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LOCKING MECHANISM FOR SERVOMOTORS

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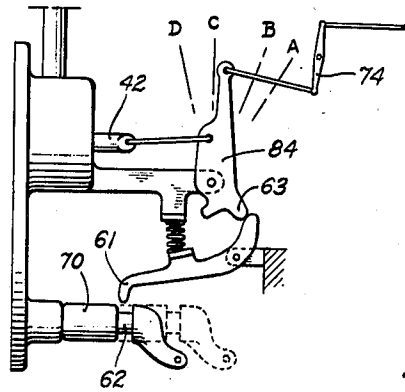
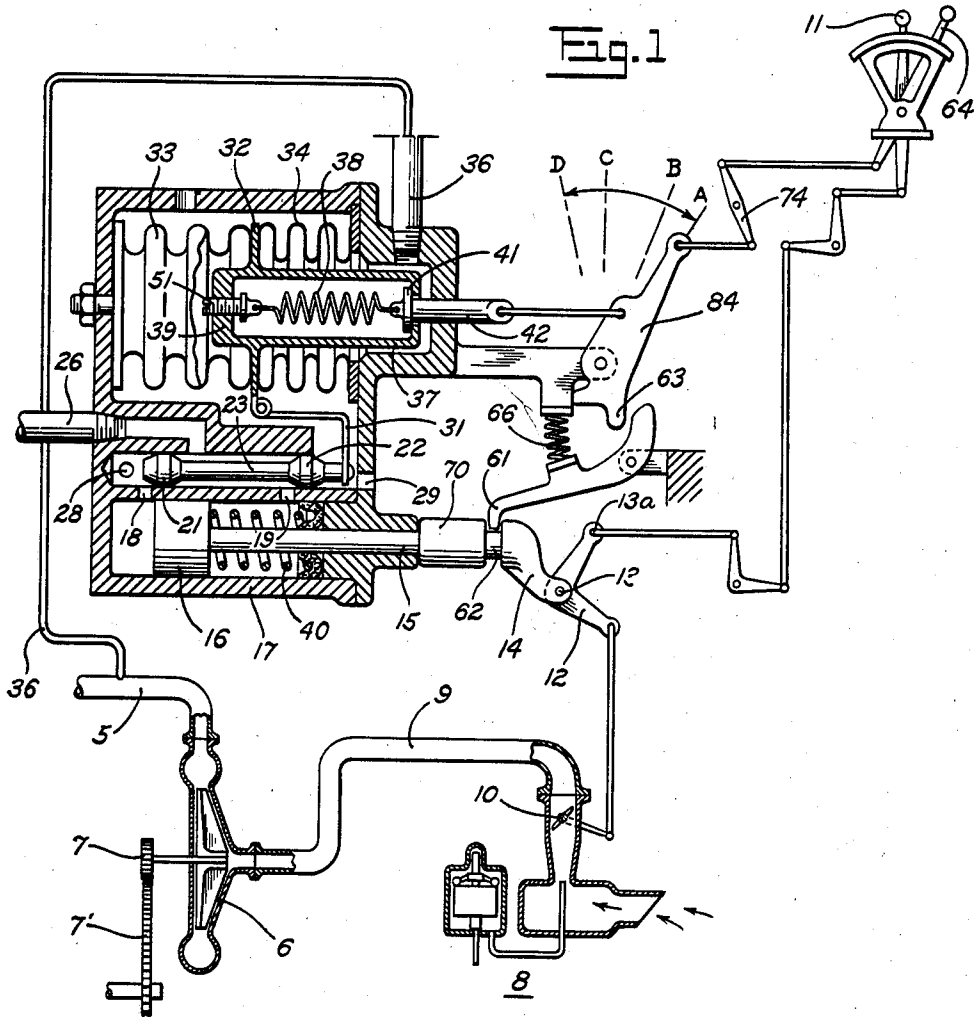


Fig. 2

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UNITED STATES PATENT OFFICE

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LOCKING MECHANISM FOR SERVOMOTORS

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Original application December 20, 1939, Serial No.
310,246, now Patent No. 2,243,626, dated May 27,
1941, which is a division of application Serial
No. 247,120, December 21, 1938, now Patent No.
2,205,354, dated June 18, 1940. Divided and
this application May 15, 1941, Serial No. 393,641

1 Claim. (Cl. 121—40)

This invention relates to servo-motors, and particularly to the control of the movement thereof along selected portions of the stroke.

An object of the invention is to provide locking mechanism for a servo-motor, said locking mechanism having as an element thereof a manual control mechanism operable to render the locking mechanism inoperative, at the will of the operator, for a preselected portion or portions of the full stroke of the servo-motor.

In the drawing, the invention is shown in a form which it may take when applied to the control of the supercharging action in a fuel supply system for an internal combustion engine of the character disclosed and claimed in Patent No. 2,205,354 issued to David Gregg and myself as joint applicants; but it is to be understood that the locking mechanism herein claimed is capable of other applications differing from the system shown in said prior patent, of which patent the present application is a division. This application is also a division of copending application No. 310,246 filed jointly by David Gregg and myself on December 20, 1939, now Patent No. 2,243,626, granted May 27, 1941.

Objects and features of the invention include, in addition to the one indicated above, the provision of a locking mechanism of novel construction, and involving novel inter-relationships of parts, as more fully described in the following specification and illustrated in one exemplification thereof in the accompanying drawing; the limits of the invention being, however, defined in the claim appended hereto rather than in the said accompanying drawing.

In the drawing, reference character 5 designates a diagrammatic showing of the intake manifold of an internal combustion engine whose crank-shaft or other power shaft (not shown) drives a supercharger 6 through suitable mechanical connections of which those shown at 7 and 7' may be considered illustrative. The manifold 5 serves to connect carburetor 8 with the combustion spaces (not shown) of the engine, by way of supercharger 6 and supercharger inlet 9; the throttle 10 being pivotally mounted in said inlet passage 9, and shiftable to any position between fully open and fully closed in response to corresponding movement of the linkage leading thereto. This linkage includes a manually shiftable throttle control lever 11 and a bell-crank 12 whose central pivot 13 passes through the end portion 14 of a rod 15 whose opposite end is integrated with a piston 16 constituting the servo-element above referred to.

As shown the servo-piston 16 is slidable in a cylinder 17 having two ports 18 and 19 on opposite sides of said piston, through which ports fluid is caused to flow whenever the correspondingly spaced covering portions 21 and 22, respectively, of the slide valve 23 are not in flow inhibiting relation thereto. The operating fluid may be oil received from the engine oil supply by way of pipe 26 and returnable to the engine oil sump by way of outlet 28 or 29, as the case may be, whenever a shifting of the control valve 23 from its neutral position causes one of said outlets to receive oil discharged from the cylinder 17.

The disclosed embodiment of manifold pressure actuated means acting upon control valve 23 to cause supercharger regulating (throttle shifting) movement of the servo-element 16 will now be described. An arm 31 extends in rigid fashion from one end of valve 23 and connects to a plate 32 interposed between a pair of hollow, flexible-walled cylinders or bellows 33 and 34, the former being sealed under vacuum or under a predetermined pressure—although a vacuum or near vacuum is preferred. Bellows 34, on the other hand, has direct communication with intake manifold 5 by reason of conduit 36 leading thereto, and also contains a tube 37 and spring 38 having one end thereof fastened to the end portion 39 of the tube 37; the opposite end of spring 38 being secured to the end portion or collar 41 of a rod 42 constituting part of the manually operable means 64, 74 and 84 for "locking out" the piston 16, and also constituting a means for varying the tension imposed upon spring 38 and thereby varying the degree of opposition to leftward movement of control valve 23 under the urge of the manifold pressure operating upon the bellows 34 in the direction counter to the pull of spring 38. The initial spring tension depends upon the setting of screw 51 in the threaded bearing or nut constituting the above-described end portion 39 of the tube 37; but from this initial adjustment the tension is variable by manually shifting the manifold pressure selecting linkage 64, 74, 84, 42. The range of movement of this linkage 64 to 42 (as indicated by the arc A—B—C—D in the drawing) thus determines the maximum and minimum limits of manifold pressure obtainable by the automatic means constituted by servo-piston 16; it being understood that the piston 16 can move only in response to a shifting of the control valve 23 in either direction from its central position, and that the action of the control valve 23 is in turn governed by the extent to which spring 38 or the existing

manifold pressure may temporarily overpower the other and thus cause a temporary shifting of the valve 23 from said central position.

The "locking out" of the servo-element 16, when desired, is accomplished in either one (or both) of two ways: first, by the establishment of a fluid lock, which involves manually shifting the control valve 23 to a position wherein the piston 16 moves to the innermost position and remains there due to the inability of the valve to reverse while the manual restraint thereon remains effective; and secondly, by the establishment of a mechanical lock in the form of latch 61 movable into position to engage groove 62 in the piston rod whenever manually shifted cam 63 (forming part of manifold pressure selecting linkage 64 to 42) occupies a position adjacent either extreme of its range of movement, said extremes of the cam's movement being so set that one extreme coincides with the fluid lock establishing position of the valve shifting rod 42; the result of such coincident settings being, of course, to make it possible to have both the fluid lock and the mechanical lock effective in such manner that the latter supplements and confirms the former.

The manner in which these two locking actions are effected will now be described in greater detail. First, as to the fluid lock, this can not occur until the movement of rod 42 is sufficient to bring the collar 41 thereof into abutting engagement with the end of tube 37. After such abutting engagement occurs, further movement in the same direction will result in corresponding shifting of the valve 23 (to the position shown in the drawing) due to the rigid connection between valve arm 31 and the plate 32 with which tube 37 is integrated. Such shifting of valve 23 will uncover outlet 18 and will thus remove all oil pressure resistance to movement of piston 16 to its innermost position, under the urge of the oil pressure on the outer side of the piston, into which oil is now being supplied by way of ports 26 and 19; the movement of the piston to its innermost position being further assured by reason of the additional pressure exerted by spring 40 upon the outer side of the piston.

Now, as to the mechanical lock (latch) this does not actually take effect until two actions concur: first, the positioning of controlling cam 63 (manually operated by the pressure selecting means 64) in either of the end zones (A—B or C—D) of its range of movement, the entire range of movement being that indicated by the arc A—D as a whole; and secondly, the completion of the inward stroke of the piston 16, whereby

groove 62 of the piston rod arrives in position to receive latch 61 and be held firmly thereby, by reason of the pressure exerted in the locking direction by spring 66. These two actions may, of course, be dissimultaneous; that is, the controlling cam 63 may be in either end zone prior to movement of groove 62 to the latch receiving position; but in such event the latch will bear frictionally upon the adjacent portion 70 of the sliding rod 15 until the groove 62 arrives opposite the latch, whereupon the latter will snap into locking position—assuming that in the meantime the operator has not shifted control cam 63 to an intermediate (B—C) position—and thereby provide positive restraint against movement of the piston 16, over and above the resistance to such movement that is due to the pressure of the oil and the spring 40 upon said piston, in this "fluid lock" position of valve 23. With the piston thus locked the operator may exercise full manual control over the throttle by manipulation of throttle lever 11, as above described.

During periods when there is no lock-out of the rod 15, the throttle may be shifted by either the manual means 11 or by movement of the piston, for—as in the prior art—the bell-crank 12 is of the floating type, with both its central pivot 13 and its upper pivot 13a serving alternately as fulcrums about which rotation may occur; the pivot 13 being the fulcrum wherein manual actuation occurs, and the pivot 13a when automatic (piston induced) actuation occurs. In this connection it is to be understood that the levers 11 and 64 are held, frictionally or otherwise in whatever position they are caused to occupy, and remain in such positions until manually shifted.

What is claimed is:

In combination with a piston having an extension, and a groove in said extension, locking means therefor including a latch engageable with said groove, means constantly urging said latch to latching position, and manual means for restraining said latch, said manual means including a rockable member having a cam-surfaced toe-piece which engages and holds said latch in non-latching position so long as said toe-piece is in the central zone of its range of movement; said rockable member being so formed that manual movement of said toe-piece in either direction from its central zone will release said latch from the restraining influence of said toe-piece.

RICHARD DAALDER.