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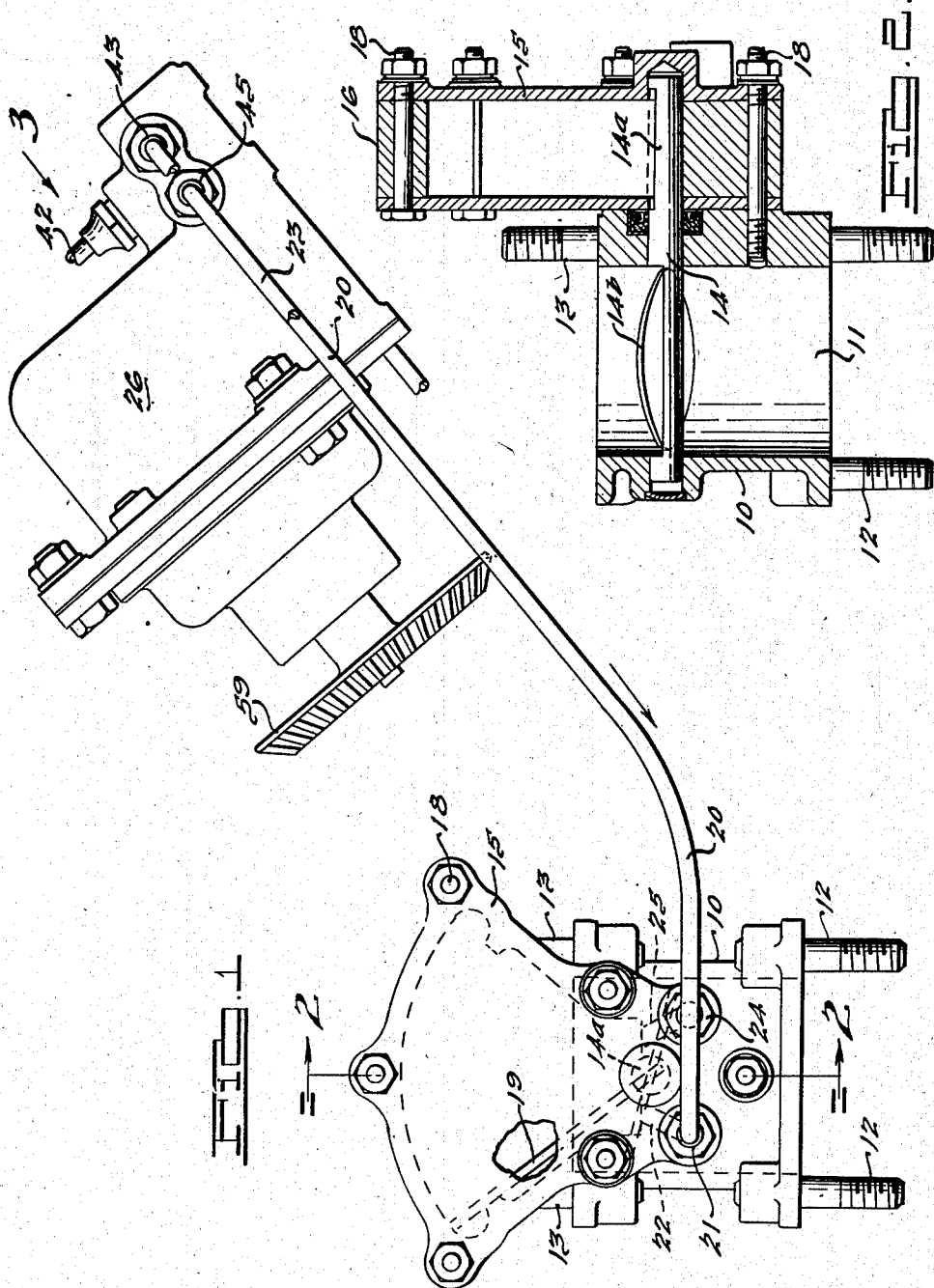
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SPEED CONTROL GOVERNOR

Filed Nov. 25, 1942

2 Sheets-Sheet 1



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SPEED CONTROL GOVERNOR

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11 Claims. (Cl. 123—103)

This invention relates to governors for controlling the speed of internal combustion engines, an object of the invention being to provide an improved governor of the centrifugal control type for maintaining a substantially constant speed of the engine within predetermined allowable limits in accordance with the setting of the governor.

A further object of the invention is to provide an improved governing mechanism having a hydraulic pressure actuated member, such as an oscillatable vane, for positively controlling the position of the engine throttle valve, and centrifugally operated means for actuating a valve device effective to vary the hydraulic pressure at opposite sides of the member or vane.

Another object of the invention is to provide an improved governing mechanism for an internal combustion engine in which the position of the throttle valve of the engine is governed within set limits by hydraulic pressure and in which the direction of the pressure to shift the throttle valve in one direction or the other is controlled by a centrifugally operated valve mechanism.

Still a further object of the invention is to provide an improved speed control governor for an internal combustion engine having a vane or the like attached to the throttle valve shaft and oscillatable within a closed chamber subject to hydraulic pressure at either side of the vane, and in which the pressure is directed selectively to opposite sides of the vane by a valve mechanism controlled by a centrifugally operated device.

Other objects of this invention will appear in the following description and appended claims, reference being had to the accompanying drawings forming a part of this specification wherein like reference characters designate corresponding parts in the several views.

Fig. 1 is a side elevation of a governing mechanism embodying the present invention.

Fig. 2 is a section taken substantially through lines 2—2 of Fig. 1 looking in the direction of the arrows.

Fig. 3 is an end view of the governor housing proper looking in the direction of the arrow 3 in Fig. 1.

Fig. 4 is a section taken substantially through lines 4—4 of Fig. 3 looking in the direction of the arrows.

Fig. 5 is a section taken substantially through lines 5—5 of Fig. 4 looking in the direction of the arrows.

Fig. 6 is a section taken substantially through

lines 6—6 of Fig. 3 looking in the direction of the arrows.

Before explaining in detail the present invention it is to be understood that the invention is not limited in its application to the details of construction and arrangement of parts illustrated in the accompanying drawings, since the invention is capable of other embodiments and of being practiced or carried out in various ways. Also it is to be understood that the phraseology or terminology employed herein is for the purpose of description and not of limitation.

In the drawings there is illustrated, by way of example, one embodiment of a speed control governor constructed in accordance with the present invention. As previously stated, the governor is particularly intended for the purpose of controlling the speed of an internal combustion engine provided with the usual carburetor connected by an intake conduit directly or through the medium of an interposed supercharger. As illustrated in Figs. 1 and 2, the engine is provided with a suitable throttle valve housing 10 having a passage 11 therethrough forming a part of the intake conduit leading from the carburetor (not shown) to the engine manifold, also not shown. The throttle valve housing 10 may be secured by means of bolts 12 to the carburetor casing and by bolts 13 either to the supercharger casing or to the engine manifold. Journalled within the housing 10 is a throttle valve shaft 14 to which is secured a butterfly throttle valve 14b oscillatable by means of the shaft 14 to control the flow of fuel mixture through the intake passage 11. The throttle valve shaft 14 has an extension 14a journalled within a casing 15. This casing, as shown, may comprise side plates closed entirely around the margins of the plates by means of a spacer member 16, the parts being secured together by means of bolts 18. By virtue of this construction the casing 15 provides a closed or sealed chamber within which is mounted an oscillatable vane 19. This vane is fastened to the shaft extension 14a and is adapted to be swung within the chamber 15 within the limits clearly indicated in Fig. 1.

The oscillatable control vane 19 for the butterfly valve 14b is hydraulically actuated. Accordingly, a pressure conduit 20 in the form of a pipe or tube is connected at 21 to the vane casing 15 and communicates through a duct or passage 22 with the interior of the casing 15 at one side of the vane 19, in this instance the lefthand side in Fig. 1. A second pressure conduit 23 is connected at 24 to the casing 15 and communi-

cates through a duct or passage 25 with the interior of the casing 15 at the opposite side of the vane 19, in this instance the righthand side in Fig. 1.

The control mechanism of the governor comprises a separate unit connected by means of the conduits 20 and 23 to the casing 15. This control unit comprises a housing or casing 26 in the form of two parts bolted together at 27. Suitably journaled within the casing 26 is a rotatable shaft 28 driven from the crankshaft of the engine. Slidably mounted on the shaft 28 is a bearing 29 engaged at one end by a yoke 30 secured to a rock shaft 31 journaled in suitable bearings within the casing. Depending from the yoke 30 are a pair of spaced forks 32 and 32a. The fork 32 embraces a reduced portion of a slide valve 33. This valve is provided with three cylindrical bearing portions 34, 35 and 36 having a sliding fit within a cylindrical bore 37 in a boss 26a formed on the casing or housing 26. Intermediate these bearing portions of the slide valve are reduced portions 38 and 39 spaced from the walls of the bore 37 to permit the passage of fluid under pressure. Communicating with the cylindrical bore 37 is a port 40 which in turn communicates with a tapped hole in the boss 26a within which is threaded a nipple 41 to which is connected a pipe-line 42 leading to a hydraulic pressure pump (not shown) driven from the engine drive shaft.

From this construction it will be seen that oil under pressure from the hydraulic pump may be forced through the conduit or pipe-line 42 and the nipple 41 and thence through the port 40 into the cylindrical chamber or bore 37 of the valve mechanism. The conduit 20 is connected to the boss 26a by a coupling 43 and communicates with the bore or chamber 37 by a duct 44. In like manner, the conduit 23 is connected to the boss by a coupling 45 and communicates with the chamber or bore 37 by means of a duct 46. Leading from the bore 37 are two spaced passages 47 and 48 which communicate with a hole or passage 49 forming the return line of the oil to the engine crankcase.

The fork 32a, depending from the yoke 30, embraces a rod or plunger 50 in position to engage the headed end 50a of this plunger, see Figs. 5 and 6. The plunger 50 is slidable within a chamber 51 formed in part by a detachable cap 52 threaded into a tapped hole in a boss 52a formed on the housing 26. Pinned to the end of the plunger 50 is a collar 53 and adjacent this collar is a nut 54 threaded onto the plunger or rod 50 and forming an abutment for one end of a compression spring 55, the opposite end of the spring bottoming against the inner end of the chamber 51. The nut 54 may be adjusted along the length of the plunger or rod 50 to vary the initial setting of the spring 55 thereby varying the deflection rate of the spring. Thus, the adjustable nut or collar 54 permits adjustment of the speed setting of the spring so that the speed range of the governor may be correspondingly varied.

The thrust bearing 29 is shiftable in one direction on the shaft 28 against the action of the spring 55 by means of a plurality of fly weights or inertia members 60, two being illustrated in the present instance. Each of the inertia members 60 is pivotally or oscillatably mounted upon a pin 56 secured to a bracket 57 rigidly secured to the shaft 28, the bracket 57 rotating with the shaft and hence causing the weights or inertia members 60 to rotate about and in spaced rela-

tion to the axis of the shaft 28. The inertia members 60 are provided with inwardly curved thrust ends 60a positioned to engage the end of the thrust bearing 29 opposite to the yoke 30. Also the inertia members 60 are provided with extensions 60b adapted to engage a stop ring 58 on the shaft 28 to limit the extent of outward movement of the fly weights or inertia members under the influence of centrifugal force. The shaft 28 is extended through the housing 26 and to the end of this shaft is keyed a bevel gear 59 adapted to be driven through suitable gearing mechanism from the crankshaft or drive shaft of the engine.

From the foregoing construction it will be seen that during rotation of the shaft 28 consequent to the operation of the engine the fly weights or inertia members 60 will tend to swing outwardly about their pivotal axes 56 under the influence of centrifugal force. As the members 60 swing outwardly the thrust ends 60a thereof exert an endwise or longitudinal force against the end of the thrust bearing 29, which force is resisted by the effort of the spring 55 transmitted through fork 32a to the yoke 30 which bears against the opposite end of the thrust bearing 29. Thus, the tendency of the inertia members 60 to move outwardly under centrifugal force and shift the thrust bearing 29 to the right in Figs. 4 and 6 is resisted by the spring 55, and it will be understood that when the inertia members 60 are in their neutral positions, as illustrated in full lines in Fig. 4, the opposing efforts exerted by the inertia members 60 and the spring 55 will be balanced and the slide valve will then occupy substantially the position illustrated in Fig. 4.

In the event the predetermined speed of the engine is exceeded the effort exerted by the inertia members 60 will then exceed the resistance of the spring 55 and hence the inertia members will shift the thrust bearing 29 to the right in Figs. 4 and 6, compressing the spring and at the same time moving the yoke 30 to cause the fork 32 to shift the slide valve 33 to the left in Fig. 4. This movement of the yoke, if sufficient, will shift the valve portion 35 to uncover the passage 46 whereupon oil under pressure from the hydraulic pump through pipe-line 42 will flow through port 40, chamber 37, passage 46, conduit 23, and passage 25 into the vane chamber 15 at the righthand side thereof, as viewed in Fig. 1, thus forcing the vane 19 toward the dotted line position shown in Fig. 1. This movement of the vane 19 will rotate or turn the butterfly throttle valve shaft 14 and move the butterfly valve toward its closed position, as shown in Figs. 1 and 2. This action will reduce the speed of the engine by throttling down the mixture flowing through intake passage 11.

Conversely, if the speed of the engine is reduced below the allowable speed range predetermined by the setting of the governor, the effort of the spring 55 will exceed the centrifugal force acting upon the inertia members 60 thereby moving the fork 32a to the right, as viewed in Fig. 6, and consequently swinging the yoke 30 to shift the thrust bearing 29 to the left, as viewed in Fig. 4. Movement of the thrust bearing in this direction against the thrust ends 60a of the inertia members will swing these members toward the thrust bearing as indicated in dotted lines in Fig. 4. Movement of the yoke in this direction, under the influence of the spring 55, will shift the slide valve 33 to the right in Fig. 4 causing the valve portion 35 to close off the passage 46 and the valve portion 36 to uncover the passage 44. Hydraulic

pressure in the chamber 37 will then pass through the passage 44, through conduit 20 and enter the chamber within the casing 15 through the passage 22 thereby shifting the vane 19 toward the right in Fig. 1. This movement of the vane 19 will swing the throttle valve 15 toward open position thereby permitting an increased flow of mixture through the intake passage 11 and resulting in an increase in the speed of the engine. It will be understood that when the vane 19 is shifted toward the right in Fig. 1 oil will be exhausted from this side of the vane through passage 25, pipe-line 23, passages 46 and 48 into the return line 49. Conversely, when the vane 19 is shifted to the left in Fig. 1 oil will be exhausted from this side of the vane through passage 22, pipe-line 20, passages 44 and 47 into the return line 49. It will also be understood that when the slide valve 33 is shifted to the right to connect passage 44 to the pressure line 42 the valve portion 35 will uncover passage 46 permitting communication between this passage and the passage 48 into the return line 49. Conversely, when the slide valve 33 is shifted to the left to connect passage 46 with the pressure line 42 the passage 44 will be uncovered by valve portion 36 to effect communication through passage 47 with the return line 49.

I claim:

1. A governor for an internal combustion engine having a butterfly valve in the intake passage thereof, comprising a chamber having an oscillatable vane connected to said valve, a pair of conduits communicating with said chamber at opposite sides of the vane, a main conduit connected to a source of hydraulic pressure, a valve shiftable to connect said main conduit selectively with said first named conduits, a spring device, a bifurcated member having a part connected to the valve and a part connected to the spring device, said member being constantly urged in one direction by the spring, and centrifugally operated means acting against said member to urge it in the opposite direction.

2. In a governing mechanism for an internal combustion engine having a butterfly throttle valve, a rock shaft carrying said valve, a pressure chamber having an oscillatable vane connected to said shaft for turning the same, means for introducing fluid pressure into the chamber at opposite sides of the vane to oscillate the same, valve means for controlling said last means, centrifugally operated means responsive solely to engine speed changes for shifting said valve means in one direction, spring means for shifting said valve means in the opposite direction, and a common means interposed between said valve means, centrifugally operated means and spring means through which said valve means is shifted in opposite directions.

3. In a governing mechanism for an internal combustion engine having a butterfly throttle valve, a rock shaft carrying said valve, a pressure chamber having an oscillatable vane connected to said shaft for turning the same, a pair of conduits communicating with said chamber at opposite sides of the vane, a main pressure line, a slide valve shiftable in opposite directions for effecting communication selectively between the pressure line and said conduits, a swinging lever connected to said valve to shift it in opposite directions, a spring connected to said lever to swing it in one direction, and centrifugally actuated means responsive to engine speed changes

and operatively connected to the lever for swinging it in the opposite direction.

4. In a governing mechanism for an internal combustion engine having a butterfly throttle valve, a rock shaft carrying said valve, a pressure chamber having an oscillatable vane connected to said shaft for turning the same, a pair of conduits communicating with said chamber at opposite sides of the vane, a main pressure line, a slide valve shiftable in opposite directions for effecting communication selectively between the pressure line and said conduits, a rotary shaft, a thrust bearing slidable on the shaft, a yoke engaging one end of the bearing, a centrifugally operated device connected to the shaft for rotation therewith and engaging the opposite end of said bearing, a spring operatively connected to one part of the yoke, and a second part of the yoke connected to said valve.

5. In a governing mechanism for an internal combustion engine having a throttle valve, a pressure chamber having a shiftable pressure operated member for actuating said valve, means for introducing fluid pressure into the chamber at opposite sides of said member to shift the same, valve means for controlling said last means, centrifugally operated means responsive solely to engine speed changes for shifting said valve means in one direction, spring means for shifting said valve means in the opposite direction, and a common means interposed between said valve means, centrifugally operated means and spring means through which said valve means is shifted in opposite directions.

6. In a governing mechanism for an internal combustion engine having a throttle valve, a pressure chamber having a shiftable pressure operated member for actuating said valve, a pair of conduits communicating with said chamber at opposite sides of said member, a main pressure line, a slide valve shiftable in opposite directions for effecting communication selectively between the pressure line and said conduits, a swinging lever connected to said valve to shift it in opposite directions, a spring connected to said lever to swing it in one direction, and centrifugally actuated means responsive to engine speed changes and operatively connected to the lever for swinging it in the opposite direction.

7. In a governing mechanism, a pressure chamber having a shiftable pressure operated member therein, a pair of conduits communicating with said chamber at opposite sides of said member, a main pressure line, a slide valve shiftable in opposite directions for effecting communication selectively between the pressure line and said conduits, a swinging lever connected to said valve to shift it in opposite directions, a spring connected to said lever to swing it in one direction, and centrifugally actuated means responsive to engine speed changes and operatively connected to the lever for swinging it in the opposite direction.

8. In a governing mechanism, a pressure chamber having a shiftable pressure operated member therein, a pair of conduits communicating with said chamber at opposite sides of said member, a main pressure line, a slide valve shiftable in opposite directions for effecting communication selectively between the pressure line and said conduits, a rotary shaft, a thrust bearing slidable on the shaft, a yoke engaging one end of the bearing, a centrifugally operated device connected to the shaft for rotation therewith and engaging the opposite end of said bearing, a spring operatively

connected to one part of the yoke, and a second part of the yoke connected to said valve.

9. In a governing mechanism, a pressure chamber having a shiftable pressure operated member therein, a pair of conduits communicating with said chamber at opposite sides of said member, a main conduit connected to a source of hydraulic pressure, a valve shiftable to connect said main conduit selectively with said first named conduits, a spring device, a bifurcated member having a part connected to the valve and a part connected to the spring device, said member being constantly urged in one direction by the spring, and centrifugally operated means acting against said member to urge it in the opposite direction.

10. In a governor for an internal combustion engine, a pressure chamber, a shiftable pressure operated member therein, means for introducing fluid under pressure into said chamber, a slide valve for controlling said means, a swinging lever, 20

centrifugally operated means connected to one end of the lever for swinging the same, a spring device, and means for connecting the opposite end of the lever at spaced points to said slide valve and spring device whereby swinging of said lever in one direction by said centrifugally operated means will shift said valve and deflect said spring device.

11. In a governor for an internal combustion engine, a rotary shaft, centrifugally operated inertia members mounted on the shaft, a swinging lever actuated in one direction by said inertia members in response to centrifugal force, said lever having spaced portions, a slide valve connected to one portion and a spring connected to the other portion whereby actuation of the lever by said inertia members simultaneously shifts said slide valve and deflects said spring.

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