Dec. 23, 1947. A. G. HEISEL 2,433,217

THROTTLE CONTROL MECHANISM

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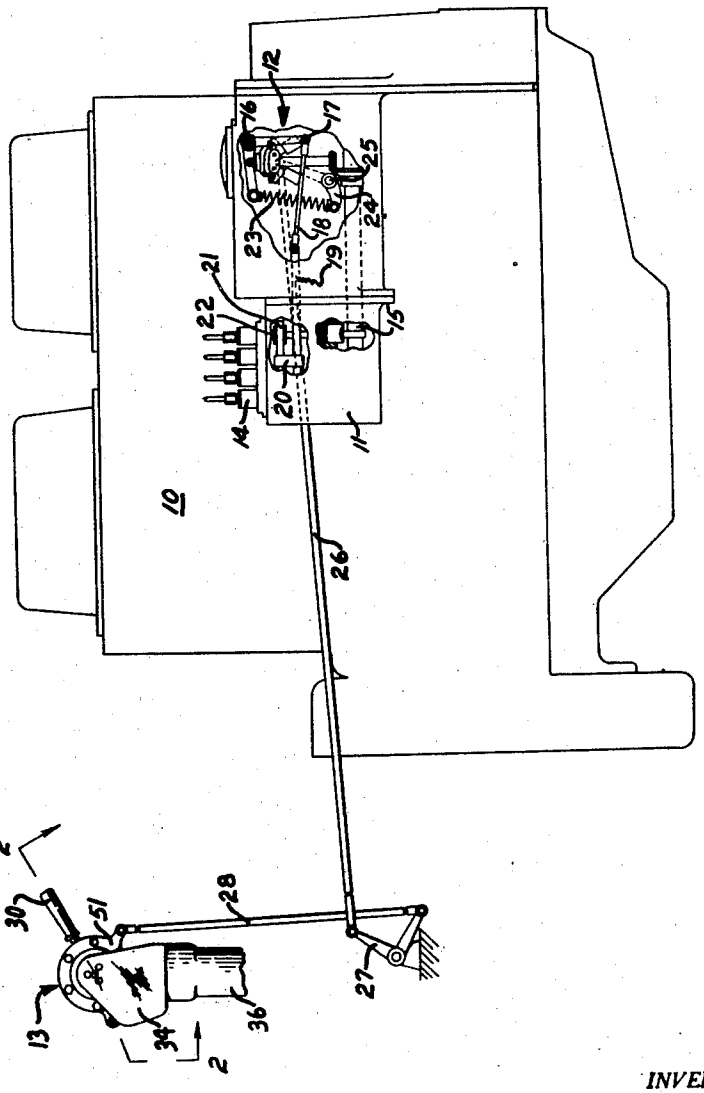

Fig. 1

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FIG-2-

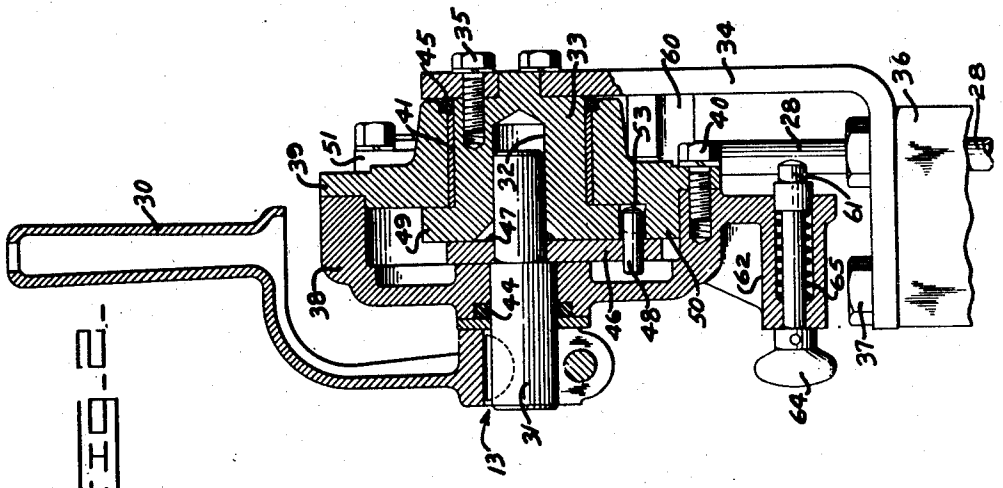


FIG-3-

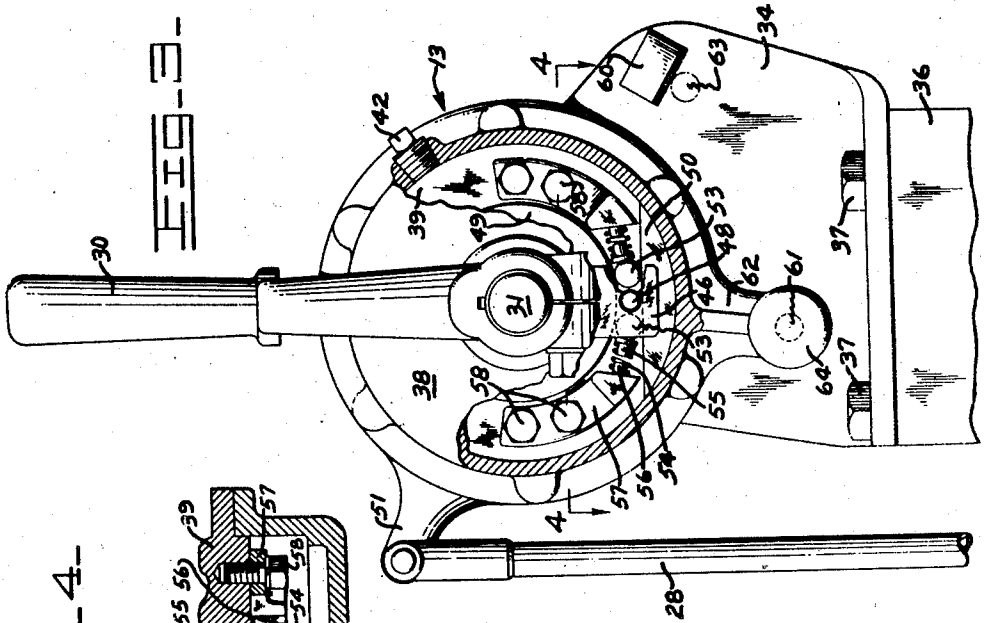
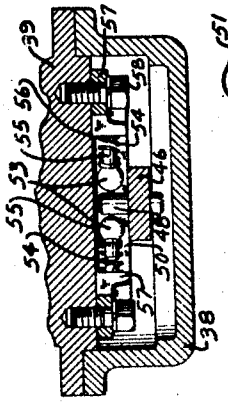


FIG-4-



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THROTTLE CONTROL MECHANISM

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The present invention relates to control mechanism and particularly to manually operated controls of the kind which are used for throttles on internal combustion engines.

The invention is in fact applicable to any manually operated lever which swings about a pivotal support and is desirably fixed in any position of adjustment about its support until further adjustment is made.

One example of the use of such a lever is the throttle control mechanism of an internal combustion engine of the compression ignition type. Such use will be referred to herein for the purpose of illustrating the principles of the present invention.

In a compression ignition engine, fuel is delivered to the combustion chambers of the engine by fuel injection mechanism which includes plunger type pumps. The amount of fuel delivered upon each pressure stroke of each plunger is usually regulated by a well known type of metering means in which the volume of fuel delivered by the pump depends upon angular adjustment of the pump plunger. It is conventional practice to employ a governor driven by the engine to control the angular adjustment of the pump plunger and thus to maintain the engine speed constant under varying load conditions. The governor is spring loaded and a throttle in the form of a manually operated control lever is employed to vary the tension of the governor spring and thus to adjust and establish the speed of operation of the engine.

It is desirable that the control lever be securely held in any position of adjustment so that the tension of the governor spring which it regulates and the vibration caused by operation of the engine will not disturb its setting. It is also desirable that the control lever be easily moved from one position of adjustment to another.

It is with control mechanism of the kind referred to that the present invention is concerned and it is an object of the invention to provide a control lever with means for securing it in any position of adjustment which means is automatically enabled whenever the lever is released and disabled easily and immediately when the control lever is grasped to vary its position. A further object of the invention is to provide a control mechanism including a lever which is automatically locked against movement by forces normally tending to move it when it is at rest and unlocked by a properly applied force which tends to move it in either direction from any position of adjustment in which it is locked. A further

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object of the invention is the provision of control mechanism of the kind described wherein all essential moving parts are abundantly lubricated to insure ease of operation. Further and more specific objects and advantages of the invention are made apparent in the following specification wherein reference is made to the accompanying drawings illustrating one form which the invention may assume.

In the drawings:

Fig. 1 is a diagrammatic view in side elevation of an internal combustion engine illustrating a fuel injection system employed therewith and showing the application thereto of a governor and a control mechanism embodying the present invention.

Fig. 2 is an enlarged sectional view of the control mechanism shown in Fig. 1 and is taken along the line 2—2 of Fig. 1;

Fig. 3 is a side elevation of the mechanism shown in Fig. 2 with parts broken away; and

Fig. 4 is a fragmentary section taken along the line 4—4 of Fig. 3.

In Fig. 1 of the drawings an internal combustion engine of the compression ignition type is shown at 10 as having a fuel injection mechanism 11 mounted adjacent its side. A governor generally indicated at 12 is associated with the fuel injection mechanism and is controlled by control mechanism generally indicated at 13. The fuel injection mechanism comprises injection pumps 14, there being one such pump for each cylinder of the engine and these pumps are actuated in a well known manner by a cam shaft 15. The cam shaft 15, which is driven by the engine, is geared to the governor for driving it and the governor which is of conventional construction includes a bell crank lever which is pivotally mounted at 16 and which has an end 17 pivotally connected with a link 18 which is in turn connected with a slide bar 19. The slide bar 19 is rigidly connected by a member 20 with a rack bar 21 which meshes with gears 22, one of which is provided for axially adjusting the plunger in each of the injection pumps 14. Consequently, any operation of the governor to rock the bell crank around its pivotal support 16 effects axial adjustment of the pump plungers and thus effects the quantity of fuel delivered to the engine for combustion therein. The opposite end of the bell crank lever mentioned is connected by a spring 23 with a lever 24 which is pivoted at 25 and capable of adjustment about its pivot to vary the tension of the spring 23 by a connecting rod 26. The connecting rod 26 is connected through a bell

crank 27 and rod 28 with the control mechanism 13.

The control mechanism 13 which is best illustrated in Figs. 2 and 3 comprises a hand lever 30 fixed to one end of a shaft 31 and preferably keyed against rotation with relation to the shaft as shown. At its other end, the shaft 31 projects into a bore 32 of a cylindrical supporting member 33 which is rigidly secured to a bracket 34 as by cap screws 35. The bracket 34 is supported at the upper end of a post or the like 36 to which it may also be secured by cap screws as shown at 37. The inner end of shaft 31 and the inner end of the supporting member 33 are both enclosed by a housing which comprises a member 38 embracing the shaft for relative rotary movement and a cover like member 39 secured to the member 38 as by cap screws shown at 40. The cover member 39 is rotatably mounted on the exterior of the supporting member 33 and a bearing bushing indicated at 41 may be interposed between the members 33 and 39. The member 38 is internally recessed for the reception of a lubricant which may be introduced through a plug shown at 42 in Fig. 3 and lubricant seals may be provided as shown at 44 and 45 to prevent the escape of lubricant around the shaft 31 and around the supporting member 33 at their points of entry into the rotatable housing which is made up of the members 38 and 39.

The shaft 31 carries a lever arm 46 which is disposed within the housing and which is secured against rotation with relation to the shaft as by welding indicated at 47. A pin 48 is carried by the lever arm 46 and has an end which projects into a space between an enlarged annular end 49 on the supporting member 33 and a flat sided projection 50 on the cover member 39 of the housing. The pin 48 forms a part of a connection between the lever 30 and the housing member 38 so that upon adjustment of the lever about the axis of the shaft 31 the housing moves with the lever and as the rod 28 which leads to the governor control is connected with the housing through a bracket 51, movement of the lever 30 in either direction affects adjustment of the governor control spring 23 through the connecting mechanism hereinbefore described.

The means, including the lever 46 and pin 48, for connecting the lever 30 with the housing and for locking the housing against rotation, except upon movement of the lever, is illustrated in Fig. 3. In this figure the projecting portion 50 on the housing cover is shown as cooperating with the enlarged portion 49 on the supporting member 33 to define a space which receives a pair of balls 53. These balls are wedged into the space between the stationary supporting part 49 and the movable housing part 50 to prevent relative movement between said parts in either direction. The balls 53 are normally held in their wedged position by means of springs 54 each of which carries a ball engaging pin 55 at one end. The opposite end of each spring 54 embraces a pin 56 carried by one of a pair of brackets 57 which brackets are secured as by cap screws 58 to the inner face of the housing cover 39. With the arrangement disclosed, each of the balls 53 will, through its wedging action, prevent relative movement in one direction between the cylindrical and flat surfaces with which it engages, but will permit movement in the opposite direction. Thus, with two balls arranged in the manner shown, relative movement in either direction is normally prevented. The pin 48, however, projects into the space between the balls 53 so that upon movement of the handle 30 the pin first engages either one of the balls to dislodge it from its wedged position, then compresses the spring 54 associated with that ball until the pin 55 engages the pin 56 and continued movement of the lever effects rotation of the housing with relation to the fixed supporting member 33. The instant that the lever 30 is released, the spring 54 is effective to return its ball 53 into the normal wedging engagement illustrated in Fig. 3 and the parts are again effectively locked against relative rotation except by further manipulation of the lever 30. The lever 30 is preferably of hollow construction as illustrated in Fig. 2 and is preferably made of some light durable metal to reduce the tendency of vibration to cause it to shift enough to dislodge either of the balls 53 from its normal wedged position. While the wedging members 53 are disclosed as balls a spherical shape is not essential to the function which they perform and cylindrical rollers or wedging members of other shapes may be used instead if desired.

Through the construction herein described, the member 33 is in effect a rigid non-rotatable support and the housing formed of the parts 38 and 39 is rotatable thereon and connected with the mechanism to be controlled. The balls 53 which are wedged between the cylindrical peripheral surface of the non-rotatable part 49 and the flat surface of the rotatable part 50 serve to lock the rotatable housing to its non-rotatable support. Movement of the lever 30 in either direction about its pivotal support, therefore, serves first to dislodge one of the balls 53 from its wedging position and then to establish an operable connection with the housing so that continued movement of the lever 30 effects rotation of the housing with relation to its support. Consequently, the housing is normally located at any position in which it may be set by the lever 30 so that adjustment of the tension on the governor spring, which establishes the speed of operation of the engine, remains constant. Any movement of the lever 30 in either direction acts first to release the lock of the control mechanism and then to adjust the control mechanism in a direction depending upon the direction of movement of the lever. When the lever is released, the locking means again automatically becomes effective. An advantage of the construction illustrated is that the locking means and all of the principal moving parts are constantly and abundantly lubricated by a bath of oil contained within the housing member 38.

When a control mechanism of this kind is employed as throttle control means on an internal combustion engine, it is desirable to limit the adjustment of the lever 30 to a position which prohibits accidental shutting down of the engine. This is accomplished in the structure disclosed by a stop member 60 supported on the bracket 34 and engageable by a pin 61 carried by a projection 62 on the housing part 38. When the pin 61 occupies the position illustrated in dotted lines at 63 in Fig. 3, the engine should be operating at low idle speed. Further movement of the adjusting lever in a counterclockwise direction will effect shutting down of the engine and may be accomplished by retraction of the pin 61 to permit it to pass the stop 60. Such retraction may be accomplished through the medium of a knob 64 on the outer end of the pin 61. A spring 65 is provided for urging the pin to its normal extended position.

I claim:

1. A control mechanism comprising a non-rotatable support having a cylindrical surface, a rotatable part thereon having a relatively flat surface opposed to and spaced from said cylindrical surface, means connecting said rotatable part with mechanism to be controlled, a pair of wedging members engaged between said cylindrical and flat surfaces and locking the rotatable part against rotation, a pivoted lever, means carried by the lever and disposed between said wedging members whereby initial movement of the lever in either direction about its pivot will dislodge one of the wedging members, and means whereby further movement of the lever in the same direction will impart rotation to said rotatable part.

2. A control mechanism comprising a non-rotatable support having a cylindrical surface, a rotatable part thereon having a relatively flat surface opposed to and spaced from said cylindrical surface, means connecting said rotatable part with mechanism to be controlled, a pair of wedging members engaged between said cylindrical and flat surfaces and locking the rotatable part against rotation, a pivoted lever, means carried by the lever and disposed between said wedging members whereby initial movement of the lever in either direction about its pivot will dislodge one of the wedging members, and means whereby further movement of the lever in the same direction will impart rotation to said rotatable part

said rotatable part being formed as an enclosure for the wedging mechanism and being adapted to contain a lubricant.

3. A control mechanism comprising a fixed support having a cylindrical surface thereon, a housing rotatably mounted on said support and enclosing said cylindrical surface, a connection between the housing and mechanism to be controlled, a substantially flat surface within the housing opposed to said cylindrical surface, a pair of wedging members interposed between the flat surface and the cylindrical surface to prevent rotation of the housing in either direction on the support, resilient means between the housing and the wedges to urge them toward their wedging positions, a pivoted manually operable lever for moving the housing, and means on said lever for engaging and dislodging either of said wedging members.

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