

Sept. 7, 1965

B. WALKER
SPEED SENSING DEVICE

3,204,620

Filed Oct. 16, 1963

2 Sheets-Sheet 1

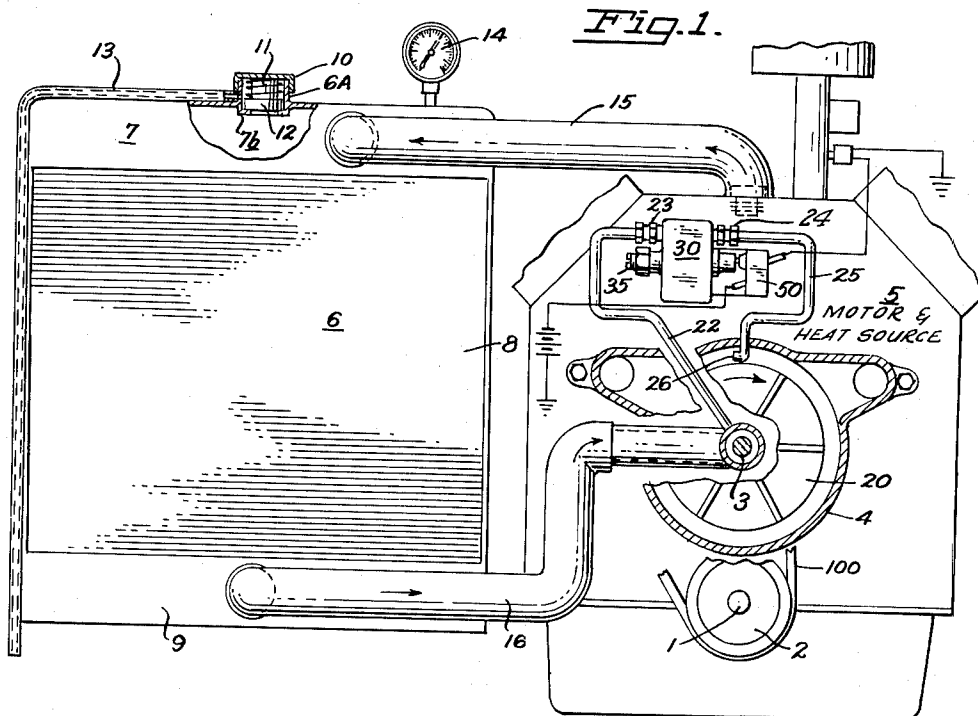
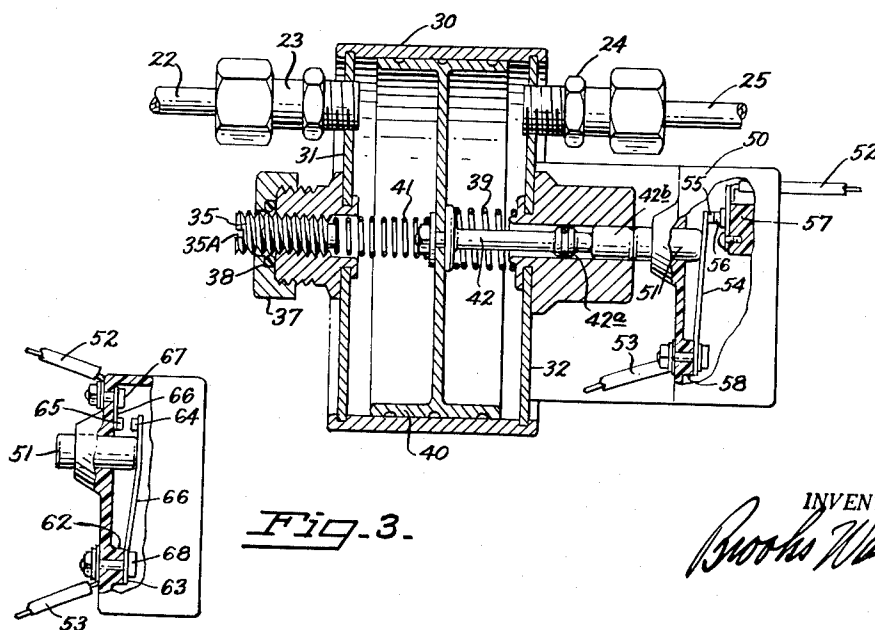


Fig. 2.



INVENTOR.
Brooks Walker

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Fig. 4.

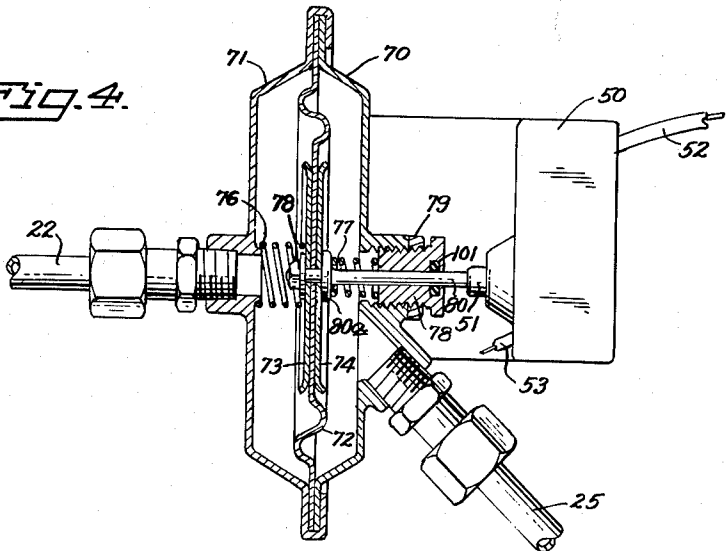
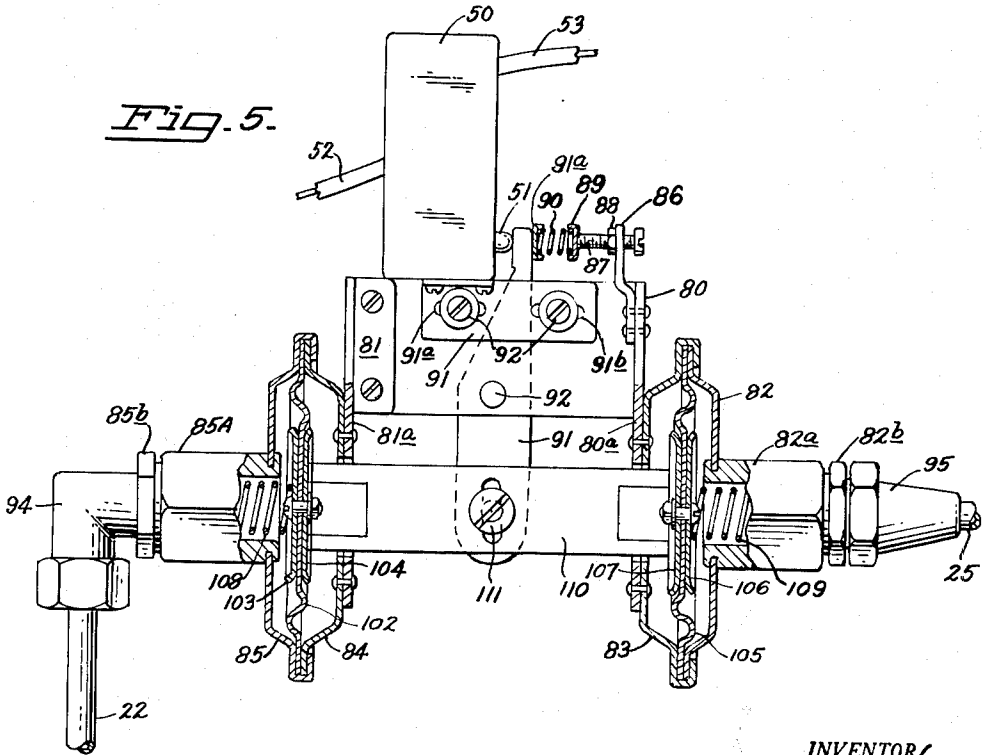


Fig. 5.



INVENTOR
Brooks Walker

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3,204,620

SPEED SENSING DEVICE

Brooks Walker, 1280 Columbus Ave.,
San Francisco, Calif.

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22 Claims. (Cl. 123—102)

This application is a continuation-in-part of my application Serial No. 140,632, filed Sept. 18, 1961, entitled, Governor, now abandoned.

This invention pertains to improvements in governors for use on motors equipped with cooling radiators and water or cooling liquid pumps.

This invention also pertains to improvements in speed sensitive devices for use in connection with liquid pumps operated from rotating shafts which could be used in connection with cooling transformers, cooling atomic piles, water circulating devices, including open or closed hydraulic circuits devices, including open or closed hydraulic circuits circulated by a variable speed pump. This invention may also be used where a centrifugal type of pump is driven at varying speeds and a speed sensitive device responsive to changes in the pump rotor speed is desired. This invention could also be used at a speed of rotation indicator for a centrifugal type pump, similar to a tachometer, by utilizing the differential pressure between the intake side of the pump and the Pitot tube pickup near the perimeter of the rotating vane in the pump.

In many instances of such motors and radiators pressure caps are used to raise the temperature at which the water or cooling liquid will boil and thus increase the cooling ability of the radiator both at sea level and at higher altitudes where water boils at temperatures well below 212° F. without pressure caps.

This invention uses the differential pressure between the intake and outlet of the water pump.

One pressure acts on one side of a piston or diaphragm and the other pressure acts on the other side of the same on mechanically coupled pistons or diaphragms so that the differential pressure developed between the intake and the outlet side of the cooling liquid or water pump will cause the piston or coupled pistons to move as the engine speed is increased and move back when the engine speed is reduced if the piston position is resisted by a spring, weight, or yieldable force.

Such motion can operate a switch, throttle, valve or any device which needs motion sensitive to change in engine speed.

Another feature is that adjustment of the spring or yieldable means is provided so that the speed range of operation of a device like a switch operated by this governor can be varied by said adjustment.

Another feature is that such a governor is all enclosed; requires no drive shaft except the normally driven cooling pump.

Another feature is to use a Pitot tube to pick up a pressure function of the velocity of the water or coolant leaving the vanes of the pump to supplement the pressure on the higher pressure side of the governor piston, this Pitot tube facing into the velocity of the liquid leaving the pump rotor makes the device operative even when the liquid flow through the cooling lines to the motor block are restricted or stopped by a thermostat, as generally used in automotive engines.

Another feature is that the high and low pressure of an engine cooling pump are used on each side of a piston so that the pressure developed in a pressurized radiator and cooling system will not effect or have negligible effect on the operation of the governor in this invention.

Another feature is the positive nature of such a gov-

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ernor as compared to governors operating off the air from the fan that cools the radiator which is affected materially by the speed of the vehicle and rear or tail winds.

Another feature of this invention is to use a Pitot tube near the perimeter of the pump rotor to pick up the higher of the differential pressures compared to the lower of the differential pressures in the intake to the pump, such a device being relatively independent of the circulation caused by the pump which may be controlled by a thermostat between the pump and the engine or between the pump, the engine, the radiator and the pump. The thermostatically controlled valve may either bypass part of the coolant liquid past the engine or curtain or shut off the flow through the engine until the engine comes up to the desired temperature, in any suitable manner as is now currently used on many vehicle motors sold and in use today.

Another feature is that such a governor can be attached to existing motors with pressure radiators with a minimum of work which is important for smog or carburetor control such as involved in U.S. Patent No. 2,809,623 to F. V. Hall or No. 2,466,090 to R. D. Fageol.

Other objects and advantages of the invention will appear from the following description of a preferred embodiment thereof.

FIG. 1 is a plan view partly cut away showing one form of the invention.

FIG. 2 is an enlarged view partly cut away of the piston and switch shown in FIG. 1.

FIG. 3 is a side view partly cut away of an alternate switch construction to that shown in FIG. 2.

FIG. 4 is a side view of an alternate construction to that shown in FIG. 2 but using a diaphragm in place of a piston.

FIG. 5 is a side view partly cut away of an alternate construction to that shown in FIG. 2 and

FIG. 4 using two diaphragms mechanically coupled.

On all figures like numerals of reference refer to similar parts.

In FIGS. 1 and 2 I have shown an engine block 5, a radiator 6, with a top tank 7, a core 8, a bottom tank 9, an outlet hose 16, an inlet hose 15, a filler neck 6A, a filler cap 10, a pressure flange 7b, a pressure seal 12, urged closed by spring 11, which is held down by filler cap 10. Relief pipe 13 carries steam and liquid away in case pressure in the radiator exceeds the loading on pressure seal 12 usually set between 3 and 15 pounds per inch. The engine cooling pump 4 houses rotor 20 mounted on shaft 3 and driven in any suitable manner as by a pulley 2, belt 100 from the crank shaft 1. As the engine speed increases the pump rotor 20 increases in speed and the pressure differential between the fluid in pipe 22 leading to the intake to the pump near the center of rotor 20 and the liquid in pipe 25 which runs from the Pitot pick up 26 at the exterior or outlet side of rotor 20 the pressure in pipe 25 being higher than the pressure in pipe 22. The differential between the pressure in the two pipes 25 and 22 being a function of engine speed the pressure of the fluid in pipe 22 acts through fitting 23 to the left side of cylinder 30, as viewed in FIG. 2, and head 31 and against the left side of piston 40. The higher fluid pressure acting through pipe 25 passes through fitting 24 and acts on the right side of piston 40, the right side of cylinder 30, and cylinder head 32.

If the piston 40 is balanced between springs 39 and 41 and a higher pressure acts through pipe 25, piston 40 will move to the left as viewed in FIG. 2. This motion to the left will move piston rod 42 to the left. On rod 42 is a sealing flange 42a carrying an O ring or other suitable seal. End 42b of piston rod 42 abuts against plunger 51 of switch 50 and holds contact arm 54 in position to close switch points 55 and 56. Contact arm 54 is

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mounted on insulating block 58 and attached to wire 53. Contact point 56 is mounted on insulating block 57 and attached electrically to wire 52.

As the engine speed increases the pressure through pipe 25 will cause piston 40 to move to the left against spring 41 to open points 55 and 56 at a predetermined speed. Contacts 55 and 56 could operate an electric solenoid controlling the idle fuel, idle air, a throttle, etc. If it is desired to have the points 55 and 56 open at higher speed adjustment screw 35 is screwed in by screw slot 35A and locked and sealed by lock nut 37 on body 34 and O ring seal 38. This increases the pressure of spring 41 to resist the motion of piston 40 to the left so a higher speed of the engine is necessary before contacts 55 and 56 will open.

If the reverse action is desired that is to close contacts when the engine speed increases, pipes 25 and 22 can be reversed where they connect to heads 31 and 32 or the switch can be changed as in FIG. 3 when plunger 51 presses against contact arm 66 to open contacts 64 and 65 as piston 40 moves to the right and piston rod 41b moves to the right. Point 65 is mounted on U-shaped support spring 66. Spring 66 is mounted on insulating block 62. Point 65 is connected through spring 66 to terminal 67. Contact 64 is connected to terminal 68 through support 63.

In FIG. 4 I have shown an alternate control using a cheaper construction in which pipe 22 is connected to stamping 71 which is attached to diaphragm 72. Diaphragm 72 is clamped between washers 73 and 74 by screw 75. Washer 74 is supported on shoulder 80a of piston rod 80. Spring 77 urges piston rod 80 to the left and is adjustable by screw plug 78 and locked and sealed by nut 79. O ring 101 seals piston rod 80. Switch 59 is like the switch shown in FIG. 2 or like the switch shown in FIG. 3 depending on whether you wish a switch closed or open with increased pressure in line 25 over pressure in line 22. Such an increase in pressure in line 25 over line 22 takes place with an increase in engine speed.

In FIG. 5 I have shown two commercially available diaphragm controls hooked together mechanically so that fluid pressure acting through pipe 22 from the intake of the pump acts on diaphragm 102 in housing 85 and 84 by passing through angle fitting 94 and housing end 85a houses spring 108 which can be adjusted by nut 85b. The higher pressure from the outlet of pump 4 acts through pipe 25, fitting 95, adjustment nut 82b, spring housing 82a to the space between stamping 82 and diaphragm 105. Diaphragm 105 is mounted between washers 107 and 106. Washers 104 and 103 are secured on both sides of diaphragm 102 and are attached by connecting link 110 to washers 107 and 106. Shoulder screw 111 is secured to rocker arm 91 and rides in slot 110a of connecting link 110. Rocker arm 91 is pivoted at 92 in mounting bracket 80. Bracket 80 has ears 80a which are mounted on stamping 83. Angle 81 has side 81a to which stamping 84 is mounted. Switch 50 with terminal wires 52 and 53 is adjustably mounted on bracket 80 by screws 92 passing through elongated slots 91a. The upper end of rocker arm 91 abuts against plunger 51 to operate switch 50 in a manner as shown in connection with FIGS. 2 and 3, depending on whether open or closed contacts are desired at low engine speed. Spring 90 abuts against cup 91a attached to the upper end of rocker arm 92. The other end of spring 90 abuts against cup 89 which is carried by adjustment screw 87 which is threaded to bracket 86 and has lock nut 88 to secure it in position. By changing the tension on spring 90 by screw 87 the engine speed at which the switch changes can be varied.

I have illustrated my invention in these various forms; however, many other variations may be possible within the scope of this invention.

To those skilled in the art to which this invention relates many changes in construction and widely differing

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embodiments and applications of the invention will suggest themselves without departing from the spirit and scope of the invention. The disclosures and description herein are purely illustrative and are not intended to be in any sense limiting.

I claim as my invention:

1. A governor for an engine having a crank shaft, a carburetor, a radiator and an engine driven cooling liquid pump comprising a fluid actuated piston, an enclosure for one side of said piston, a connection between the intake side of said pump and one side of said piston and another connection between the outlet side of said pump and the other side of said piston, means actuated by said piston for controlling the amount of fuel fed to said engine by said carburetor, said pump having a vaned rotor driven in relation to the speed of rotation of said crank shaft, said connection to the outlet side of said pump including a Pitot tube with its opening near the perimeter of said pump rotor to pick up liquid pressure resulting from the velocity of the liquid leaving or following said rotor.

2. A governor for an engine having a crank shaft, a carburetor, a radiator, an engine driven cooling liquid pump, said governor comprising a fluid actuated piston, an enclosure for one side of said piston, an electrical switch, a connection between the intake side of said pump and one side of said piston and another connection between the outlet side of said pump and the other side of said piston, a connection between said piston and said electrical switch, said switch being closed at low engine speeds and open at higher engine speeds, said switch controlling the amount of fuel to said engine through said carburetor at certain engine operating conditions, said pump having a vaned rotor driven in relation to said crank shaft, said connection to the outlet side of said pump including a Pitot tube near the perimeter of said pump rotor to pick up liquid pressure resulting from the velocity of the liquid leaving or following said rotor.

3. A governor for an engine having a crank shaft, a carburetor, a radiator and an engine driven cooling liquid pump, comprising a fluid actuated piston, an enclosure for said piston on each of said piston, a connection between the intake side of said pump and one side of a piston and another connection between the outlet side of said pump and the other side of said piston, means actuated by said piston for controlling a function of the amount of fuel fed to said engine, by said carburetor at various engine speeds, said piston having a spring resisting travel in one direction, an adjustment for said spring, said pump having a vaned rotor rotating in relation to the speed of rotation of said crank shaft, said connection to the outlet side of said pump including a Pitot tube near the perimeter of said pump rotor to pick up liquid pressure resulting from the velocity of the liquid leaving or following said rotor.

4. A governor for an engine having a crank shaft, a carburetor, a radiator and an engine driven cooling liquid pump comprising a fluid actuated piston, an enclosure for each side of said piston, a connection between the intake side of said pump and one side of a piston and another connection between the outlet side of said pump and the other side of said piston, means actuated by said piston for controlling the amount of fuel fed to said engine by said carburetor at various engine speeds, said piston having a spring resisting traveling in one direction, an adjustment for said spring, said adjustment changing the speed range at which said governor functions, said pump having a vaned rotor rotating in relation to said crank shaft, said connection to the outlet side of said pump including a Pitot tube near the perimeter of said pump rotor to pick up liquid pressure resulting from the velocity of the liquid leaving or following said rotor.

5. A governor for an engine having a crank shaft, a carburetor, a radiator and an engine driven cooling liquid pump, comprising a hydraulically actuated piston, an

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enclosure for one side of said piston, a second enclosure for the opposite side of said piston, a connection between the intake side of said pump and one side of said piston and another connection between the outlet side of said pump and said second enclosure for the opposite side of said piston, an electrical switch, a connection between said piston and said electrical switch, said switch being open at lower engine speed and closed at higher engine speeds, said switch controlling the fuel admission to said engine, said pump having a vaned rotor rotating in relation to the speed of rotation of said crank shaft, said connection to the outlet side of said pump including a Pitot tube near the perimeter of said pump rotor to pick up liquid pressure resulting from the velocity of the liquid leaving or following said rotor.

6. A device of claim 5, an adjustment in said governor for changing the engine speed at which said switch changes from open to closed.

7. A device of claim 1 in which said radiator has a pressure cap, said increase in pressure due to said pressure cap acting approximately equally on each side of said piston.

8. A governor for a fuel driven engine having fluid cooling by a radiator and a fluid cooling circulating pump including a rotor driven in accordance with the speed of the engine and having a rotating vane comprising speed responsive means actuated by the differential pressure on the intake and outlet of said pump independently of the pressure in said radiator, a Pitot tube for supplementing the pressure on the outlet side of said pump, said Pitot tube facing into the direction of the liquid leaving the perimeter of said pump rotor and thereby helping to actuate said speed-responsive means, and means actuated by said speed-responsive means under predetermined speed conditions for changing the amount of fuel supplied to said engine.

9. A device of claim 8, said radiator having a pressure cap, said radiator operating at pressures from atmosphere to over five pounds per square inch above atmosphere.

10. An engine speed sensitive device for an engine having fluid cooling, a radiator, and an engine-driven fluid cooling circulating pump, comprising a Pitot tube extending into said pump, pressure sensitive-means for controlling the amount of fuel fed to the engine, said pressure sensitive means being actuated by the differential pressure on the intake and outlet of said pump independently of the pressure in said radiator, said pump including a vaned rotor, the pressure on the outlet side of said pump being supplemented by pressure entering the inlet to said Pitot tube which faces into the direction of the liquid leaving the perimeter of said pump rotor.

11. An engine having a carburetor, a radiator, a liquid cooling system, a liquid cooling circulating pump, said pump driven by said engine, a speed sensitive device operated by the differential pressures in said cooling system while said engine is operating, said speed sensitive device controlling fuel to said engine from said carburetor as a function of said engine speed, said pump including a vaned rotor, a Pitot tube extending into said pump for supplementing the pressure on the outlet side of said pump by pressure of liquid entering said Pitot tube, said tube facing into the direction of the liquid leaving the perimeter of said pump rotor.

12. A device of claim 11, said radiator having a pressure cap, said radiator operating between atmospheric pressure and a substantial positive pressure above atmosphere, said cap releasing pressure above a predetermined limit above atmosphere.

13. An actuator, including in combination a rotating shaft, a governor, a fluid pump, a closed hydraulic circuit connected to said pump, a rotating vaned rotor in said pump, said rotor rotating in relation to the speed of rotation of such shaft, a hydraulically actuated mov-

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able element, a fluid pressure pick up Pitot tube, the opening of said pick up Pitot tube facing into the velocity of liquid leaving the perimeter of said vaned rotor, fluid pressure from said Pitot tube pick up acting on one side of said movable element, resilient means for resisting the motion of said movable element when acting under fluid pressure from said Pitot tube, so that said resilient means offers greater resistance to the motion of said movable element at higher speeds of rotation of said shaft than when said movable element is in less advanced position due to lower pressure from said Pitot tube at lower speeds of said shaft, and actuator means actuated by the motion of said movable element as a function of the speed of said shaft.

14. A governor for an engine having a crank shaft, a carburetor for supplying fuel to said engine, a fluid pump with a vaned rotor driven in relation to the speed of said shaft, said governor comprising a pressure sensitive element, a Pitot tube pick up near the perimeter of said rotor, sensitive to the velocity of liquid following the perimeter of said rotor, a device for controlling the supply of fuel from said carburetor to said engine, said pressure sensitive element actuating said device at a predetermined speed of rotation of said shaft to act as an actuating governor to sense said predetermined speed of rotation of said shaft and control the engine fuel supply in varying degree, depending on whether said engine is operating above or below said predetermined engine speed under certain operating conditions.

15. A device as described in claim 14, in which there is a closed circuit connected with said centrifugal pump, said closed circuit being exposed to variable pressures at the same altitude due to operating conditions, a second fluid connection to the other side of said movable element from the side against which the liquid from said Pitot tube acts, said fluid connection being connected to said closed circuit at a place different from said Pitot tube.

16. A device of claim 15, in which said second fluid connection is connected to said closed circuit on the intake side of said pump.

17. An actuator for use with a rotating shaft and a fluid pump having a rotating vaned rotor driven in relation to the speed of said shaft, said actuator comprising a pressure sensitive element, a Pitot tube pick up near the perimeter of said rotor, said pickup being sensitive to the velocity of liquid following the perimeter of said rotor, an actuator actuated by said pressure sensitive element at a predetermined speed of rotation of said shaft, so that said actuator senses said predetermined speed of rotation of said shaft and actuates at said predetermined speed of rotation of said shaft.

18. An actuator, including in combination a liquid actuated movable element, a fluid pump of the centrifugal type, a rotor in said pump, a Pitot tube with the opening facing the liquid flowing around in the direction of rotation near the perimeter of said rotor, said movable element being actuated by varying pressures of liquid entering said Pitot tube at different speeds of rotation of said rotor.

19. An actuator comprising a fluid pump, a rotor in said pump, a Pitot tube extending into said pump, said Pitot tube picking up hydraulic pressure near said rotor, a pressure sensitive device operated by pressure from said Pitot tube, and actuator means controlled by said device and having a different motion for speeds below a predetermined speed of rotation of said rotor than when the speed of said rotor is above said predetermined speed of rotation.

20. A device as defined in claim 19, in which there is a closed hydraulic circuit connected with said pump, a source of heat connected thermally with a portion of said hydraulic circuit, a thermostatically controlled valve, said valve located in said hydraulic circuit for materially affecting the rate of liquid flow past the portion of said

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heat source at said thermal connection while said pump is operating at a given rate of rotation.

21. A hydraulically actuated pressure sensing device for actuating a mechanism at differential pressures lying above a predetermined differential pressure comprising a pair of coaxial hydraulically operated movable elements, coaxial means connecting said elements together to move in unison, a fluid pump, a rotor in said pump, an intake means into said pump, a Pitot tube extending into said pump and picking up hydraulic pressure near said rotor, means connecting said Pitot tube to one said movable element, means connecting said pump intake means to the other said movable element, and sensing means actuated by the motion of said coaxial means resulting from differential pressure between said Pitot tube and said pump intake means and varying according to the speed of rotation of said rotor.

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22. A mechanism as defined in claim 21 in which each of said movable elements comprises a separate flexible diaphragm, and an enclosure supporting and sealed to said diaphragm, said fluid pressure acting between said enclosure and said diaphragm on the opposite side thereof from said coaxial means to actuate said coaxial means.

References Cited by the Examiner

UNITED STATES PATENTS

10	1,358,812	11/20	Anderson	-----	123—103
	2,168,605	8/39	Messinger	-----	123—103
	2,450,199	9/48	Leibing	-----	123—103

FOREIGN PATENTS

15	887,129	8/53	Germany.
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KARL J. ALBRECHT, *Primary Examiner.*

RICHARD B. WILKINSON, *Examiner.*