

Nov. 14, 1933.

J. KUTTNER

1,935,507

CONTROLLING DEVICE FOR ENGINES

Filed Feb. 2, 1933

2 Sheets-Sheet 1

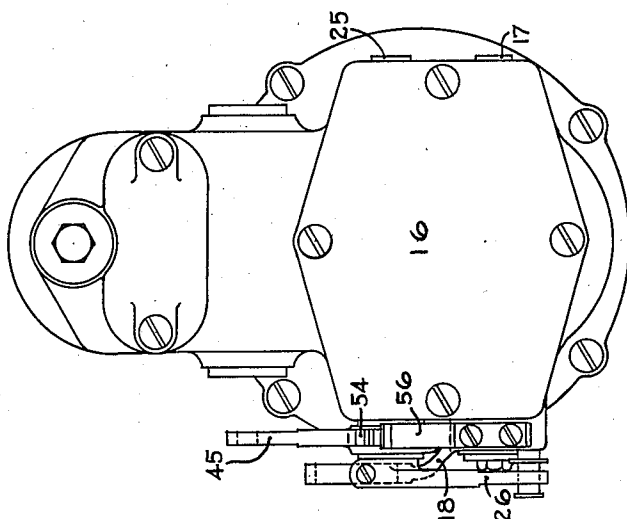


Fig. 2.

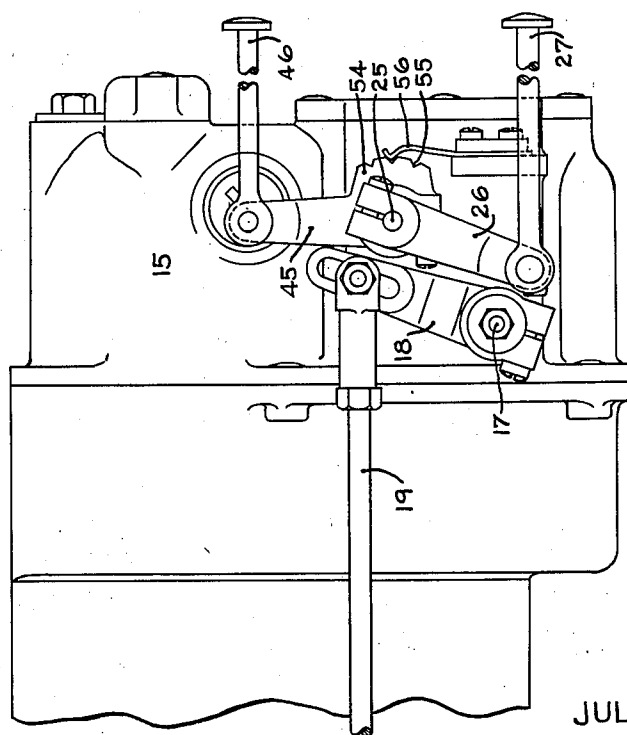


Fig. 1.

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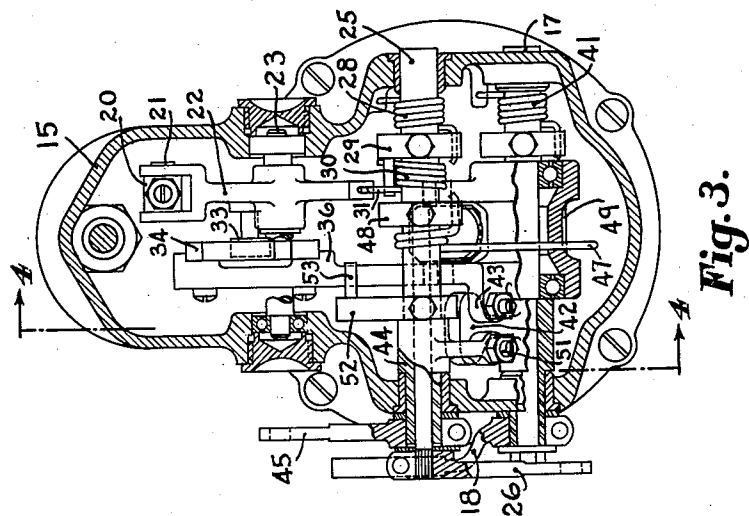


Fig. 3.

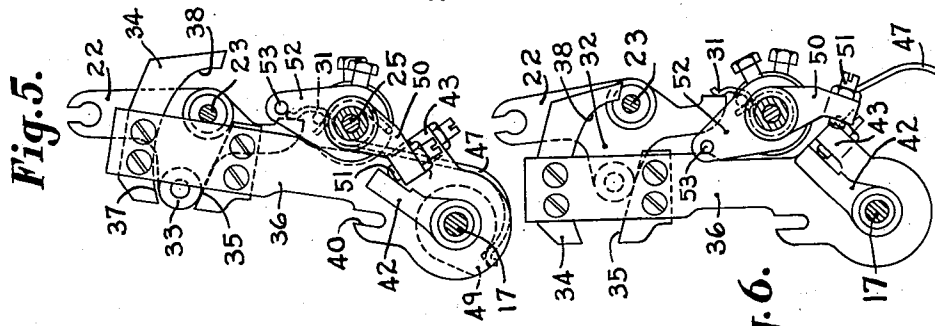


Fig. 5.

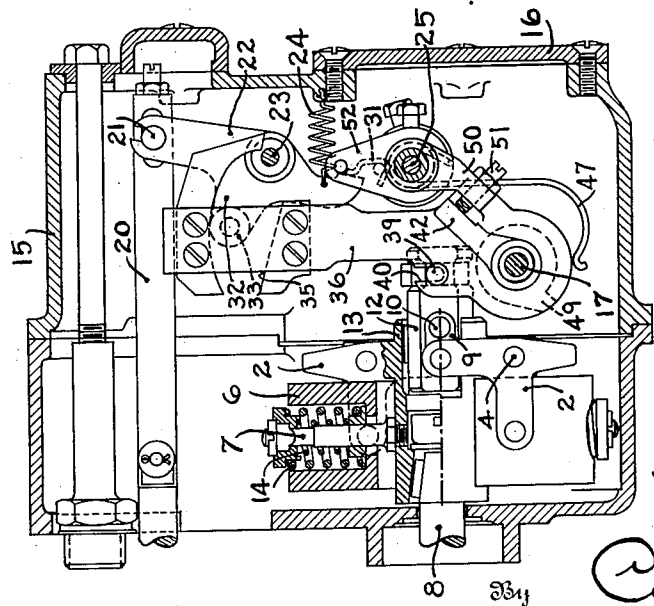


Fig. 4.

Fig. 6.

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UNITED STATES PATENT OFFICE

1,935,507

CONTROLLING DEVICE FOR ENGINES

Julius Kuttner, Long Island City, N. Y.

Application February 2, 1933. Serial No. 654,943

16 Claims. (Cl. 123—140)

My invention relates to controlling devices for engines and more particularly for Diesel engines.

The present invention comprises an improvement on the arrangement shown and described in my copending application Serial No. 609,245, filed May 4, 1932.

In a Diesel engine, it is always difficult to start when the engine is cold. In starting, the idling speed of the engine should be increased and the fuel injection timing should be advanced. According to the present invention, manually controlled means are provided for accomplishing these two purposes simultaneously.

The primary object of the present invention is to provide, in an arrangement in which the movement of the accelerator or fuel feed control element is limited by a governor controlled cam or the like, a device to be used in starting the car which affects the accelerator mechanism in such a manner as to aid in starting.

More specifically, my invention applies to a device of the kind shown in my copending application in which the governor prevents stalling of the motor by increasing the feed of fuel when the speed drops below that required for smooth running. The purpose of the present invention is to add to this construction an arrangement, manually controlled, by which the minimum idling speed permitted by the governor may be increased so that when the engine is cold the feed of fuel will be somewhat greater at idling speed than during normal operation. In addition, my invention includes means to advance the timing by this same manual operation so as to make the motor start more easily.

A further object of my invention is to provide means, particularly in combination with and as a part of the starting means, for stopping the motor. This means preferably comprises a manual arrangement for preventing the governor from increasing the feed of fuel when the speed drops below the minimum necessary for running.

Furthermore, according to the present invention, the starting arrangement has an intermediate position in which the control device can operate independently of the starting arrangement in the manner described in my copending application referred to above.

Still another object of the invention is to arrange this choking device in such a manner that, when affecting the feed of fuel to the motor, the choking action is accomplished by a spring which supplements the action of the governor spring.

A final object of my invention is to provide a

simple device for accomplishing the above results.

Further objects and advantages of the invention will appear more fully from the following description when taken in conjunction with the accompanying drawings which form a part thereof.

In the drawings:

Fig. 1 is a side elevation of an engine casing to which my invention is applied.

Fig. 2 is an end view of the same.

Fig. 3 is a similar view with the end wall of the casing extension removed.

Fig. 4 is a cross section substantially on the line 4—4 of Fig. 3.

Fig. 5 is a detail view of certain parts in choking or starting position.

Fig. 6 is a similar view with the parts in stopping position.

The present control device is shown as utilized on an arrangement of the same general type as that shown in my copending application. This includes a governor comprising bell crank levers 2 pivoted at 4 and each secured at the end of one of its arms to a weight 6 mounted on a guide 7. This governor is driven by the engine in any suitable manner, preferably through gearing and a shaft 8 at a speed somewhat less than that of the engine. Attached to the other ends of the levers 2 are links 9 which are pivoted at 10 to a plunger 12 which is slidably mounted in a frame 13. Springs 14 normally urge the weights inward and thus resist the outward movement of the weights 6.

The device is applied preferably to a Diesel engine, the casing of which has a rearward extension 15, closed by an end plate 16. Mounted in the casing is a shaft 17 which extends outside of the casing and carries on its end a lever 18 which is connected by a rod 19 to the fuel injection timing mechanism of any well known type. A fuel pump or similar fuel feeding device is controlled by a rod 20. Movement of the rod 20 to the right in Fig. 4 increases the feed of fuel to the engine, while movement of the rod 19 to the left (Fig. 1) advances the fuel injection timing.

The rod 20 is connected at 21 to a three-armed lever 22 which is pivoted on a shaft 23. A spring 24 is secured at one end to the lever and at the other to a fixed part of the casing. This spring normally urges the fuel control rod 20 to closing position.

Mounted in the casing above the shaft 17 is a second shaft 25 which extends outside the casing and carries at its outer end a lever 26 which

is connected to a rod 27 and through this rod is operated by the usual hand or foot accelerator lever. A spring 28 which is coiled around shaft 25 is secured at one end to a collar 29 rigidly mounted on the shaft and at its other end abuts against a fixed part of the casing. A second spring 30 also has one end secured to the collar 29 while its other end 31 engages one arm of the lever 22. Turning of the shaft 25 by the lever 26 will thus turn the lever 22 and move the rod 20. It will be evident that this will permit manual control of the fuel feed, the springs 24 and 28 tending to return the fuel feeding mechanism to its closed position.

The third arm 32 of the lever 22 carries a roller 33. This roller is mounted to move between two cam surfaces 34 and 35 which are mounted on a lever 36 pivoted on shaft 17. These two cam surfaces are formed generally in the same manner disclosed in my copending application, the upper surface comprising a portion 37 which limits the movement of the lever 22 so that the amount of fuel which is fed to the engine cannot exceed the amount which will be completely burned in the motor at the momentary speed thereof. The other portion 38 of the upper cam surface is an overspeed surface which, if an attempt is made to drive the motor at an excessive speed, will depress the roller and will thereby reduce the feed of fuel to the engine. The lower surface 35 is the idling control surface, this serving as the speed of the motor drops too low to raise the roller 33 and thereby increase the feed of fuel to the engine. This arrangement will prevent stalling of the engine.

The movement of the lever 36 is controlled by a pin 39 mounted on the plunger 12 which engages in a slot 40 formed in the lever 36. It will be quite evident that as the speed of the engine increases the lever will be moved in a counterclockwise direction as seen in Fig. 4.

The fuel injection timing rod control lever 18 is rigidly mounted on the shaft 17. A coil spring 41 also on the shaft 17 normally urges the lever 18 in such a direction as to retard the timing. In order to advance the timing as the speed of the motor increases, a lever 42 is rigidly fixed on the shaft 17. The lever 36 is provided with a projection 43 which extends in the path of the lever 42. Thus the turning of the lever 36 in a clockwise direction likewise turns the lever 18, while the lever 18, except for the action of the spring 41, is free to turn in such a direction as to advance the timing independently of the lever 36.

The operation of the above described arrangement should be clear from my pending application. As the speed of the motor increases, the fuel controlling device can be manually moved further and further, but never to such an extent as to feed more fuel than the motor can burn at its momentary speed. If the speed becomes too great, the feed of fuel is automatically reduced. If the speed of the engine tends to drop too low so that there is danger of stalling, the feeding of fuel is automatically increased so as to prevent the motor from stopping. As the speed of the motor increases, the fuel injection timing is advanced therewith.

According to the present invention, I provide on the shaft 25 a sleeve 44 which extends out of the casing and carries a lever 45 to one end of which is pivoted a rod 46 which extends to the dashboard of the vehicle and is manually controlled by the operator. Likewise mounted

on this sleeve is a spring member 47, one end of which is fixed to a collar 48 rigid on the sleeve while the other end is adapted to engage an extension 49 on the lever 36 below the shaft 17. Likewise mounted on the sleeve 44 is an arm 50 having at its free end a pin 51 which is engageable with the lever 42 at a point above the shaft 17. It will be noted that the upper end of lever 42 is widened so as to lie in the paths of both arms 43 and 50. A third arm 52 mounted on the sleeve 44 extends upwardly therefrom and has at its free end a sidewardly extending pin 53 which can engage the lever 36.

In starting the engine, the rod 46 is drawn out and the parts assume the position shown in Fig. 5. In this position, the spring 47 adds its tension to that of the springs 14 of the governor. The result of this is that at any given speed the arm or lever 36 will move further in a clockwise direction than when the starting arrangement is not in use. This will mean that at any given speed the roller 33 will be raised to a greater extent by the cam section 35 and the idling speed of the engine will thus be increased. That is, at low speeds the operator by means of the rod 27 can advance the fuel control rod 20 only by a distance which is determined by the engagement of the roller 33 with the portion 37 of the cam 34. At low speeds little movement of the rod 20 is possible. As the speed increases, and the lever 36 approaches the position shown in Fig. 4, more and more fuel can be fed to the engine, although it is quite obvious that there is no necessity to feed this amount of fuel as the cam only acts to limit the movement of the manual means. At any given speed the rod 20 can be advanced and the feed of fuel increased only by an amount such that the fuel can be burned by the engine without smoking. At high speeds, the cam portion 38 will engage the roller 33 and will limit the speed at which the motor can be driven.

If the speed of the motor drops too low, the cam surface 35 will engage the roller 33 in the position shown in Fig. 5 and will increase the feed of fuel to a slight extent so as to prevent the motor from stalling. At the same time, the pin 51 will strike the fuel injection timing lever arm 42 and advance the timing against the action of the spring 41. In this manner, when the engine is cold the feed of fuel at idling speed and thereby the idling speed can be increased while the fuel injection timing is likewise advanced.

As soon as the motor is warmed up, the starting rod is moved to its intermediate position and the spring 47 and pin 51 are no longer effective on the governor and timing lever, as shown in Fig. 4. The engine then operates in the manner disclosed in my prior application.

In order to stop the motor, the choke rod 46 is pushed in as far as possible. When this is done, the pin 53 strikes the lever 36 and prevents it from moving clockwise as the speed of the motor decreases when the foot is removed from the accelerator. It is then possible for the roller 33 to move downwardly as shown in Fig. 6, the usual action of the cam surface 35 to prevent stalling being prevented. The fuel feeding mechanism can thus be completely closed by the spring 24 and the engine will stop.

If desired, I may provide means for holding the lever 45 in any one of the three positions. This may comprise a segment 54 secured to the lever

and provided with three notches 55, one for each of the operating positions, and a spring 56 fixed to the casing and engaging in these notches.

While I have described herein one embodiment of my invention, I wish it to be understood that I do not intend to limit myself thereby except within the scope of the appended claims.

I claim:

1. In a controlling device for motors, manual control means for controlling the feed of fuel to the motor, governor means for limiting the movement of said manual means, and manually operable means for varying the effect of said governor means, said governor means including means operable when the engine reaches a minimum speed to increase the feed of fuel to said engine, said varying means operating to cause said governor means to increase the feed of fuel at such minimum speed, and means controlled by the manual operation of said varying means to advance the fuel injection timing.

2. In a device of the character described, manual control means for controlling the feed of fuel to an engine, means controlled by the speed of the engine for limiting the movement of said manual means, said last means including a pivoted element extending on both sides of its pivot, and manually operated means for engaging said element and exerting a pressure thereon selectively on either side of the pivot.

3. In an engine, means to control the fuel injection timing, manual means to control the fuel feed, means controlled by the speed of the engine to limit the movement of said manual means and to vary said timing control means, and manually operable means for advancing said timing control means.

4. In an engine, manual control means to control the feed of fuel, means controlled by the speed of the engine to limit at low speed the movement in a direction to reduce the fuel feed of said manual means, thereby to increase the feed of fuel as the speed decreases and prevent stalling, fuel injection timing control means, said speed controlled means including means to move said timing control means to advance the timing as the speed increases, and manually operated means to advance said timing means at low speeds.

5. In an engine, manual means to control the feed of fuel, means controlled by the speed of the engine to limit at low speed the movement in a direction to reduce the fuel feed of said manual means, thereby to increase the feed of fuel as the speed decreases and prevent stalling, fuel injection timing control means, said speed controlled means including means to move said timing control means to advance the timing as the speed increases, and manually operated means for simultaneously increasing the effect of said speed controlled means to increase the feed of fuel and advancing the timing.

6. In an engine as claimed in claim 5, means normally urging said control means to a position to cut off the feed of fuel, and manually operated means to render said speed controlled means inoperative so as to permit movement of said control means to a position to cut off the feed of fuel and stop the engine.

7. In an engine as claimed in claim 5, means normally urging said control means to a position to cut off the feed of fuel, and manually operated means to render said speed controlled means inoperative so as to permit movement of said control means to a position to cut off the

feed of fuel and stop the engine, said last means being combined with said increasing and advancing means.

8. In a controlling device for engines, manual control means for controlling the feed of fuel to the engine, governor means for limiting the movement in a direction to decrease the feed of fuel of said control means, said governor means including a spring normally urging the same to low speed position, said governor means including means to increase the minimum feed of fuel as the same moves towards low speed position, and manually operable means independent of said spring to exert an additional pressure on said governor means in the direction of low speed position.

9. In a controlling device for engines, manual control means for controlling the feed of fuel to the engine, governor means for limiting the movement in a direction to decrease the feed of fuel of said control means, said governor means including a spring normally urging the same to low speed position, said governor means including means to increase the minimum feed of fuel as the same moves towards low speed position, and manually operable means independent of said spring to exert an additional resilient pressure on said governor means in the direction of low speed position.

10. In a device as claimed in claim 9, manually operable means to prevent movement of said governor means to low speed position.

11. In a controlling device for engines, manual control means for controlling the feed of fuel to the engine, governor means for limiting the movement in a direction to decrease the feed of fuel of said control means, said governor means including a spring normally urging the same to low speed position, said governor means including means to increase the minimum feed of fuel as the same moves towards low speed position, and manually operable means selectively to exert an additional resilient pressure on said governor means in the direction of low speed position or positively to prevent movement of said governor means towards low speed position.

12. In a controlling device for motors, manual control means for controlling the feed of fuel to said motor, governor means to limit the movement of said manual means in accordance with the speed of the engine, said governor means including a spring normally urging the same to low speed position, said governor means including means to increase the minimum feed of fuel to the engine when the engine reaches a predetermined minimum speed, and manually operated means selectively operable to resist movement of said governor means to low speed position, whereby to permit the movement of said fuel control means to non-feeding position.

13. In an engine, manual means for controlling the feed of fuel, a member moved in accordance with the speed of the engine, means operated by movement of said member toward a lower speed position to limit increasingly the movement of said manual means in a direction to reduce the fuel feed, thereby causing a gradually greater minimum amount of fuel to be fed as the speed decreases so as to prevent stalling, and manually operable means for resiliently urging said member towards its low speed position so as to increase the minimum quantity of fuel at any particular speed, means to control the fuel injection timing of the engine, and means

operated by operation of said manually operated means to move said timing means to advance the timing.

14. In an engine, manual means for controlling the feed of fuel, a member moved in accordance with the speed of the engine, means operated by movement of said member toward a lower speed position to limit increasingly the movement of said manual means in a direction to reduce the fuel feed, thereby causing a gradually greater minimum amount of fuel to be fed as the speed decreases so as to prevent stalling, and manually operable means for resiliently urging said member towards its low speed position so as to increase the minimum quantity of fuel at any particular speed, means normally urging said control means to a position to cut off the feed of fuel, and manually operated means to move said member to a higher speed position so as to render said limiting means inoperative, whereby to permit movement of said control

means to a position to cut off the feed of fuel and stop the engine.

15. In an engine as claimed in claim 14, means to control the fuel injection timing of the engine, and means operated by operation of said manually operated means to move said timing control means to advance the timing. 80

16. In a device of the character described, manually controlled fuel feeding mechanism, fuel injection timing mechanism, a governor adapted to control said fuel feeding mechanism, an element connected to said timing mechanism, means connecting said governor to said element to move said element in a direction to advance the timing, said element being free to move in said direction without movement of said connecting means, and manually operable means for moving said element in said direction and thereby advancing the timing mechanism independently of the governor. 90

JULIUS KUTTNER. 95

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