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TIMING AND IDLING CONTROL MECHANISM

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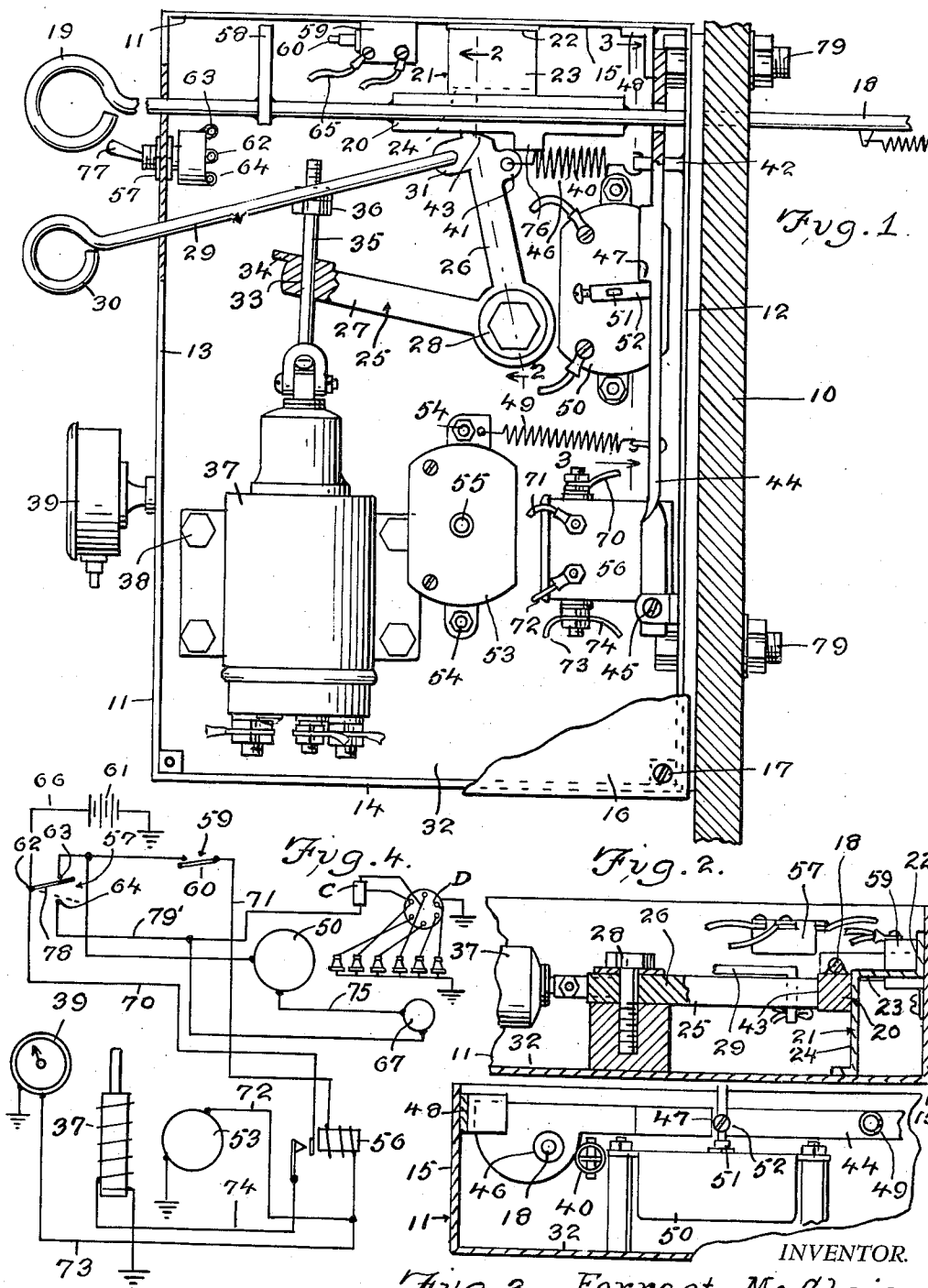


Fig. 3. Forrest McClain

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TIMING AND IDLING CONTROL MECHANISM

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1 Claim. (Cl. 123—102)

This invention relates to a motor or engine, such as an internal combustion engine, and more particularly to a timing and idling control mechanism for such as an engine.

The object of the invention is to provide a timing and idling control mechanism for an engine which will permit the engine to operate at idling speed for a predetermined period of time, as for example before it is shut down.

Another object of the invention is to provide a control mechanism for an internal combustion engine whereby the mechanism will control the time that the engine operates and whereby the throttle can be automatically set to idle for a predetermined period of time, the present invention permitting the throttle to be automatically returned to idling speed before the engine is completely shut down so that the necessity of idling the engine manually is eliminated.

A further object of the invention is to provide a timing and idling control mechanism which is extremely simple and inexpensive to manufacture.

Other objects and advantages will be apparent during the course of the following description.

In the accompanying drawings, forming a part of this application, and in which like numerals are used to designate like parts throughout the same.

Figure 1 is a side elevational view of the control mechanism of the present invention, with parts broken away and in section.

Figure 2 is a sectional view taken on the line 2—2 of Figure 1.

Figure 3 is a sectional view taken on the line 3—3 of Figure 1.

Figure 4 is a wiring diagram illustrating schematically the present invention.

Referring in detail to the drawings, the numeral 10 designates a portion of a supporting structure such as a fire wall of a pumping unit, Figure 1. There is further provided a hollow housing which is indicated generally by the numeral 11, and the housing 11 includes a first vertically disposed end wall 12 which is arranged contiguous to the supporting structure 10. The housing 11 further includes a second end wall 13 which is arranged in spaced parallel relation with respect to the first end wall 12. The housing 11 is also provided with a horizontally disposed bottom wall 14 and a horizontally disposed top wall 15, Figure 1. A cover plate 16 is detachably connected to the housing 11 through the medium of securing elements such as the screws 17. Thus, by removing the cover plate 16 access can be gained to the parts in the interior of the housing 11.

The numeral 18 designates a throttle rod which can be provided for changing the speed of an engine such as an engine used for pumping water or the like for irrigation purposes on a farm, and an end of the throttle rod 18 is provided with a handgrip 19, the throttle rod 18 being movably mounted in the housing 11. Secured to the throttle rod 18 and mounted for movement therewith, is a bar 20 which can be made of any suitable material such as metal. Arranged in the housing 11 is a station-

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ary base which is indicated generally by the numeral 21, and the base 21 includes a horizontal upper portion 22 which may be secured to the lower surface of the top wall 15 in any suitable manner, as for example, by welding. The base 21 further includes a vertical depending portion 23 which terminates in a horizontal portion 24 that is adapted to coact with the movable bar 20.

Pivottally mounted in the housing 11 is a bell crank lever 25, and the bell crank lever 25 includes a first arm 26 and a second arm 27, the arms 26 and 27 being arranged angularly with respect to each other. The bell crank lever 25 is pivottally connected to the back wall 32 of the housing 11 through the medium of a pivot pin or bolt 28. A manually operable release rod 29 is provided with a handgrip portion 30 on its outer end, and the inner end of the release rod 29 is connected to an apertured ear 31 on the first arm 26. The second arm 27 of the bell crank lever 25 is provided with an aperture or opening 33 through which extends a movable rod 35. A disc or flange 34 is secured to the end of the arm 27, and the disc 34 is adapted to be selectively engaged by nuts or securing elements 36 which are mounted on the end of the rod 35. The rod 35 is moved upon energization of a solenoid 37, and the solenoid 37 may be secured within the housing 11 through the medium of securing elements 38.

A pressure switch 39 is arranged exteriorly of the housing 11 and may be secured to the end wall 13. A coil spring 40 has one end connected to an apertured ear 41 on the first arm 26 of the bell crank lever 25, while the other end of the coil spring 40 is connected to a lug 42 which extends inwardly from the first end wall 12. An end of the first arm 26 may be beveled or tapered as at 43, and the tapered surface 43 is adapted to engage a portion of the movable bar 20.

Arranged within the housing 11 is a pivottally mounted lever 44, and the lever 44 may have one end pivoted in place through the medium of a pivot pin 45. The lever 44 is provided with an aperture or opening 46 through which the throttle rod 18 extends, and the lever 44 is provided with an enlarged portion or shoulder 47 for a purpose to be later described. An L-shaped stop member 48 may be secured to the top wall 15 for limiting pivotal movement of the lever 44, and a coil spring 49 has an end connected to the lever 44 for normally urging the lever 44 into the position shown in Figure 1.

Mounted in the housing 11 is a minute timer which is indicated generally by the numeral 50. Actuated by the timer 50 and extending outwardly therefrom is a shaft 51 which carries a rotary finger 52, and the finger 52 is mounted for movement into and out of engagement with the shoulder 47 on the lever 44.

Arranged within the housing 11 is an hour timer 53 which may be secured in place by securing elements 54. The hour timer 53 has a rotary shaft 55 extending outwardly therefrom. A relay 56 is also mounted or arranged in the housing 11, and a manually operable switch member 57 may be mounted on the end wall 13 of the housing. Secured to the throttle rod 18 and extending therefrom is a lug or ear 58, and the lug 58 is mounted for movement into and out of engagement with a push button 60 which extends from a switch 59.

Referring to Figure 4 of the drawings, there is shown a wiring diagram wherein the numeral 61 may designate the source of electrical energy which may be a battery for example. The letters C and D indicate the usual coil and distributor, respectively. The manually operable switch member 57 is provided with a contact 62 and a pair of terminals or contacts 63 and 64, and the terminals 63 may be used for setting the apparatus on automatic operation. The terminal 63 may be connected to the switch 59 through the medium of a conductor or wire 65.

and a conductor 66 may lead from the source of electrical energy 61 to the contact 62 on the switch 57. The numeral 67 designates an oil pressure switch which may be arranged on the pump or may be arranged in engagement with a conduit through which the fluid is flowing. The switch 39 is of the adjustable type so that it can be calibrated or adjusted as desired. A wire 70 may connect the switch 57 to the relay 56, and a wire 71 connects the switch 59 to the relay 56. The relay 56 may be electrically connected to the hour timer 53 through the medium of a wire 72, and a wire 73 may lead from the pressure switch 39 to the relay 56. The solenoid 37 is connected to the relay 56 through the medium of a wire 74, while the minute timer 50 is connected to the oil pressure switch 67 by means of a wire 75.

The numeral 76 designates a guide member which insures that the bar 20 will be maintained in its proper position as it moves back and forth since the bar 20 will move between the guide member 76 and the portion 24 of the base 21. The numeral 77 designates the manual element which can be used for actuating the switch member 57. The numeral 79 designates securing elements such as bolt and nut assemblies which can be used for attaching the housing 11 to the supporting structure 10.

From the foregoing, it is apparent that there has been provided a timing and idling control mechanism for an engine such as an internal combustion engine. With the present invention, the engine can operate at idling speed for a predetermined period of time such as before the engine is shut down. Thus, by means of the present invention it will not be necessary to manually idle the engine since the idling can be accomplished automatically whereby there will be less wear and tear on the engine or pumping unit.

The switch 57 can be manually set in either one or two positions. That is, when the movable contact 78 of the switch 57 is in engagement with the contact or terminal 63, the apparatus is in automatic position. Furthermore, when the movable element 78 of the switch 57 engages the contact 64, the switch 57 is in starting position. Initially, the element 78 can be moved to the broken line or dotted line position shown in Figure 4 by means of the finger engaging portion 77 so that the element 78 will engage the terminal 64 whereby the engine is started in the same manner as any other engine. Thus, the engine may form part of a pumping unit such as a pumping unit for pumping irrigation water on farms and the like. When the switch 57 is in starting position, all other elements in the housing 11 are at zero position so that nothing will work. Next, the pump is primed in the usual way and the pump starts operating. Next, the main hour timer 53 is turned or set by means of a knob which is arranged on the outer end of the shaft 55, and this knob is manually set or adjusted to the amount of hours that the engine is to operate. Then, the switch 39 can be adjusted so that it indicates a little less than operating pressure so that the contacts will close when a pressure drop occurs. The main hour timer 53 and the pressure switch 39 have normally open contacts, and after the expiration of time or upon a drop in pressure, these contacts on either of the switch 39 or the hour timer 53 will close and the throttle rod 18 will be released so that the throttle rod 18 will be in idling position. Next, the idling or minute timer 50 is manually set by means of a knob which can be arranged on an outer end of the shaft 51 and the minute timer 50 is set so that the finger 52 engages the shoulder 47 on the lever 44 as shown in Figure 1 and this is accomplished by turning the shaft 51 approximately one-quarter of a turn in a clockwise direction. Next, the switch 57 is moved to automatic position and this is accomplished by moving the terminal 78 to the solid line position shown in Figure 4 so that the terminal 78 engages the contact 63 and with the parts in the automatic position it is safe to leave the unit. Then, at the expiration of the working time of the pump, or upon the happen-

ing of a pressure drop such as a pressure drop due to a break in the pipe line or a line separation, the throttle rod 18 will be released and will be returned to idling position. When the throttle rod 18 returns to idle position, the minute timer or idling timer 50 will be released since the bar 20 will strike the lever 44 and this will move the shoulder 47 away from the finger 52 so that the finger 52 is free to rotate and with the finger 52 free to rotate, the timer 50 can operate. Thus, the timer 50 may operate for a short period of time such as three or four minutes and then the ignition circuit will be broken and the engine will stop. When the throttle rod 18 returns to idling position, the lug 58 will contact the push button 60 of the switch 59 so that the current will be cut off to the solenoid 56 so that the solenoid or relay 56 is deactivated which in turn will deactivate or deenergize the solenoid 37 and this in turn will return the clamping mechanism to clamping position. The clamping mechanism includes the bell crank lever 25 which is provided with a tapered portion 43 that serves to clamp against the bar 20. The clamping mechanism thus serves to selectively hold the throttle rod 18 in a stationary position before the engine will stop. The motor can be left as it is, in the stopped position and there will be no battery drain from any switches.

The main hour timer 53 and the pressure switch 39 actuates the solenoid 37 so as to release the throttle rod 18. The switch 59 is normally opened when the throttle rod is in idling position.

It is well known that manufacturers usually recommend that engines should be idled after running to dissipate heat so as to prevent warping of valves or other damage to parts. Many farmers live away from the farms so that with the present invention it is possible to automatically shut off the engines without the necessity of the farmers being present. The numeral 18 designates the throttle rod which is connected to the engine carburetor in the usual manner, while the numeral 29 designates a manual release rod which is connected to the arm 26 of the bell crank lever 25. Thus, by pulling out on the rod 29 by means of the hand gripping portion 30, the clamping bell crank lever 25 can be released so that the throttle rod 18 can be adjusted to any desired setting since pulling out on the rod 28 releases the clamping mechanism. The spring 40 serves to maintain the clamp in holding position until the clamp is actuated.

The oil pressure switch 67 may be arranged on the pumping unit and may be a safety switch. The various timers may be of conventional construction, and the mechanism of the present invention will permit the engine to idle for a predetermined period of time, as for example, for three or four minutes before a complete engine shut down, and this is done automatically. When the elements 78 of the switch 57 is in engagement with the terminal 64, current can flow from the battery 61 to the engine ignition system. The wire 79' may lead to the engine ignition. After the engine has been started, the element 78 is moved to the automatic position so that it engages the contact 63 so that the current from the battery 61 goes through the normally closed switch 59 and then to the relay or solenoid 56 and from the relay 56, the current goes to the pressure gauge 39 and to the hour timer 53. When the throttle rod 18 moves to idling position, it starts the minute timer 50 which lets the minute timer operate for approximately several minutes. The minute timer 50 is connected also to the oil pressure switch and when the minute timer 50 has run the predetermined period of time, the engine or motor stops. Also, in the event that oil pressure drops, the engine will cut off. When the throttle rod 18 moves from left to right in Figure 1, it moves the lever 44 so that the finger 52 can pivot whereby the timer 50 can start operating.

The switch 57 is a single pole double throw switch and is constructed so that when the contact 78 is in the solid line position of Figure 4 the device is in automatic posi-

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tion, and when the contact 78 is in the broken line position of Figure 4, the device is in starting position. The pressure switch 39 is adjustable and a wire may lead from the switch 39 to the housing 11. The member 56 is a magnetic switch, while the member 50 is an idling timer. With the present invention an engine will be kept running for a predetermined period of time and then the engine will idle for a few minutes and then the engine will stop. When the throttle rod 18 moves forward, it releases the timer 50 and also opens the switch 59 to thereby deenergize the magnetic switch 56 which in turn deenergizes the large solenoid 37 so as to permit the clamping bell crank lever 25 to hold the throttle rod 18. As shown in Figure 1 the finger 52 is in holding position. It is to be noted that in the operation of the engine, as set forth above, the throttle or fuel control rod 18 is instantly adjustable to suit any load placed on the engine. The throttle or fuel control rod bar 20 is held at any setting by frictional engagement between the tapered end 43 of the arm 26 and the throttle or fuel control rod bar 20. The spring 40 biasing the arm 26 will maintain the tapered end 43 thereof in constant contact with the throttle or fuel control rod bar 20 to thereby assure more of a safety margin in holding the throttle or fuel control rod bar 20 in position. By manual operation of the throttle or fuel control rod 18 by means of the hand grip 19 the throttle or fuel control rod bar 20 can be set and held in an infinite number of positions.

If the operator of the engine overlooks setting the pressure switch 39 or the manually operable main hour timer 53, but has set the minute timer 50, the engine will immediately go into idle and the operator will know that some operation that he has performed is incorrect and he should check to correct his mistake. In other words, if the control has not been properly set or adjusted when the operator sets the minute timer 50 or closes the switch 57 so that contacts 62 and 64 complete the circuit and the throttle or fuel control rod 18 moves to forward position the operator will know immediately that he has not adjusted the control correctly.

The engine powering a pump or other machine that has run under heavy load for a considerable time is far different from an engine powering an automobile in the respect that an engine powering an automobile is not generally running near its capacity. It is rarely true that an engine in an automobile has been run so hard that it should be idled before shut-off, on the other hand it is a rare case that an engine powering a pump or other machine should not be idled.

The present invention will control the time that the engine operates and will automatically set the throttle to idling speed for the last several minutes before a

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complete engine shut down. The mechanism can also be connected to the water temperature and oil pressure switches. Thus, it is recommended by engine manufacturers to idle the engine to a period of several minutes before a complete shut down and without the present invention this must be done manually, but with the present invention this is accomplished automatically for the pre-setting time of operation of this invention primarily relates to an automatic controlling of an unattended engine.

I claim:

A timing and idling control mechanism for an internal combustion engine, a movable throttle rod and having a hand grip on its outer end for manually controlling the speed of the engine, a movable bar secured to said rod, a bell crank lever pivotally mounted adjacent the bar on said throttle rod, said bell crank lever embodying first and second angularly arranged arms, a release rod having its inner end pivotally connected to said first arm, the free end of said first arm being tapered for engagement with said bar, a coil spring connected to the first arm of said bell crank lever, there being an aperture in said second arm, a solenoid embodying a rod projecting through the aperture in said second arm, a disk secured to said second arm, securing elements on the rod extending from said solenoid and said securing elements being mounted for movement into and out of engagement with said disk, a lever provided with an aperture for the projection therethrough of said throttle rod, there being a shoulder on said lever, a minute timer mounted in said housing and embodying a rotary shaft having a finger thereon mounted for movement into and out of engagement with said shoulder, a coil spring connected to said lever, a relay, a manually operable switch member, an ear secured to said throttle rod, a switch mounted adjacent said throttle rod and embodying a push button adapted to be engaged by said ear, an hour timer including a rotary shaft, a fluid pressure switch, and an electric circuit embodying said switch mounted adjacent said throttle rod, said relay, said minute timer and said hour timer and said manually operable switch member and said fluid pressure switch for controlling the operation of said throttle rod after said throttle rod has been manually pre-set to control the operation of the unattended engine.

References Cited in the file of this patent

UNITED STATES PATENTS

2,434,871	Taft	Jan. 20, 1948
2,475,166	Vanerka	July 5, 1949
2,495,857	Massare	Jan. 31, 1950
2,748,759	Schiffer	June 5, 1956