S. TROOD.

INTERLOCK FOR AUTOMOBILE STARTERS.

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1,289,315. Patented Dec. 31, 1918.

Fig. 1.

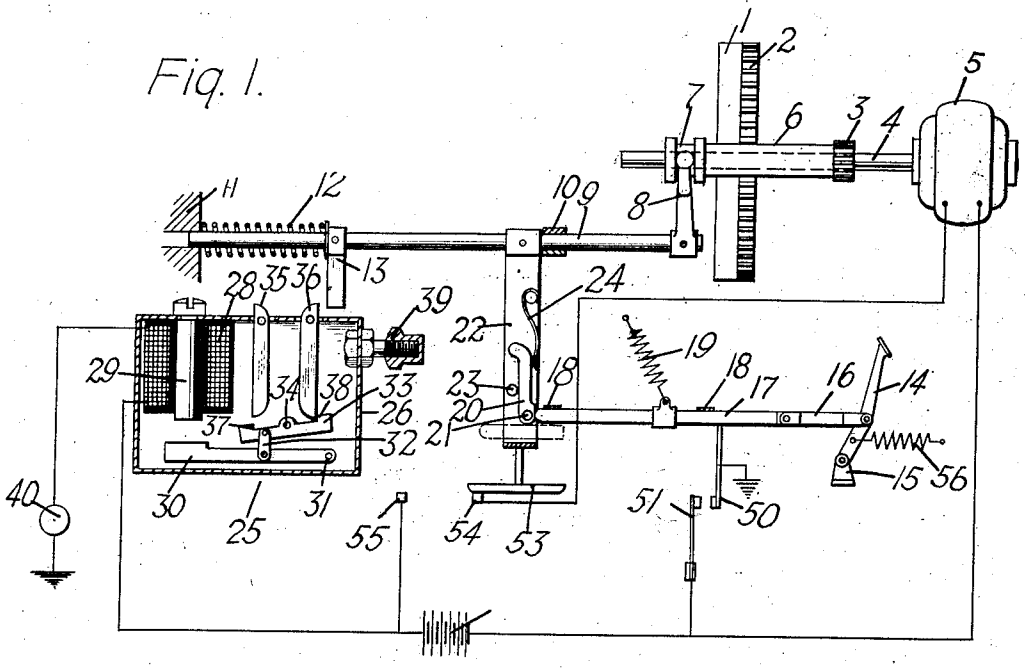
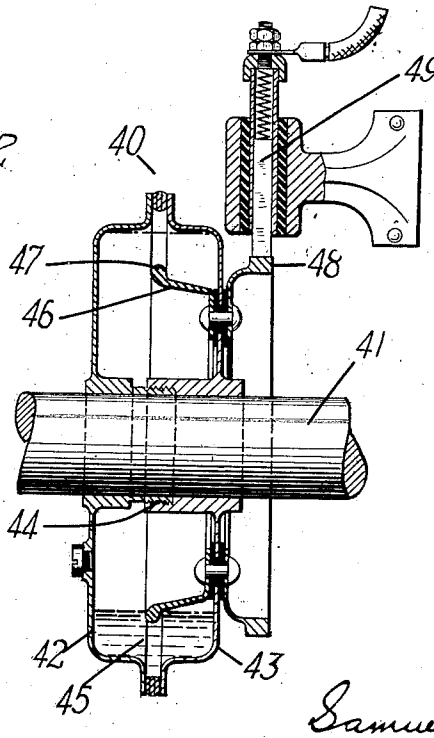


Fig. 2.



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INTERLOCK FOR AUTOMOBILE-STARTERS.

1,289,315. Specification of Letters Patent. Patented Dec. 31, 1918.

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To all whom it may concern:

Be it known that I, SAMUEL TROOD, a citizen of the United States, and a resident of Edgewood Park, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Interlocks for Automobile-Starters, of which the following is a specification.

My invention relates to interlocks for automobile starters and has for one of its objects to provide a safety device for protecting the gear mechanism of a starting motor.

A further object of my invention is to provide a structure which automatically disconnects the starting motor from the engine shaft of an automobile or motor vehicle when a predetermined speed is reached.

The usual method of connecting a starting motor to an engine shaft is to provide the flywheel with a gear which meshes with a pinion connected to the starting motor. In the normal operation of the engine, the flywheel rotates with a high peripheral speed and, if the operator, by accident or mistake, attempts to mesh the pinion with the flywheel gear while the engine is operating under its own power, it is practically certain that the gears will be damaged. As a relatively high-speed ratio is customarily employed between the motor and the engine shaft, it is advisable to disconnect the gears before the engine attains full speed in order to avoid an excessive motor speed.

In my invention, I propose to employ a magnetically operated interlock to be controlled by a centrifugal switch that is adapted to break an electric circuit at a predetermined speed. The interlock prevents the engagement of the flywheel gear by the motor pinion when the flywheel is rotated at more than a predetermined speed, and also operates to release the pinion from engagement with the flywheel when the predetermined speed is reached.

The details of my improved construction will be understood in connection with the accompanying drawings in which Figure 1 is a diagrammatic view of apparatus embodying my invention, and Fig. 2 is an enlarged sectional view of a centrifugal switch.

The flywheel 1 of a gas engine (not shown) is provided with gear teeth 2 to be engaged by a pinion 3 that is slidably keyed on the shaft 4 of a starting motor 5 of any desired character, but here shown as a dynamo electric machine. The pinion 3 has an integral sleeve member 6 that is provided with a grooved collar 7 to be engaged by a yoke member 8. The member 8 is fastened to a rod 9 which is slidably mounted in brackets 10 and 11. The pinion 3 is normally held in its inoperative position by a spring 12 that is compressed between an arm 13, upon the rod 9 and the bracket 11. The rod 9 is actuated, against the pressure of the spring 12, by means of a pedal 14 that is pivotally mounted upon a lug 15 projecting from any suitable stationary part of the vehicle (not shown). A link 16 connects the pedal 14 to a rod 17 which is held upward against two retaining members 18 by a spring 19 and is adapted to engage an arm 20 having a pivotal support at 21 upon a bar 22 that is fixed to the rod 9. The arm 20 is held against a stop 23 by a spring 24.

A locking device 25 is mounted adjacent to the rod 9 and comprises a casing 26, an electro-magnet winding 28, a core 29, an armature 30 having a pivotal support at 31, arm 33 having a pivotal support at 34, and a link 32 connecting the members 30 and 33. Two bars 35 and 36 are pivotally supported in the casing 26 with their upper ends in the path of movement of the arm 13 and their lower ends in position to be engaged by the respective shoulders 37 and 38 of the arm 33, according to the position of the latter. An adjustable stop 39 is attached to the casing 26 to be engaged by the upper end of the arm 20, as hereinafter described.

A centrifugal switch 40, shown in detail in Fig. 2, is mounted on the engine shaft 41, or some other rotating part of the engine, and comprises two cup shaped members 42 and 43 fastened together, as by screw threads, at 44 and inclosing a body of mercury indicated at 45. A contact member 46 is attached to and insulated from the casing and has an annular surface 47 which dips into the mercury when the switch is stationary, as shown, but is disconnected therefrom when the switch rotates at a speed sufficiently high to cause the mercury to extend around the casing. The minimum speed of the gas engine is higher than the speed used in starting, and the switch is adjusted to break its contact at a speed above its starting speed but below the running speed of the engine. The contact member 46 is connected to a slip ring 48 upon which bears

a brush 49 forming one terminal of the switch, the other terminal of the switch being grounded through the engine shaft.

When it is desired to start the engine of the vehicle, the pedal 14 is actuated by the operator to move the rod 17, and with it the bar 22, to slide the pinion 3 toward the flywheel 1. A small movement of the rod 17 is sufficient to effect engagement between a grounded contact member 50 and a spring supported contact member 51 and thus close an electric circuit through a battery 52, the magnet winding 28 and the centrifugal switch 40 to ground. The magnet winding 28 being thus energized, the armature 30 is lifted, and, consequently the arm 33 is tilted to release the bar 36 from the shoulder 38 and effect engagement between the shoulder 37 and the bar 35. Each of the bars 35 and 36 is thus free to turn upon its pivot as its upper end is engaged by the arm 13 in moving toward the bracket 11. The bars will be returned to their normal positions by gravity and the bar 35 will act as a latch to prevent movement of the arm 13 toward the flywheel. When the pinion 3 is in mesh with the teeth 2 a switch member 53 on the bar 22 bridges contact members 54 and 55 to close the battery circuit through the motor 5. Just before the bar 22 reaches the limit of its movement, the upper end of the bar 20 is engaged by the stop 39 and rocked on its pivot to permit the end of the rod 17 to slip downwardly and longitudinally into the dotted line position shown. The bar 22 and its connected mechanism, being thus released, are free to be returned by the spring 12 to the positions shown, as soon as the arm 13 is released by the bar 35.

When the engine starts under its own power and attains a predetermined speed, the centrifugal switch 40 operates to break the circuit of the magnet winding 28. The armature 30, being released by the magnet, drops by its own weight and rocks the arm 33 into the position shown, thereby releasing the bar 35 from the shoulder 37 to allow the arm 13 to move back to its right hand position. Movement of the rod 9, as just indicated, disengages the pinion 3 from the flywheel gear teeth and operates the switch member 53 to break the circuit of the motor. This action takes place regardless of the release of the pedal by the operator because the rod 17, in the dotted line position, cannot obstruct movement of the bar 22. Upon the release of the pedal, it is retracted by a spring 56, attached to any suitable stationary part, not shown, into its normal position, and the rod 17 is drawn upward by the spring 19 into the position shown. Any attempt by the operator to connect the pinion 3 to the gear teeth 2 while the engine is running will be prevented by the bar 36, the lower end of which is locked by the shoulder 38. The magnet winding cannot be energized because the centrifugal switch in series with it has broken the circuit and will not close until the engine speed is decreased to the predetermined amount or until the engine has stopped.

It may readily be understood from the above described construction and operation of the parts that, when the starting motor is operatively connected to the engine shaft, this connection is automatically broken as soon as the engine starts to operate under its own power, and it is impossible for the operator to allow the motor to be driven at high speed by the engine by maintaining pressure on the starting pedal. The operator may disengage the pinion at any time desired by allowing the pedal to be retracted to separate the contact terminals 50 and 51 and thus break the circuit of the magnet. It will also be clear that I have provided a positive means for preventing engagement of the pinion and the flywheel gear teeth when the engine is operating under its own power. It is necessary for current to flow in the control circuit before the motor can be operated, and this circuit must be both broken and closed before the motor can again be placed in the operative connection with the engine.

It is understood that such changes and modifications may be made in the structural details of my invention as will fall within the scope of the appended claims.

I claim as my invention:

1. In a starting mechanism, the combination with an engine shaft and a starting motor, of a shiftable pinion adapted to operatively connect said motor to said engine shaft, and automatic electrically controlled means for locking said pinion in both operative and inoperative positions.

2. In a starting mechanism, the combination with an engine shaft and a starting motor, of a shiftable pinion adapted to operatively connect said motor to said engine shaft, and electrically controlled means for locking said pinion in both operative and inoperative positions.

3. In a starting mechanism, the combination with an engine shaft and a starting motor, of a shiftable pinion adapted to operatively connect said motor to said engine shaft, and speed-controlled means for locking said pinion in both operative and inoperative positions.

4. In a starting mechanism, the combination with an engine shaft, a starting motor, and gear mechanism for operatively connecting said motor to said shaft, of means for effecting the operative connection of said gear mechanism, latching means for locking said gear mechanism in operative position, and automatic means for disconnecting said mechanism at a predetermined speed.

5. In a starting mechanism, the combination with an engine shaft, a starting motor, and gear mechanism for operatively connecting said motor to said shaft, of means for effecting the operative connection of said gear mechanism, latching means for locking said gear mechanism in operative position, and speed-controlled means for disconnecting said mechanism.

6. In a starting mechanism, the combination with an engine shaft, a starting motor and means for operatively connecting said motor to said engine shaft, of an electric circuit for controlling said means, and means for locking said connecting means in an inoperative position whereby electric current must flow in said circuit before said motor can be operatively connected to said engine shaft.

7. In a starting mechanism, the combination with an engine shaft, a starting motor, and a shiftable member for operatively connecting and disconnecting said motor and said shaft, of an electric circuit for controlling said shiftable member, and means for locking said shiftable member in operative position whereby said circuit must be broken before said member can be shifted to disconnect said motor from said engine shaft.

8. The combination with an engine shaft, a starting motor, and a shiftable member for operatively connecting and disconnecting said motor and said engine shaft, of an electric circuit, and means for locking said shiftable member in a plurality of positions whereby an electric current must flow in said circuit before said member can be shifted to connect said motor to said shaft, and whereby said circuit must be broken before said motor can be disconnected from said shaft.

9. In a starting mechanism, the combination with an engine shaft, a starting motor, and gear mechanism for operatively connecting said motor to said shaft, of means for controlling said gear mechanism comprising a shiftable member, and speed-controlled means for locking said member in a plurality of positions.

10. In a starting mechanism, the combination with an engine shaft, a starting motor, and gear mechanism for connecting said motor to said shaft, of means for shifting a portion of said mechanism into and out of operative relation with the remaining portion, and electro-responsive latching means for preventing the shifting of said mechanism in one direction under predetermined conditions and in the other direction under other predetermined conditions.

11. In a starting mechanism, the combination with an engine shaft, a starting motor and gear mechanism for operatively connecting said motor to said shaft, of a locking device adapted to prevent the connection and the disconnection of said motor and said shaft under predetermined speed conditions.

12. In a starting mechanism, the combination with an engine shaft, a starting motor, and means for operatively connecting the said motor to said shaft, of an electrically operated locking device for controlling said means, and a centrifugal switch for controlling said locking device.

13. In a starting mechanism, the combination with a shiftable member, of a unitary locking device having a plurality of operating conditions, adapted, when one condition obtains, to allow said member to be shifted in one direction only and, when a second condition obtains, to allow movement of said member in the opposite direction only.

14. The combination with an engine shaft, a starting motor, and means for operatively connecting said motor to said shaft, of means for effecting said operative connection, comprising a longitudinally shiftable member and means coacting therewith, a stationary stop member adapted to be engaged by said coacting means after a predetermined movement of said shiftable member to disconnect said shiftable member from said coacting means.

In testimony whereof, I have hereunto subscribed my name this 20th day of February 1913.

SAMUEL TROOD.

Witnesses:
B. B. HINES,
L. E. CUNNINGHAM.