conditions occurring in the engine intake system, such conditions occurring as described in said patent.

The present invention is directed to a structure which utilizes the same inherent feature of basic operation, to-wit, the constant application of a pressure and then the application of another pressure at predetermined times when spark adjustment is necessary or desirable, the latter pressure application modifying the former to obtain proper spark control adjustment.

The present invention is characterized by the fact that the main piston in the governor structure is the sole piston or may be the sole piston utilized in the composite structure.

In the present invention, the governor valve is of the butterfly type and of the off-center or unbalanced type and to that extent is similar to the governor valve illustrated in the beforementioned suction governor, Patent No. 2,287,036.

The chief feature, therefore, of the present invention is a simplification of the governor per se and control device per se for the spark control, and whereby a single part, to-wit, a main power piston is so arranged that it is simultaneously associated with the governor, as hereinafter pointed out for governor operation and also is associated with certain connections to a control, for a spark control device so that the latter may function substantially as described and claimed basically in the beforementioned spark control Patent No. 2,248,996.

Other objects and features of the invention will be set forth more fully hereinafter.

The full nature of the invention will be understood from the accompanying drawings and the following description and claims.

In the drawings,

Fig. 1 is a side elevational view of the governor structure with spark control addition connections and a carburetor and a portion of an intake manifold.

Fig. 2 is a top plan view of the governor unit with the spark control, carburetor and engine manifold connections omitted, the throttle body control mechanism including chamber being shown in section.

Fig. 3 is an end view of the governor construction.

Fig. 4 is a transverse sectional view taken on line 4—4 of Fig. 1 and in the direction of the arrows.

Fig. 5 is an elevational view of the combination power and spark control piston.

Fig. 6 is a transverse sectional view taken on line 6—6 of Fig. 3.

Fig. 7 is a perspective view of the accommodation adapter gasket interposed between the carburetor and the governor structure.

Fig. 8 is a side view of a portion of the mechanism.

In Fig. 1 of the drawings, 10 indicates a portion of a carburetor to which is usually secured at its upper end, if the carburetor be of downdraft type, an air cleaner. It is provided with a flange 11 for connection to the complementary flange 12 of the intake manifold 13. The carburetor includes the usual throttle valve. Herein the governor structure, the subject of the present invention, includes a body portion 14 provided with an intake passage 14a that is of the same shape and area as the engine manifold opening or intake 13a and the carburetor intake or opening 10a.

The body portion 14 is provided with bolt openings 15 that receive the connecting bolts 16 that extend through the several flanges and the body portion 14 through the apertures 15 and securely clamp the governor, carburetor and engine manifold together with the intakes of each in registering relation. The usual gasket structures are interposed between these anchoring flanges.

Within the governor intake 14a and extending across the same, somewhat offcenter, is the shaft 17, to which is secured the unbalanced or offset governor butterfly valve 18. This is sub-

stantially elliptical in shape. The intake wall is relieved at 146 for tool clearance.

In applying the governor construction to the engine intake system, the usual procedure is to first remove the air cleaner, throttle rod, carburetor and manifold studs. The vacuum line from the carburetor to the vacuum spark control, if utilized, then is disconnected. The governor structure then is interposed between the carburetor flange and the engine manifold flange in such a manner that the governor valve closes in a direction opposite from that which the carburetor valve closes. Then the several parts are connected together, the air cleaner is reconnected to the carburetor and the throttle rod is reconnected, using an extension, if necessary. The matter of adjustment for different speeds will be described hereinafter. The matter of utilizing the invention in combination with a vacuum spark control if the distributor is provided therewith, also will be described hereinafter as well as the parts are required in the event, such a vacuum spark control for the distributor is not provided.

There is formed integral with the portion 14 a housing structure 19 connected to the former by the web arrangement 20. This housing structure includes a longitudinal extension 21 and the same is provided with a detachable cap 22 or head.

Extending oppositely from the portion 21 on the housing 19 is a slotted boss 23 internally threaded as at 24 to receive an adjusting screw 25. This structure is enclosed by a cap 26 having a tail portion 27 secured to the housing 19 by the screw 28, and this may be provided with the conventional seal wire and lead seal to indicate any unauthorized tampering with the adjustment. The aforesaid member 25 is the primary adjusting structure and is the one that is used to set the governor for the desired speed under which the engine is to be governed. When the member 25 is retracted into the boss portion 23, the governed speed determined by such adjustment is less. When it is advanced to the right, the governed speed is greater. The parts cooperating with the aforesaid adjustment member will be set forth more fully hereinafter.

The housing 19 is provided with a cover plate 29 suitably secured thereto as at 30 and having the usual sealing gasket 31 interposed therebetween. Within this chamber formed by the housing there is provided near the adjusting end of the same the post structure 32, and upon the same is pivotally mounted a tiltable member 33 by means of the member 34. A coil spring 35 has one end 35a hooked about the member 33 and the other end is relatively stationarily anchored as at 35b. The purpose of this spring 35 is to normally constrain the member 33 into contact with the adjusting member 25.

The adjusting member 33 includes a pin 36 and a member 37 is provided with a slot 38 in which the pin rides. This member 37 is secured as at 39 to a member 40 pivoted at 41. This member 40 also supports the member 42, the same being secured thereto by the screws 39, before mentioned. This member 42 has the sinusoidal-like surface 43. Whenever desired, particularly for a design running into several thousands, the elements 37, 40 and 42 may all be made of one piece instead of the three pieces described. It will be noted the end 35b of the spring is associated with the hook or offset member 40a on the member 40. This spring, if desired, may bear against the side wall of the housing chamber, said wall being indicated by 19a.

The member 33 opposite the pin 36 is apertured as at 44 and one end 45 of a closely coiled spring 46 is anchored therein. The opposite end of the spring 46 as at 47 is secured about a pin 48 extending between two parallel T-shaped plates 49. These plates also mount a parallel pivot 50 upon which is mounted a roller 51. This roller is constrained by the spring into contact with the sinusoidal surface 43.

Another pin 52 joins the other ends of the two T-shaped members 49 and constitutes a pivotal connection to a T-shaped member 53. This T-shaped member 53 is provided with an elongated slot 54 therein and the flattened portion of the shaft 17 and indicated by 55 seats in this opening 54 and hence, the member 53 constitutes a valve lever. If desired, each end of the shaft may be mounted in an anti-friction structure as indicated at 56 and 57, the latter being mounted in the projecting boss 58 and closed by a plug 59.

The depending tail portion 53a of the valve lever 53 is apertured as at 60 and the same is adapted to receive weight material for counterbalancing purposes, if required. The third arm of this T-shaped valve lever 53 is provided with a pin 61 and the same rotatably supports a roller 62. Adjacent thereto, the T-shaped lever has a portion turned angularly as at 63 and the same is adapted to engage a stop or post 64 for limiting the travel of the valve member under the influence of the spring means, only one of which has been described at present.

When the valve member is constrained by fuel mixture flow (velocity) to close, this closing force is partially offset by another spring means, to which reference will be had hereinafter, and by the extension of the spring 46. The force and effect of the latter is normally a straight line function but upon extension the force is modified so that it corresponds in a certain sense to the vacuum curve by reason of the sinusoidal character of the surface 43.

The housing extension 21 is provided with a bore 65 extending entirely therethrough and in this bore is mounted a piston 66. This piston 66 has adjacent one end and slightly offset from the middle, an annular groove 67 therein. It also is, at the aforesaid end, axially reduced or provided with a bore 68 and therein is seated a spring 69. This spring 69 normally constrains the face 70 or head of the piston into engagement with the roller 62 and this spring through the piston normally constrains the governor valve to open position, and hence, assists spring 46 to constrain the governor valve to open position. It might be here set forth the spring 46 alone is insufficient in force to secure proper operation of the governor valve.

In addition to the foregoing spring 69 being effective on the piston, the piston is subject to suction or pressure as will be pointed out more fully hereinafter. Naturally, when the offset portion 63 of the valve lever 53 engages the stop 64, further movement of the piston 66 toward the governor valve will be prevented. Whenever desired, the piston 66 is apertured on its face 70 as at 71 and there is inserted in this aperture a spring retainer 72. An extremely light spring 73 is connected to this member 72 at one end and is connected at its opposite end to the extended end of pin 61 by having the end curled about a grooved portion of said extended portion beyond the roller mounting portion thereof. Hence, the

piston and the valve lever are yieldingly connected together. This structure prevents piston sticking and noise.

The end of the cylinder 65 is closed by the cap or head 22. This cap or head 22 is suitably secured to the portion 21 by the screws 74. This cap 22 includes a boss portion 76 that is of the same diameter as the bore 65 so that it seats in the same and the end of the spring 69 opposite the piston seated end normally bears thereagainst. A gasket preferably is interposed between the cap or head 22 and the portion 21. This cap or head 22 includes two independent ports 77 and 78, each of which terminates at their inner ends in the tapped openings 79 and 80, respectively, one of which is adapted to be connected to the vacuum connection of the carburetor which is normally connected to the vacuum control of the spark control or distributor device. The other tapped opening is adapted for connection to the vacuum operable spark control and the purpose of the ports 77 and 78 will be set forth more fully hereinafter.

Suffice to state, when vacuum spark control is not utilized, then each of the openings 79 and 80 are provided with plugs and, therefore, the ports 77 and 78 have no effective function. However, since the majority of the motor vehicles are provided with vacuum operable spark controls and since the invention disclosed and broadly claimed in Patent No. 2,248,996 beforementioned, is available without materially increasing cost, the connections are made between the vacuum outlet of the carburetor before mentioned, and the vacuum operable device and the two tapped openings 79 and 80, respectively. Then the engine is not only subject to governing but the distributor also is subject to spark control in accordance with engine operation while subject to governor operation and the single power piston 66 is the control element for both operations, as will be hereinafter more fully pointed out.

In order to properly understand the operation of the device, either as a governor or a spark control or as a combination of both, reference now will be had to the various ports and passages included in the single casting including the portions 14, 19 and 21, and no other arrangements are necessary or required other than those previously described.

In the portion 21 there is provided a channel or passage 82 which registers with the passage 78 in the cap, the gasket being apertured to permit such communication. Likewise, there is provided the bore or passage 81 which registers with the port 77 in the cap 22 through an aperture in the gasket. The passages 81 and 82 communicate by the smaller port 83 and the larger port 84 with the respective bores 81 and 82, as shown in Figs. 1 and 2. The passage 81 communicates through a minute port 85 with the chamber 19. It also communicates with the cylinder 65 through the port 83. Hence, when the piston blocks the opening 83 it also blocks the opening 84 but does not block, naturally, the opening 85. Hence, the opening 85 is the vacuum line to the distributor. This vacuum line is on the engine side of the governor valve at all times, since—see Fig. 1—the port 86 communicates with the intake downstream of the governor valve. Hence, vacuum always is applied on the minute port 85 and hence, to the spark control pressure responsive element. Two ports 86 are illustrated. This is to insure sufficient exhaustion of air from the mechanism chamber so the pressure therein and on piston 66 is substantially that present in the intake manifold.

When the piston 66 is moved so that the wide groove 67 thereof registers with the ports 83 and 84, said ports communicate with each other and hence, since the passage 82 which communicates with passage 84 is connected through the port 78 in the cap 22 to the tapped wall 80 and from thence to the carburetor above the carburetor valve or upstream thereof, atmospheric or sub-atmospheric pressure is applied directly to the port 84 and, as stated, when groove 67 of piston 66 is in proper position, this sub-atmospheric pressure is applied through the port 83 to the passage 81 and thence to the spark control through the tapped wall 79. Hence, the communication between passages 81 and 82 is separated by the governor opposed force piston until the piston registers groove 67 as aforesaid. When this occurs, the governor valve is substantially in wide open position.

This condition may arise, first, when the governor valve is wide open due to heavy power demand at which time there would be very little vacuum to advance the spark, or second, when the carburetor throttle valve, not shown, is closed and the governor valve returns to the open position. When either of these conditions occur the atmospheric pressure or sub-atmospheric pressure is sufficiently great to overcome the effect of vacuum continuously applied through the port 85 so that the spark control then may be said to be responsive to atmospheric pressure, and hence, the spark is adjusted automatically in accordance with engine operation for better engine performance.

It also is noted that the governor intake downstream of the governor valve, and it may be said to be immediately below the valve, is provided with a port or passage 87 that is subject to intake manifold or downstream pressure, and hence, the same is imposed in the chamber formed by the housing 19 and its cover 29.

Slightly upstream of the governor valve when closed and adjacent the side of said valve, there is a port 88 and this port has an upwardly extending branch 89. The passage 89 communicates by a cross passage 90 with another passage 91. This passage 91 communicates with a lateral passage 92 which opens into the end of the cylinder 65 at 93. In this cylinder is mounted the power piston 66 and said port 93 is not blocked by the cylinder closing end or boss 76 in the cap. Hence, the spring engaged end of the power piston 66 always is subject to whatever pressure is imposed on the port 88 which is slightly upstream of the governor valve when the latter is closed. Accordingly, if the governor valve is closing, due to velocity, there may be some suction applied to the spring end of the piston serving to counteract the spring and piston forces tending to oppose the closing movement of the valve. If, however, the governor valve be closed and the carburetor or throttle valve be opened, then the port 88 supplies sub-atmospheric pressure to the end of the piston 66 which is spring pressed, and accordingly, this pressure then is cumulative with the spring 69 tending to oppose the closing of the valve.

Also since at this time the governor valve is closed, the housing 19 is subject to suction—that is, the intake manifold pressure and this is effective upon the roller contacting face of the power piston, so that this suction on one face and sub-atmospheric pressure on the other face is cumu-

lative and also is cumulative with the spring, the force of which upon extension, incident to governor valve closing, is modified by the sinusoidal surface and the force of the piston constraining spring 69.

The operation of the governor valve in this form of the invention disregarding the spark control function, is substantially the same as that described and claimed in the copending Patent No. 2,287,036, entitled, "Suction governor."

The portion 10 of the carburetor supports portion 96 thereof, same supporting portion 97 to which an air cleaner may be secured at 98, if desired. Portion 96 is somewhat diagrammatically illustrated as including the carburetor bowl portion 99.

The gasket 112 between governor and carburetor is provided with an arcuate slot 113 concentric with the intake opening 10a. Hence, for different styles of carburetors of the same intake passage size, the same governor may be used and the slot 13 is an accommodation feature only.

While the invention has been illustrated and described in great detail in the drawings and foregoing description, the same is to be considered as illustrative and not restrictive in character.

The several modifications described herein as well as others which will readily suggest themselves to persons skilled in this art, all are considered to be within the broad scope of the invention, reference being had to the appended claims.

The invention claimed is:

1. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system.

2. The combination with an engine governor having a valve in the intake thereof, a spark control operable by pressure variation, and an engine intake including a throttle valve, the throttle valve being upstream of the governor valve, of a differential pressure operable device having free communication with the engine intake system upstream of the throttle valve and downstream of the governor valve and connected to the spark control for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, said governor including a differential pressure operable governor valve control element constituting an inherent control element of the differential pressure operable device.

3. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type.

4. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type and the governor including spring means normally opposing closing of the governor valve and insufficient for prevention thereof, and a pressure responsive piston normally opposing closing of said governor valve and cumulative in effect with said spring means for governor valve control.

5. The combination with an engine governor having a valve in the intake thereof, a spark control operable by pressure variation, an engine intake including a throttle valve, the throttle valve being upstream of the governor valve, of a differential pressure operable device having free communication with the engine intake system upstream of the throttle valve and downstream of the governor valve and connected to the spark control for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type and the governor including spring means normally opposing closing of the governor valve and insufficient for prevention thereof, and a pressure responsive piston normally opposing closing of said governor valve and cumulative in effect with said spring means for governor valve control, the governor piston constituting the differential pressure operable element of the differential pressure operable device.

6. The combination with an engine governor having a valve in the intake thereof, a spark control operable by pressure variation, an engine intake including a throttle valve, the throttle valve being upstream of the governor valve, of a differential pressure operable device having free communication with the engine intake system upstream of the throttle valve and downstream of the governor valve and connected to the spark control for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type and the governor including spring means normally opposing closing of the governor valve and insufficient for prevention thereof, a pressure responsive piston normally opposing closing of said governor valve and cumulative in effect with said spring means for governor valve control the governor piston constituting the differential pressure operable element of the differential pressure operable device, and a valve means for controlling the intermittent pressure application.

7. A combination engine governor and spark device control including a conduit connected at one end to said device having its opposite end constantly subject to intake suction, a governor valve of unbalanced type in the engine intake system, a shaft for said valve, a differential pressure operable piston, yielding means normally constraining the valve to open position, said piston having operative association with the valve to constrain the valve to open position, the valve being velocity closable, conduit means

interrupted and controlled by said piston and connected to the first mentioned conduit at one end and at its opposite end to a source of pressure materially in excess of intake suction, piston movement effecting communication between the adjacent ends of the interrupted conduit means to impose the excess pressure.

8. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the greater pressure being taken upstream of the throttle valve.

9. The combination with an engine governor having a valve in the intake thereof, a spark control operable by pressure variation, and an engine intake including a throttle valve, the throttle valve being upstream of the governor valve, of a differential pressure operable device having free communication with the engine intakt system upstream of the throttle valve and downstream of the governor valve and connected to the spark control for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, said governor including a differential pressure operable governor valve control element constituting an inherent control element of the differential pressure operable device, the greater pressure being taken upstream of the throttle valve.

10. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type, the greater pressure being taken upstream of the throttle valve.

11. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type and the governor including spring means normally opposing closing of the governor valve and insufficient for prevention thereof, and a pressure responsive piston normally opposing closing of said governor valve and cumulative in effect with said spring means for governor valve control, the greater pressure being taken upstream of the throttle valve.

12. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type and the governor including spring means normally opposing closing of the governor valve and insufficient for prevention thereof, and a pressure responsive piston normally opposing closing of said governor valve and cumulative in effect with said spring means for governor valve control, the governor piston constituting the differential pressure operable element of the differential pressure operable device, the greater pressure being taken upstream of the throttle valve.

13. An engine control including a differential pressure operable device having free communication with an engine intake system upstream of a throttle valve therein and downstream of a governor valve therein and connected to a spark control of such engine for continuous restricted application of downstream pressure thereon and intermittent and greater pressure application thereon in accordance with pressure variation in the intake system, the governor valve being of unbalanced butterfly type and the governor including spring means normally opposing closing of the governor valve and insufficient for prevention thereof, a pressure responsive piston normally opposing closing of said governor valve and cumulative in effect with said spring means for governor valve control, the governor piston constituting the differential pressure operable element of the differential pressure operable device, and a valve means for controlling the intermittent pressure application, the greater pressure being taken upstream of the throttle valve.

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