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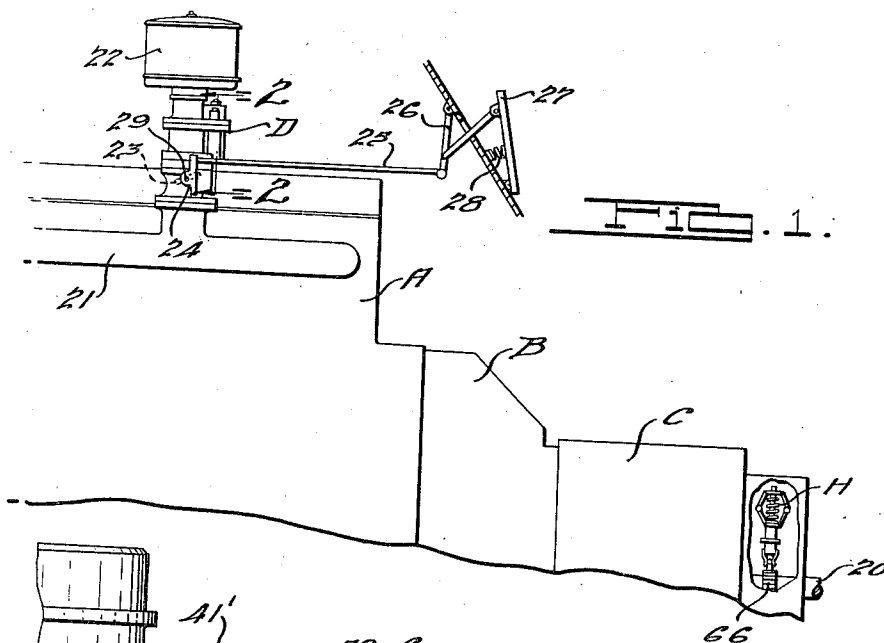
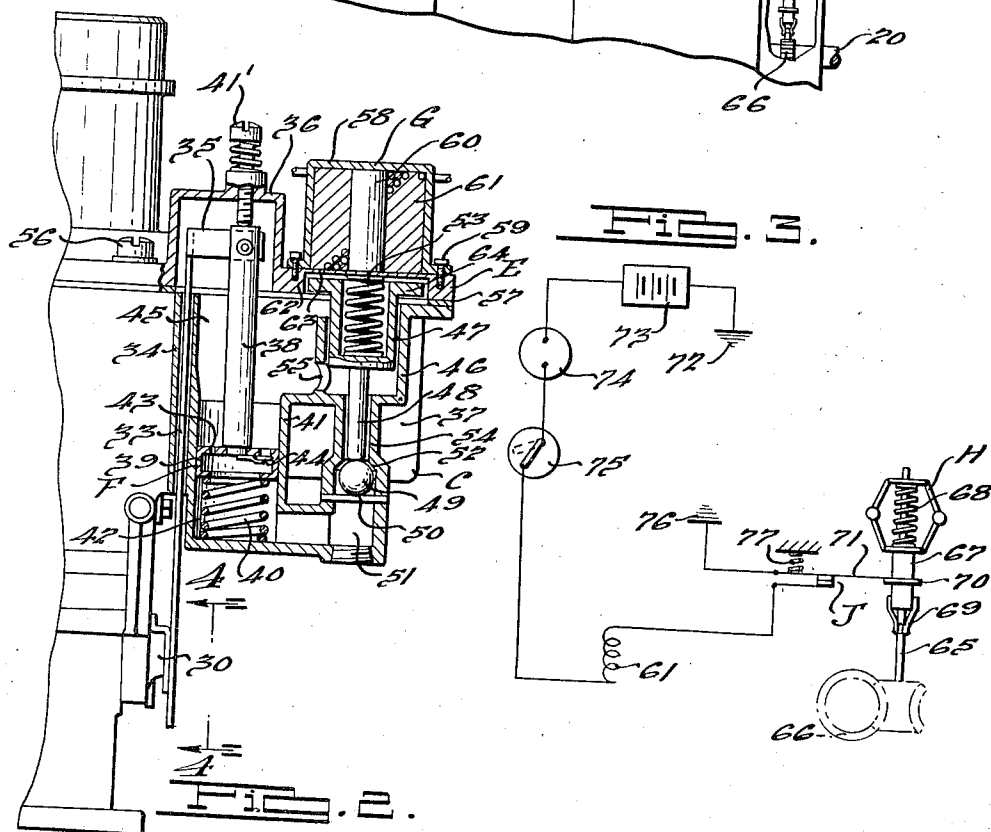
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2,334,857

CONTROL MECHANISM

Filed Dec. 5, 1940

2 Sheets-Sheet 1



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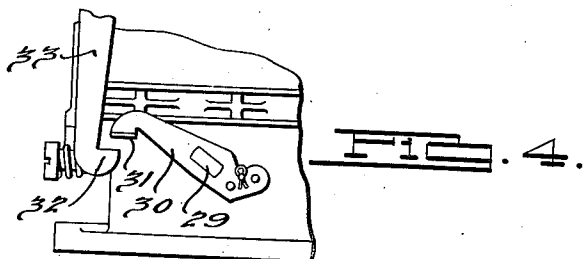
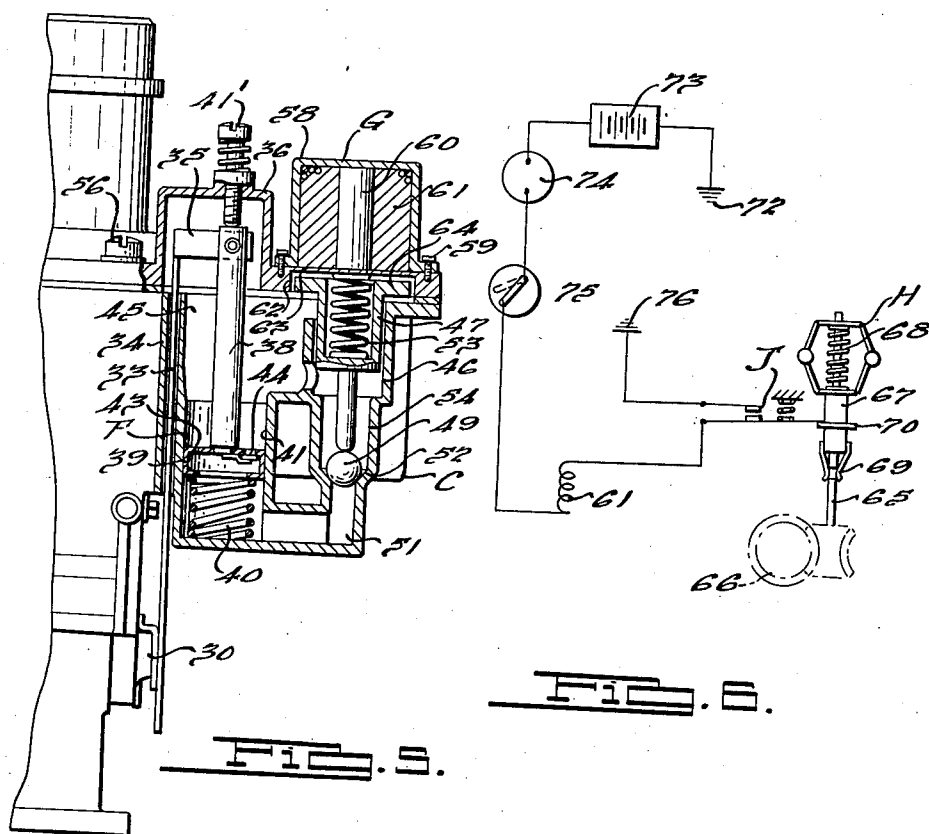
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CONTROL MECHANISM

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2 Sheets-Sheet 2



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2,334,857

CONTROL MECHANISM

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Application December 5, 1940, Serial No. 368,575

13 Claims. (Cl. 123—97)

This invention relates to throttle control devices especially in conjunction with motor vehicles.

It is well known at this time that an internal combustion engine has a tendency to stall when, at relatively low vehicle driving speeds, the driver suddenly releases the usual accelerator pedal to allow the throttle valve to suddenly close. This characteristic is known to be especially pronounced in motor vehicles equipped with a fluid coupling through which the drive is taken.

Heretofore it has been customary to provide a dashpot for retarding the last part of throttle closing so that when the accelerator pedal is suddenly released, the throttle has its final closing movement retarded so that the fuel supply system and other factors which are disturbed and which give rise to engine stalling have an opportunity to become balanced or adjusted to the coast conditions whereupon the throttle valve is allowed to fully close.

The foregoing throttle retarding devices have the disadvantage that they operate at relatively high vehicle speeds thereby preventing full use of the engine as a brake because when the accelerator pedal is released, the throttle valve does not fully close until after an appreciable time during which the dashpot acts. Furthermore, where the vehicle is equipped with a change speed mechanism functioning as a characteristic of allowing the engine to coast down in its speed, the foregoing dashpot devices have the disadvantage of increasing the time required to effect change in the speed ratio as the dashpot delays the engine retardation.

In my copending application Serial No. 360,476, filed October 9, 1940, now Patent No. 2,314,570 issued March 23, 1943, I have provided a control for the dashpot so arranged as to overcome the foregoing difficulties by incorporating means for rendering the dashpot ineffective for throttle closing retardation at times when the engine does not tend to stall as an incident to sudden release of the accelerator pedal.

My present application is directed to improved means for controlling the retarding device and may, if desired, be employed in the transmission system disclosed in my aforesaid application.

One object of my invention is to provide a simplified control for throttle closing dashpot devices.

Another object is to provide a dashpot control comprising an electromagnetic device especially arranged for mounting in association with the dashpot-fluid container but free from danger of

leakage of the fluid in proximity to the electromagnet.

Another object is to provide an improved electromagnet for use with a throttle closing dashpot or for general applications to a variety of devices wherein the magnet is separated from the armature by wall which allows the magnetic flux to pass therethrough.

An additional object is to provide an improved electromagnet of the aforesaid character wherein the electromagnet and armature are separated by a relatively thin wall of non-ferrous material which allows the desired magnetic action to take place while effectively sealing the regions on each side of the wall from each other.

A still further object is to provide an improved dashpot control especially adapted for use with throttle systems.

Further objects and advantages of my invention will be more apparent from the following illustrative embodiment thereof, reference being had to the accompanying drawings in which:

Fig. 1 is a side elevational view somewhat diagrammatically illustrating my throttle control applied to a vehicle driver system, parts being broken away to show the governor.

Fig. 2 is an elevational view taken as indicated by line 2—2 in Fig. 1, the dashpot mechanism being shown in cross-section.

Fig. 3 is a wiring diagram illustrating the electrical control for the dashpot.

Fig. 4 is a fragmentary side elevational view taken as indicated by line 4—4 in Fig. 2.

Fig. 5 is a view generally similar to Fig. 2 but illustrating a modified form of my invention.

Fig. 6 is a wiring diagram for the Fig. 5 modified arrangement.

My invention may be used advantageously in connection with any vehicle power transmission system. In my aforesaid copending application I have illustrated one drive system which is equally well adapted for use with my present improvements. However, in order to illustrate the principles of my present invention I have shown the same in connection with a simplified background of vehicle drive, it being understood that this drive mechanism may take a variety of forms especially in drive systems where, at times, it is desired to allow the engine to rapidly slow down upon release of the accelerator pedal without retarding throttle closing by a dashpot control which, at other times, is desired to prevent tendency of the engine to stall.

The customary internal combustion engine A is arranged as is now well known to drive through

suitable clutch mechanism in housing B, thence through any desired type of transmission change speed mechanism C to the output shaft 20 for driving the usual vehicle rear drive wheels according to standard practice. The clutch mechanism at B may comprise a fluid coupling or friction type clutch or both.

The engine intake manifold 21 is fitted with an air cleaner 22 and carburetor D, the usual throttle valve 23 being operated by lever 24 and link 25 connected by linkage 26 to accelerator pedal 27 yieldingly urged by compression spring 28 to a position of closing the throttle 23. In Fig. 1 the accelerator pedal is shown in a position of part open throttle.

On the side of the intake system opposite to that seen in Fig. 1, the throttle shaft 29 (Fig. 4) is fitted with a lever 30 having a terminal shoulder 31 which, prior to closing movement of throttle 23 engages the shoulder 32 of a lever 33 which slides vertically in guide 34. This lever has its upper end offset at 35 extending into the dome 36 of cover E for the float bowl 37 of carburetor C.

The offset 35 is connected to the upper end of a piston rod 38 which extends down for connection with a piston 39, a spring 40 yieldingly urging the piston and lever 33 upwardly to the positions illustrated. An adjustable stop 41' limits the upward piston movement and variably determines the extend of the dashpot action on throttle closing.

Piston 39 operates in an open top cylinder 41 which therefore is filled with gasoline from the bowl 37. When the piston moves downward, assuming the chamber 42 below the piston to be closed against fluid escape, the fluid must escape through the metering restricted opening 43 thereby retarding the downward movement. The return or upward stroke of the piston, by spring 40, is unrestricted by reason of a check valve 44 which at such time is free to open for passage of the fluid from the storage chamber at 45 to chamber 42. Therefore when the accelerator pedal is released, under certain conditions presently apparent, the lever 30 engages lever 33 just before throttle 23 closes and the last part of the throttle closing movement is retarded by the aforesaid dashpot generally designated at F, the spring 28 gradually overcoming the dashpot action to fully close the throttle and compressing spring 40 which, of course, is of less force than spring 28.

The carburetor bowl 37 is formed with a cylinder or guideway 46 which slidably receives a plunger 47 having a stem 48 engageable with a dashpot-control ball or valve 49 which, in Fig. 2, seats on a pin 50 disposed across passage 51 which is open to chamber 42. When the dashpot is operating, the fluid displaced by piston 39 enters passage 51 and causes ball 49 to seat at 52 thereby preventing escape of the fluid from this passage and requiring the fluid to flow through restriction 43. At other times a spring 53 acts on plunger 47 to hold ball 49 unseated as in Fig. 2 and at such times the dashpot F is inoperative as a retarding device because piston 39 is then free to move downwardly as the liquid freely flows through passage 51, around ball 49 and in the space between stem 48 and by-pass cylinder 54 and thence to cylinder 46 and out at vent 55 to the reservoir 45.

The bowl cover E, and the carburetor housing 37 if desired, is preferably of a non-ferrous metal such as zinc alloy now widely employed for cast-

ing such parts. The cover E is secured by fasteners 56 to the top of bowl 37, a sealing gasket 57 preventing gasoline leakage out of the bowl.

Mounted on the top of cover E is an electromagnet G comprising a ferrous cover 58 secured to cover E by fasteners 59, and a ferrous core 60 around which is wound the conductor coil 61 of the electromagnet. Cover E is formed with a cavity 62 in its under face thereby forming a cover wall 63 of relatively thin cross-section below the electromagnet. Plunger 47 has its upper end outwardly flanged at 64 for movement in cavity 62 and is of ferrous material so as to be attracted upwardly to the underface of wall 63 thus acting as an armature when the electromagnet is energized at coil 61. The aforesaid spring 53 seats at its upper end on the wall 63.

The wall 63 separates the electromagnet from the armature 64 without interfering with the desired magnetic action therebetween. With my arrangement the cover E may be formed as a single piece without openings therethrough and therefore the gasoline cannot leak through the cover as would be the tendency if the armature operated through the cover. I have also dispensed with any requirement for sealing the electromagnet from the armature in the liquid chamber.

When the electromagnet is energized, armature 64 moves upwardly to wall 63 thereby allowing ball 49 to seat at 52 when piston 39 starts its downward movement. Under such conditions the last part of the throttle closing movement is retarded by the action of dashpot F. When the solenoid is de-energized, as in Fig. 2, then spring 53 acts through plunger 47 to hold ball 49 unseated and against pin 50. Under such conditions the throttle is allowed to freely close without retardation by dashpot F.

The energization of the electromagnet G may be controlled by any suitable means according to conditions dealt with. By preference the electromagnet is controlled in response to speed of the engine or the car travel, the latter arrangement being illustrated in my drawings. At some convenient point in the drive there is provided a governor H whose drive shaft 65 is driven from a gear 66 carried by the transmission output shaft 20 so that the governor is driven at a speed proportional to that of the car. The governor, at a predetermined speed, operates to move sleeve 67 outwardly against the action of the restoring spring 68. If desired, a detent 69 may be provided to control the sleeve which is provided with a flange 70 engaging one end of a moving switch piece 71 for controlling the governor switch J.

The electrical circuit comprises ground 72 and battery 73 thence through ammeter 74 and ignition switch 75 to coil 61, switch J and ground 76. At car standstill the switch J is closed thereby energizing electromagnet G so as to render dashpot F operative to retard the last part of throttle closing. As the car is accelerated from standstill, the governor H operates at a predetermined car speed to open switch J thereby de-energizing electromagnet G and rendering dashpot F inoperative to retard throttle closing. While the governor may be arranged to operate at any desired speed, I have obtained good operating functions by arranging the parts so that the governor switch J will open at around 20 miles per hour car speed. As the car is brought to a stop, the governor H operates to accommodate closing of switch J thereby restoring the dashpot F to oper-

ation. A spring 77 yieldingly acts on the swinging switch piece 71 to close switch J.

Referring to Figs. 5 and 6, I have provided a slightly modified arrangement such that when the electromagnet G is energized the dashpot F is rendered inoperative instead of operative as in Fig. 2.

In Fig. 5 the ball 49 is now disposed above the seat 52 and is held on this seat by the spring 53 when the electromagnet G is de-energized thereby preventing passage of the fluid from chamber 42 to the outlet 55 and rendering the dashpot F operative. When the electromagnet is energized the plunger 47 is raised as before and ball 49 is free to allow the fluid to flow from chamber 42 through cylinder 54 to outlet 55 thereby rendering the dashpot inoperative. In Fig. 6 the governor switch J is now open at the low car speeds and closes to energize the coil 61 at the relatively higher speeds of the car. The Fig. 5 arrangement operates otherwise just as described in connection with the Fig. 2 system.

The wall 63 is preferably formed relatively thin so that the gap between the electromagnet and armature may be kept to a small dimension approximately comparable to an air gap. By such arrangement I avoid the necessity of an objectionably large electromagnet G or an electromagnet requiring more than about the amount of current necessary if the wall 63 were replaced by an air gap.

The non-ferrous wall 63 acts the same as though it was a very small air gap. Furthermore the wall 63 takes the place of a customary intermediary between the armature and iron of the electromagnet commonly used to prevent magnetic adherence of the armature to the electromagnet when the latter is de-energized.

The thin wall section 63, being localized at the armature, will not objectionably lessen the desired strength of the cover E as a whole as might well be the case in the event that the whole cover E was formed with a cross-section equal to that at wall 63.

I claim:

1. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, said casing having an opening at its top, a cover closing said opening, a dashpot element movably disposed between said reservoir and chamber, a by-pass having a seat, said by-pass extending between said reservoir and chamber, a dashpot-controlling ball in said by-pass adapted for movement from a first position accommodating fluid flow through the by-pass to a second position engaging said seat thereby preventing passage of fluid through the by-pass, a plunger disposed entirely within said casing structure and below said cover, said plunger being adapted for operation to control movement of said ball, an electromagnet disposed entirely outside of said casing structure and seated on said cover, said electromagnet being adapted to control operation of said plunger, and an armature connected to said plunger, said armature being disposed below said cover in magnetic association with said electromagnet through said cover.

2. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element movably disposed between said reservoir and chamber, a by-pass having a seat, said by-pass extending between said

reservoir and chamber, a dashpot-controlling ball in said by-pass adapted for movement from a first position accommodating fluid flow through the by-pass to a second position engaging said seat thereby preventing passage of fluid through the by-pass, a plunger operable from a first position of preventing engagement of said ball with said seat to a second position accommodating movement of said ball to its said second position, a spring biasing said plunger to its said first position, and an electromagnet for moving said plunger to its said second position.

3. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element movably disposed between said reservoir and chamber, a by-pass having a seat, said by-pass extending between said reservoir and chamber, a dashpot-controlling ball in said by-pass adapted for movement from a first position accommodating fluid flow through the by-pass to a second position engaging said seat thereby preventing passage of fluid through the by-pass, a plunger operable from a first position of holding said ball in its said second position to a second position accommodating movement of said ball to its said first position, a spring biasing said plunger to its said first position, and an electromagnet for moving said plunger to its said second position.

4. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element movably disposed between said reservoir and chamber, a by-pass having a seat, said by-pass extending between said reservoir and chamber, a dashpot-controlling ball in said by-pass adapted for movement from a first position accommodating fluid flow through the by-pass to a second position engaging said seat thereby preventing passage of fluid through the by-pass, a plunger structure having at one end thereof a stem portion engageable with said ball and having at the other end thereof an armature portion, a spring biasing said plunger so as to cause said stem portion to prevent movement of said ball to its said second position, and an electromagnet cooperable with said armature portion and adapted when energized to move said plunger structure so as to accommodate movement of said ball to its said second position.

5. In a dashpot device for controlling closing movement of an engine throttle, an open top casing structure having a fluid reservoir and a pressure chamber, a dashpot element movably disposed between said reservoir and chamber, a cover closing the top of said casing structure, a by-pass having a seat, said by-pass extending between said reservoir and chamber, a dashpot-controlling ball in said by-pass adapted for movement from a first position accommodating fluid flow through the by-pass to a second position engaging said seat thereby preventing passage of fluid through the by-pass, a plunger structure disposed within said casing structure and having at the lower end thereof a stem portion engageable with said ball and having at the upper end thereof an enlarged armature portion underlying said cover, a spring acting between said cover and said plunger structure for biasing said plunger structure so as to cause said stem portion to maintain said ball in its said second position, and an electromagnet cooperable with said armature portion and adapted when ener-

gized to move said plunger structure so as to accommodate movement of said ball to its said first position.

6. In a control device of the character described, a liquid reservoir, a dashpot operably associated with said reservoir, an electromagnet, an armature magnetically associated with said electromagnet, and a cover for said reservoir separating said armature from said electromagnet.

7. In a control device according to claim 6, said cover comprising a body of non-ferrous material having a magnetic flux transmitting portion engaged by the armature, said cover portion being of materially less cross-section than other portions of said cover adjacent said armature engaging portion.

8. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element operably disposed between said reservoir and said chamber, a cover for said reservoir, an electromagnet mounted on the outside of said cover, and means magnetically operable in response to energization of said electromagnet for controlling operation of said dashpot element, said magnetically operable means comprising an armature disposed within said cover and separated from said electromagnet by said cover.

9. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element operably disposed between said reservoir and said chamber, a cover for said reservoir having a portion of its underface recessed to provide a cover portion of thin cross-section relative to other portions of said cover adjacent said thin cover portion, an electromagnet mounted on the outside of said cover adjacent said thin cover portion, an armature for said electromagnet operably disposed within said recessed cover portion and separated from said electromagnet by said cover, and means operated under control of said armature for controlling operation of said dashpot element.

10. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element operably disposed between said reservoir and said chamber, a cover for said reservoir having a portion thereof of thin cross-section relative to other portions of said cover adjacent said thin cover portion, an electromagnet mounted on the outside of said cover adjacent said thin cover portion, an armature for said electromagnet operably disposed within said cover and separated from said electromagnet by

said cover, and means controlled by said armature for controlling operation of said dashpot element.

11. In a dashpot device for controlling closing movement of an engine throttle, a casing structure having a fluid reservoir and a pressure chamber, a dashpot element operably disposed between said reservoir and said chamber, a by-pass having a seat, said by-pass extending between said reservoir and chamber, a dashpot-controlling ball in said by-pass adapted for movement from a first position accommodating fluid flow through the by-pass to a second position engaging said seat thereby preventing passage of fluid through the by-pass, a cover for said reservoir, an electromagnet mounted on the outside of said cover, and an armature for said electromagnet adapted to control movement of said ball, said armature being disposed within said cover and separated from said electromagnet by said cover.

12. In a dashpot device for controlling closing movement of an engine throttle valve, a casing having a portion thereof containing a body of fluid, a dashpot element reciprocable in said casing portion and being so disposed as to divide said casing portion to form a fluid reservoir and a fluid pressure chamber, means providing an operative connection between said throttle valve and dashpot element, spring means biasing said throttle valve to its closed position and acting through said connection to bias said dashpot element for movement in one of its directions of reciprocation, a passage between said reservoir and chamber by-passing said dashpot element, a dashpot-controlling ball valve for said passage adapted for movement between positions effecting closing or opening of said passage, means restrictedly venting said chamber to said reservoir with metering fluid flow therebetween such that when said ball valve is positioned to effect closing of said passage then said dashpot element will be moved in its said one direction by said spring means with retarded action thereby retarding closing movement of said throttle valve, a plunger operable for controlling movement of said ball valve, and an electromagnet for controlling operation of said plunger.

13. In a dashpot device according to claim 12, governor controlled means for so controlling energization of said electromagnet that said dashpot element will be moved in its said one direction by said spring means with said retarded action only when said spring means acts to bias said throttle valve to its closed position under conditions otherwise tending to stall the engine.

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