Sept. 8, 1953 F. T. IRGENS 2,651,296

CONTROL DEVICE

Filed May 22, 1950 2 Sheets-Sheet 1

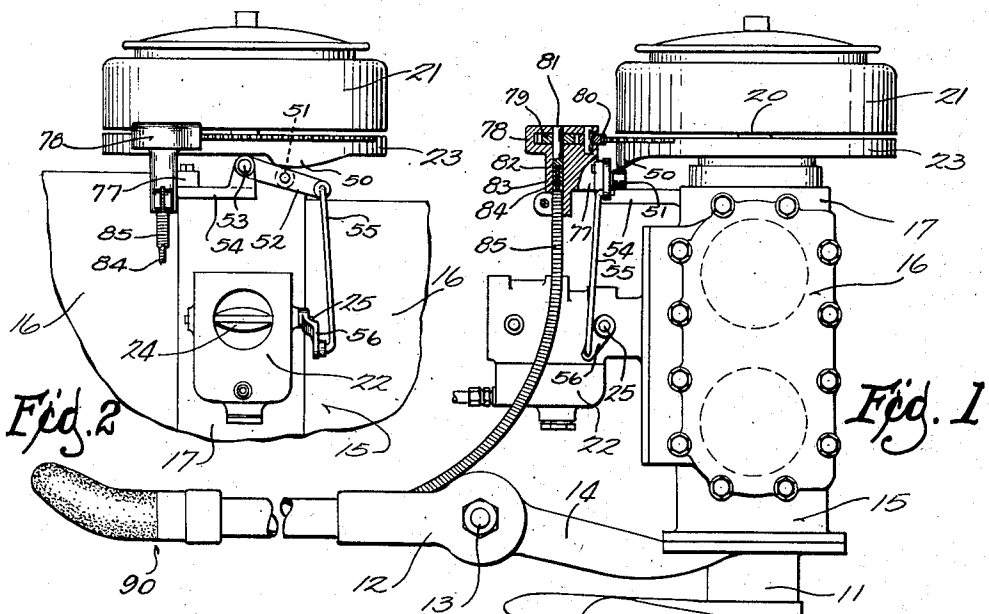


Fig. 2

Fig. 1

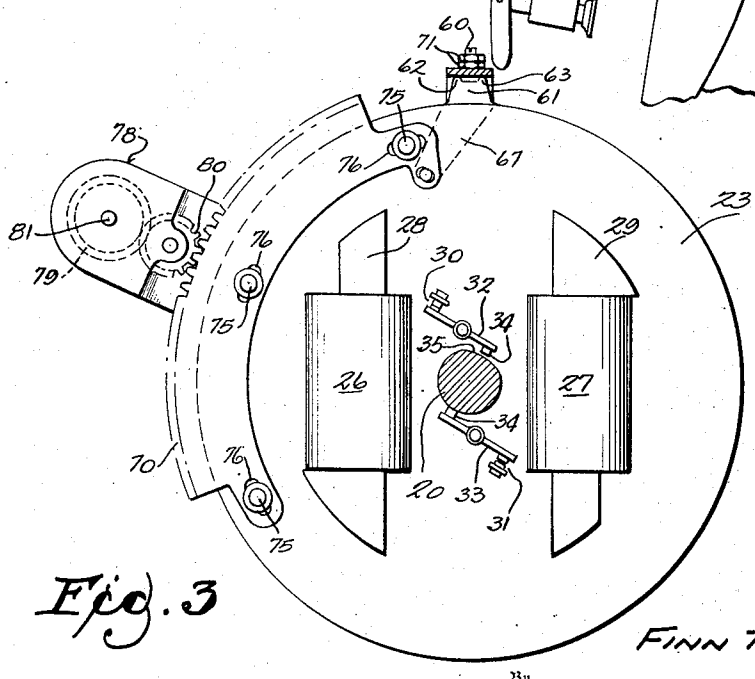


Fig. 3

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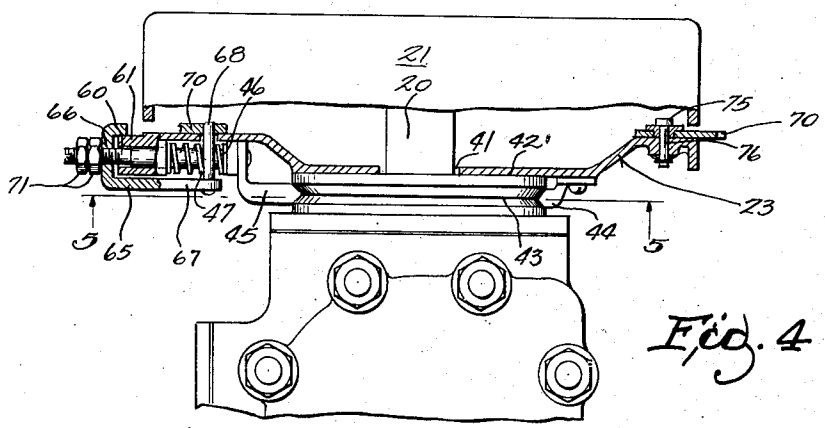


Fig. 4

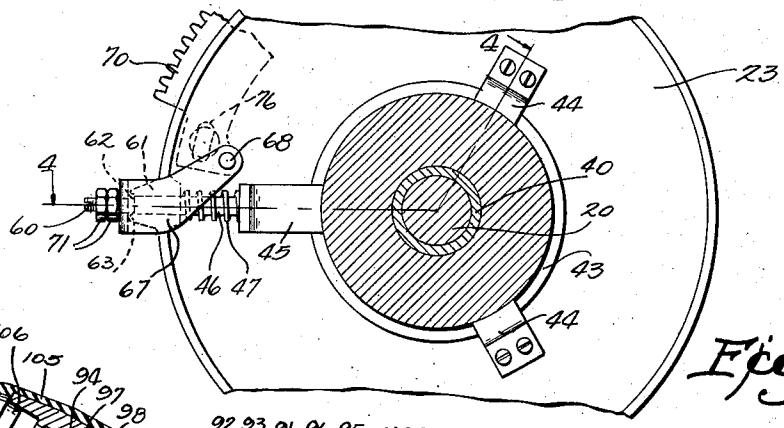


Fig. 5

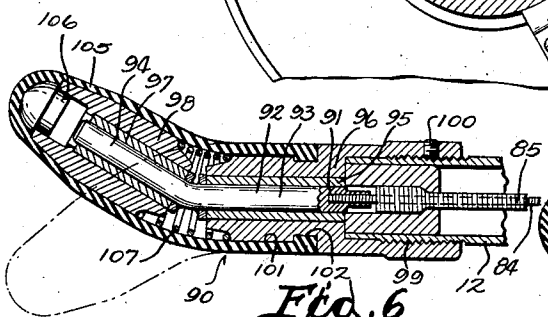


Fig. 6

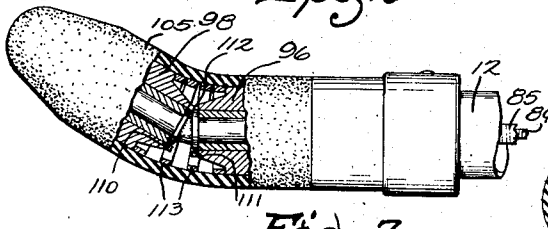


Fig. 7

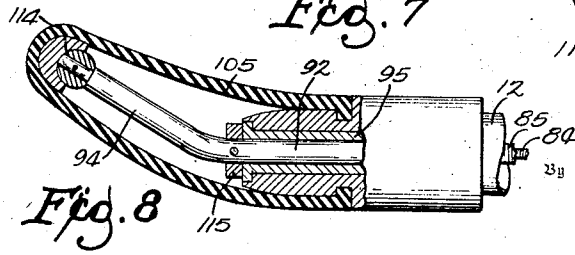


Fig. 8

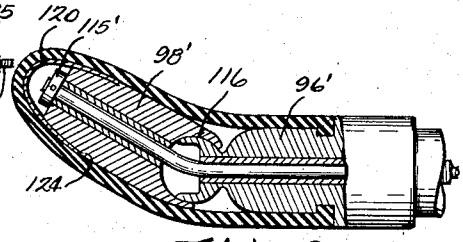


Fig. 9

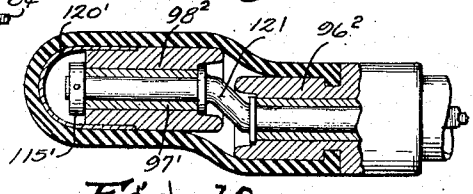


Fig. 10

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UNITED STATES PATENT OFFICE

2,651,296

CONTROL DEVICE

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Application May 22, 1950, Serial No. 163,523

10 Claims. (Cl. 123—98)

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My invention relates to improvements in control devices.

More particularly stated my invention relates to improvements in control devices especially suited for control of internal combustion engines.

The speed control of internal combustion engines with torque and vibration constantly present to tend to vary the position of adjustment, presents problems which are met with my invention hereinafter described. The timing of the spark for such an engine is best adjusted when it is coordinated with the speed of the engine. Therefore, since the speed of the engine is regulated by fuel supply, the increased fuel supply and the advance of spark should be coordinated. This is accomplished as indicated by the description of my invention below.

Furthermore, in the control of many internal combustion engines the operator is occupied with many duties which do not permit of his constant attention to coordination of spark and throttle and if torque and vibration tend to cause the adjustable elements of spark or throttle to creep away from the adjusted position the return of the controls to proper coordination and the return of the controls to proper position for desired speed may overtax the ability of the operator to perform his duties. One illustration of the problem solved by my invention is to be found in the spark and throttle control of an internal combustion engine for an outboard motor on a boat or other craft. The operator is called upon to perform all of the duties pertaining to the navigation of the powered craft plus all of the duties of operating and coordinating the engine control functions.

In addition to coordination and in addition to the prevention of creep of the control devices due to vibration or torque my invention provides improved control handle means with connecting parts so that steering and navigation may be performed by an outboard motor operator at the same time that all engine control is centered for immediate attention of the operator even though throttle or spark or both may be locked in a given position of coordinated adjustment.

The objects, therefore, of my invention are:

To provide a lock for a control device, at the same time maintaining the control device freely subject to manual movement in variable increments of adjustment; to provide coordinated interconnection between operating adjustments of the various adjustable functions of such a machine as an internal combustion engine; and to provide the control handle or manual operating unit for control devices such as those referred to above whereby an operator may manually adjust the various functions of a machine without diverting his attention from others of his duties such as navigation, steering, etc.

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In the drawings:

Figure 1 is a side elevation of the upper portion of an internal combustion outboard motor equipped with my invention, certain parts of my control devices being shown in vertical section.

Figure 2 is a front elevation showing fragmentarily a portion of the outboard motor shown in Figure 1 and the position of certain control device parts when they are in position for high speed motor operation.

Figure 3 is a plan view of the adjustable magnetoplate and certain of my control devices attached thereto as exposed when the fly-wheel of the outboard shown in Figure 1 is removed; the crank shaft of the outboard motor being shown in horizontal section.

Figure 4 is an enlarged view of the upper portion of the motor shown in Figure 1, portions of the fly-wheel, magnetoplate and control device being broken away on line 4—4 of Fig. 5.

Figure 5 is a bottom view of the magnetoplate shown in Figure 4, a horizontal section through the outboard motor being taken on line 5—5 of Figure 4.

Figure 6 is a section through the hand grip portion of the steering handle of the outboard motor shown in Figure 1 and shown the parts of my control device incorporated therein.

Figures 7–10 inclusive are views similar to Figure 6 and showing alternative forms of hand grip mechanism for use in accord with my invention.

Like parts are designated by the same reference characters throughout the several views.

I shall describe the embodiments of my invention in conjunction with a somewhat conventional outboard motor construction, although it will be obvious from the following description of my invention that the various features of my control devices may be used for the control of other mechanical units.

In the drawings the outboard motor includes mounting bracket 10 for attachment of the outboard motor to the transom of a boat. In this bracket 10, the vertical power shaft and housing 11 and the parts of the motor thereabove, are dirigibly mounted so as to be oscillated under

the control of a steering handle 12 hingedly secured at 13 to a steering arm 14 connected to the power head 15. The powerhead includes the usual cylinders 16 mounted upon a crank case 17 with the usual internal combustion engine parts carried by said cylinders and crank case, said parts including a crank shaft 20, a fly-wheel 21, carburetor or mixing valve 22 and magneto ignition parts carried by a magnetoplate 23. In the particular embodiment of my invention shown in these drawings, plate 23 is adjustably oscillatable about the axis of the crank shaft 20 and butterfly valve 24 with its butterfly valve shaft 25 constitute the speed control devices for the internal combustion engine which are subject to the control of my improved control devices.

Magnetoplate 23, as shown in Figure 3, has mounted upon it the coils 26 and 27 with their respective armatures 28 and 29 about which the fly-wheel 21 carrying magnets (not shown) may revolve upon crank shaft 20 to induce electric current to be controlled by sets of contact points 30 and 31 to provide timed spark discharges in the cylinders 16 in the power head 15. I have not shown the electric circuit for this purpose since such circuits are well known and may be regarded herein as conventional. The usual movable breaker points at 30—31 are biased to close position and mounted upon breaker arms 32—33 with a fiber at 34 to ride upon crank shaft 20 a portion of the surface of which at 35 is flattened to permit the points to make and break in proper time.

To properly adjust the timing, electrically, of the motor shown in the drawings, the magnetoplate 23 is subject to adjustment in an oscillatory manner about the crank shaft 20, and the breaker point mechanism carried by the plate points 20 is thus caused to operate "earlier" or "later" in accord with the adjustment of the plate rotatably about the shaft 20. According to previous practice plate 23 is frictionally mounted upon a stationary sleeve 40 in which the crank shaft 20 is rotative, but it has always been necessary to employ a high degree of friction on the magnetoplate mounting in order to prevent it from changing its position due to the more or less violent torque vibration always encountered in outboard motors. This high friction has always made it relatively hard to adjust the magnetoplate.

According to my invention magnetoplate 23 is apertured at 41 to freely receive and be accurately centered upon the upper end of the crank shaft 20 (see Fig. 4). The plate need not rest frictionally against the top surface 42 of crank case 17, for it is positioned by the grippers described below. The exterior of the top portion of crank case 17 is circular in cross section and is V-grooved at 43. Into this V-groove are fitted two or more gripper brackets 44 secured to the underface of the magnetoplate 23. "Opposite" the gripper brackets 44 a movable gripper 45 carried by a spring pressed plunger 46 is so mounted upon the underside of the magnetoplate 23 that its normal position is that shown in Figures 4 and 5 in which compression spring 47 thrusts the movable gripper 45 deeply into the groove 43 with the result that grippers 44 on the opposite side of the plate 23 are likewise thrust deeply into the groove to effectively clamp the plate 23 upon the crank case 17 and prevent oscillation of the magnetoplate 23. Thus unless the gripper 45 is somewhat withdrawn from its wedged position in the groove, the magnetoplate and the parts associated therewith are stationary relative to the crank case and remain stationary until my control devices are actively set in motion as described below.

Since the adjustment of spark timing and the adjustment of butterfly valve 24 are to be coordinated for efficient internal combustion engine operation, I shape the underside of the plate 23 to include a cam projection 50 as shown most clearly in Figures 1 and 2. When the cam is in the position shown in the Figures 2 and 3, the magnetoplate is in extreme position of oscillation for highest speed of the motor, and the cam bears with its greatest force upon cam roller 51 carried by the central portion of throttle arm 52 which is fulcrumed at 53 on a control boss 54 extending forwardly from crank case 17. Throttle control arm 52 controls throttle link 55 which is connected in turn with butterfly shaft arm 56. Thus when butterfly valve 24, which is biased to closed position is acted upon by the cam 50, the link 55 and arm 56 are thrust downwardly against the bias and when the magnetoplate is moved clockwise, as viewed from the top of the motor, the throttle will close as the cam 50 relieves its pressure upon roller 51. At the same time, of course, the spark is retarded and the motor is slowed.

It will be noted that movable gripper 45 is mounted upon the inner end of gripper release shaft 60 about which the compression spring 47 is coiled. This gripper release shaft extends through gripper mounting lug 61 forming part of the magnetoplate 23. The outer end of the gripper mounting lug is vertically ridged at 62 and 63. Against these ridges is a J-shaped rocker plate 65 apertured at 66 so that the gripper release shaft 60 may extend through it. The long leg 67 of the rocker plate 65 is somewhat off-set (shown most clearly in Figure 5) and terminated in a pin connection at 68 with a control gear sector 70. Lock nuts 71 adjustable upon the end of the gripper release shaft 60 bear snugly against the rocker plate 65 under the pressure of compression spring 47 and it will be obvious from an examination of Figures 4 and 5 that if pin 68 is moved in a circumferential direction, either one way or the other, a ridge 62 or 63 will become a fulcrum about which the rocker plate 65 will oscillate, thus pulling the movable gripper 45 slightly out of the groove 43 to release plate 23 for oscillation.

The above description has indicated how adjustment of the carburetor throttle is coordinated with adjustment of the magnetoplate. The control devices for oscillating the magnetoplate 23 so that the operating speed may be controlled by the operator will now be described.

Reference is made above to the gear sector 70 to which the pin connection 68 is secured. This sector is mounted to the upper face of the magnetoplate by means of headed studs 75, but these extend through arcuate slots 76 in the sector to provide for a certain amount of oscillatory movement of the sector before the magnetoplate 23 is forced to move with it. It is during this relatively slight free movement of the sector that the pin connection 68 operates the mechanism for release of the gripper 45 whereby to free the plate 23 for adjustment.

The gear sector 70 has its toothed outer periphery extending radially beyond the magnetoplate 23 and beyond the periphery of the flywheel 21, and the circumferential extent of the gear sector is ample to provide for oscillation of the plate 23 throughout the practical operating

range of the speed and spark control of the particular motor with which it is associated. At a practical and convenient mid-point in the range of oscillation of the gear sector 70, I provide a control bracket 77 secured to the crank case 17. This bracket provides a housing and mounting 78 for a drive pinion 79 and a transfer pinion 80 so disposed and so meshed that rotation of the drive pinion 79 results in rotation of transfer pinion 80 and oscillation of the sector 70. The shaft 81 of pinion 79 has its bearing 82 in a lower extension 83 of the bracket 77 and is so shaped as to have good mechanical connection with a flexible drive cable 84 sheathed at 85 and extended into the hollow interior of steering handle 12. Within the steering handle 12 the sheathed flexible cable extends to a wobble grip 90. The construction of the wobble grip 90 is such that the operated of my control device may rotate the flexible shaft 84 and thus rotate the pinion 79 and 80 in one direction or another to oscillate the gear sector 70. In the first small increment of movement of the sector, the pin connection 68 rocks the rocker plate 65 to release the gripper 45. Then upon further oscillation in the same direction, the magnetoplate 23 is moved to adjust the spark timing. But as soon as the operator ceases to urge the sector to move the direction in which the adjustment was initiated spring 47 will pull the rocker plate 65 back into abutment with both of the ridges 62 and 63 to permit the movable gripper 45 to re-engage grooved crank case at 43. Reverse movement of the sector is readily accomplished since the first movement of the rocker plate in the opposite direction will release the movable gripper for adjustment of the plate 23.

It will be obvious from the above description that any form of hand grip upon the end of the steering lever 12 and attached for positive rotation with flexible shaft 84 may be used to accomplish an adjustment of the control devices thus far disclosed above, but if the handle is an ordinary knurled tube there is little for the hand of the operator to grasp in a manner which will inform him, without visual examination, of the position of the control devices. On the other hand if the handle is shaped with an exposed crank there is danger that gloves or clothing of the operator may become entangled therewith to interfere with speedy and accurate control of the motor, it being remembered that the steering handle is not only used for speed control but is also used for steering throughout a relatively wide range of oscillation of the handle 12.

I have, therefore, provided the improved wobble grip shown in various alternative forms in Figures 1 and 6 to 10 inclusive. In each of these wobble grip constructions, the flexible shaft 84 terminates in a positve connection at 91 with a wobble crank 92 which includes a straight extension 93 in alignment with the flexible shaft 84 and a wobble tip 94. The straight portion 93 of the wobble crank 92 has its separate bearing 95 carried by the main frame 96 of the wobble grip, and the wobble tip 94 of the crank 92 has a separate bearing 97 mounting in a wobble frame 98. The main frame 96 of the wobble grip is bored and threaded at 99 to receive the end of the steering handle 12. A set screw 100 firmly holds the frame 96 of the grip so that the frame may not become loose and may not rotate with respect to the handle 12. It will be noted that the main wobble grip frame 96 has a smaller diameter at 101 and that there is a groove at 102. A resilient tubular hand grip 105 of rubber or other rubber-like material is tightly receivable over the wobble frame 98 or the main frame smaller diameter 101 and is provided with an interior flange to fit the groove 102. Any form of suitable adhesive may be used to bind the rubber grip 105 to the main frame at 101—102, and may be used to likewise bind the rubber grip to the wobble frame 98. In the tip of the interior of the rubber hand grip 105 is a button shaped cap 106 flanged to bear against the end of the wobble frame 98.

It will be noted that the adjacent ends of the wobble frame 98 and the main frame 96 of the hand grip construction are relieved exteriorly to provide space between the rubber hand grip and these frame members for a short length of spring 107 so shaped and of such predetermined diameter that there may be no collapse of the rubber-like hand grip 106 between the frame members.

From the above description it will be apparent that the operator's hand may grip the handle 12 and the main frame 96 with a portion of his hand or fingers extended in such a way as to rotate the wobble crank 94 by swinging the tip of the rubber grip in an arc as indicated in full and dotted lines in Figure 6. The operator may thus apply this wobble motion in the form of rotative motion to the flexible shaft 84 and thus by means of the pinions 79 and 80 adjust the gear sector 70.

In each of the Figures 7 to 10 inclusive, I show various alternative forms of wobble grip construction each offering features of advantage relating to cost of construction, adaptability with use of differing rubber-like materials, or better suited to personal preferences of a particular user. In the Figure 7 construction frame members 96 and 98 are each provided integrally with pinion-like end flanges 110 and 111, the margins of which are provided with teeth to mesh as at 112, thus assuring that the frame members will not rotate with respect to each other and no torque will be applied to the rubber 105. Also in the Figure 7 construction, the spring member 107 is made up of individual rings 113, which are free from one another but which tend to take the position shown in Figure 7 whereby to prevent the rubber-like grip surface material from folding in between the ends of the frame pieces or between the teeth of the flanges 110—111 between which it might otherwise be pinched. In the Figure 8 construction only the straight portion of the wobble crank 92 is provided with its bearing 95 and the tip of the wobble grip has neither a frame member nor a bearing for the wobble crank 94. An anti-friction ball and socket tip at 114 is fitted snugly at the end of the wobble crank 94 and the rubber-like grip 105 is in tension. Thrust washer 115 pinned to the straight portion of the wobble shaft 92 takes the thrust induced by the tension referred to.

The Figure 9 construction will be understood clearly from the drawing which shows a ball and socket construction at 116 between the main frame 96^1 and wobble frame 98^1. Here a thrust washer 115^1 holds the parts in assembly and a thrust cap 120 bearing against a shoulder at 124 protects the tip of the rubber grip from abrasion upon the end of the wobble crank and the thrust washer.

The Figure 10 construction shows clearly the alternative form of crank 121 with a wobble frame 98^2 equipped with a cap 120^1 comparable to the cap 120 in Figure 9. The main frame 96^1 has a shape as shown in Figure 10 and the wobble frame 98^2 is equipped with a bearing 97^1 for the same purposes as 97 in Figure 6.

It will be obvious from the above description that an operator who takes his position to swing steering arm **14** and steering lever **12** may with one hand on the wobble grip **90** carry out the complete control functions of steering and speed control with a minimum of inconvenience and with a maximum of accuracy control. Obviously for a two-cycle outboard motor, such as the one shown in the drawings, the range of movement for the gear sector **70** may be considerable since the spark timing may be adjustable for operations not only in a forward direction but also in a rearward direction of propeller operation; but I have found that through the use of my control devices and the selection of proper sizes of pinion **79—80**, and with proper selection of cam curve for throttle actuation, I can properly adjust the spark for slow speed, or idling operation and with one-half turn of the wobble crank **92**, can make the final adjustment of the plate **23** from slow to high speed. In other words, one-half turn of the wobble crank **92** will oscillate plate **23** sufficiently to move the throttle shaft **25** from idling position to full open position. Obviously if it is desired that the ratios of pinion sizes at **79** and **80** be otherwise selected a greater accuracy of plate adjustment may be provided.

At the end of any particular increment of adjustment in one direction, my control device assures that the plate **23** will, by means of the grippers **44**, **45** fix plate **23** in the particular position of adjustment to which it was last brought by the operator in his manipulation of the wobble grip.

I claim:

1. In an internal combustion engine having a frame and a control, the improvement comprising a gripper, first means for normally engaging the gripper with the control and frame for interlocking said frame and control against relative movement therebetween, an actuator for moving the control respecting the frame, and second means actuated by initial movement of the actuator for releasing the gripper prior to movement of the control respecting the frame.

2. The device of claim 1 in which said actuator has a lost motion mounting on said control whereby the gripper is released in the range of said lost motion, said first means comprising a resilient member and being interconnected with said second means to restore the actuator and second means to normal position after release of the gripper.

3. In an internal combustion engine having a crank case and a revoluble magnetoflywheel adjacent thereto, a magnetotimer plate mounted for oscillatory adjustment between the crank case and the flywheel, said plate having grippers engageable with the case to prevent adjustment, one of said grippers being movably mounted for release of the plate, a rock plate positioned to move said gripper and a control device connected to said rock plate and to said plate whereby to simultaneously move said gripper and said plate.

4. In an internal combustion engine having an externally grooved crank case and a revoluble magnetoflywheel adjacent thereto, a magnetotimer plate mounted for oscillatory adjustment between the crank case and the flywheel, said plate having a pair of grippers fixed to said plate and having gripper means receivable in said groove, an additional gripper movably secured to said plate and provided with biasing means urging said movable gripper into said groove; a rocker plate mounted upon said plate for relative movement therewith and connected with a control device whereby upon a movement of the control device to relieve the movable gripper of said bias and adjust the position of the plate.

5. The internal combustion engine of claim 4 wherein the biasing means for the movable gripper includes a compression spring between the gripper and the plate, and the control device includes a rock plate between the timer plate and said biasing means, whereby upon response to movement of the control device to initially relieve the movable gripper of a portion of the force of said compression spring.

6. The internal combustion engine of claim 4 in which the control connections include a gear sector connected to said timer plate and the crank case is provided with a bracket; and a bracket carried pinion meshed with said gear sector, and manual means for rotating such pinion.

7. In an internal combustion engine having a frame part and a speed regulating part and a remote manual control, the combination with said speed regulating part, of a detent mounted thereon and releasably engaged with said frame part to hold the speed regulating part in any predetermined position of adjustment, and motion transmitting connections from the remote manually operable part to the speed regulating part and including a connection to said detent for the operation thereof in a releasing direction incidentally to the movement of said speed regulating part, the said detent being biased toward re-engagement with the frame part when relieved of actuation by said connections.

8. The device of claim 7 in which the speed regulating part comprises a timer plate oscillatable upon the frame part.

9. The device of claim 7 in which the speed regulating part comprises a timer plate, said engine being further provided with a carburetor having a throttle valve, together with additional motion transmitting connections from the timer plate to the throttle valve for movement of the valve in an opening direction as the timer plate is advanced and vice versa and for fixing the position of said throttle valve pending release of said detent.

10. The device of claim 7 in which the remote manual control comprises a handle having a rotatably mounted and angularly offset grip manually gyratory at the end of the handle, the said connections comprising a rotor extending through the handle and connected with the grip to be rotated as the grip is gyrated.

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