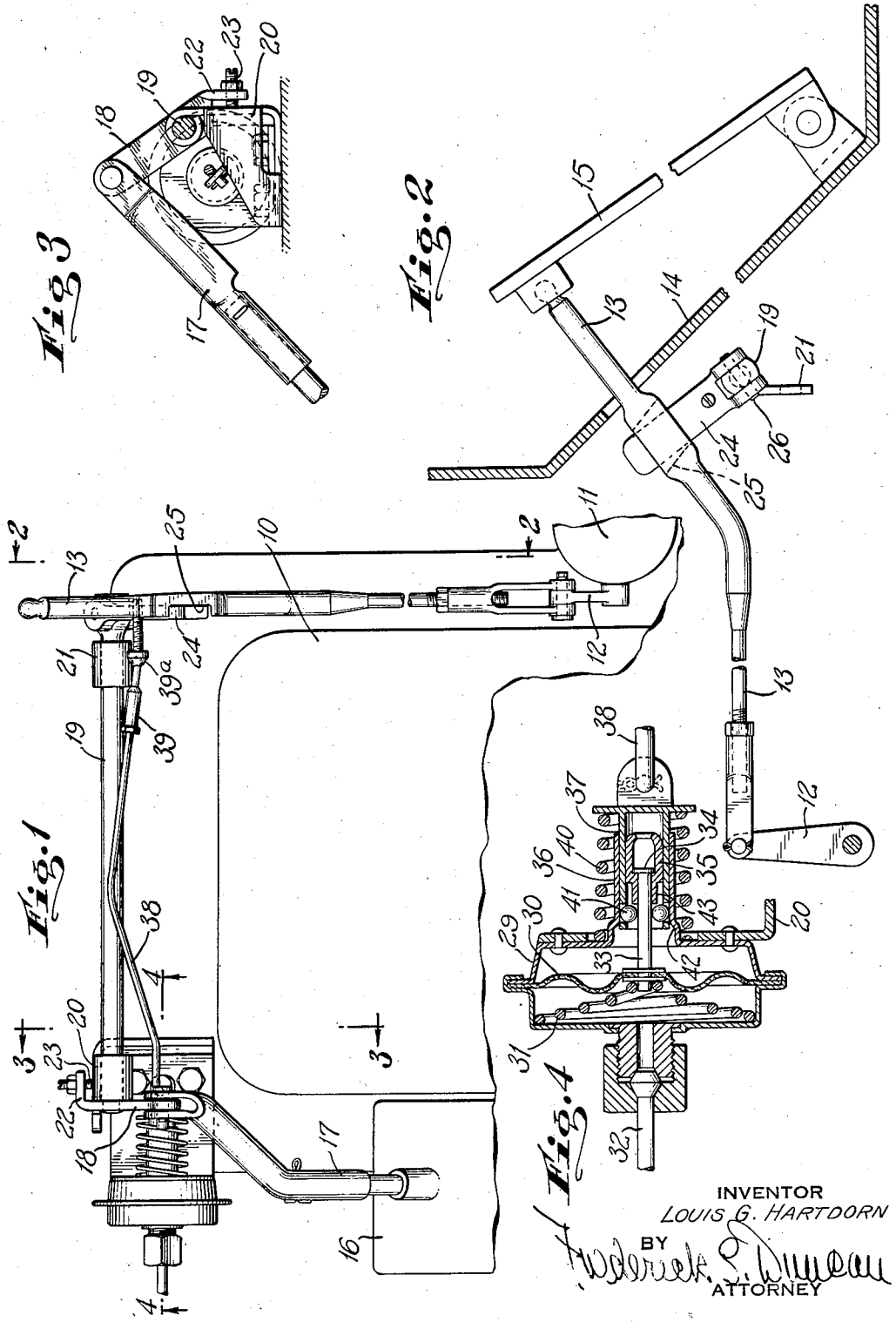
Oct. 2, 1934. L. G. HARTDORN 1,975,147

CONTROL MECHANISM FOR AUTOMOBILE ENGINES

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Fig. 5

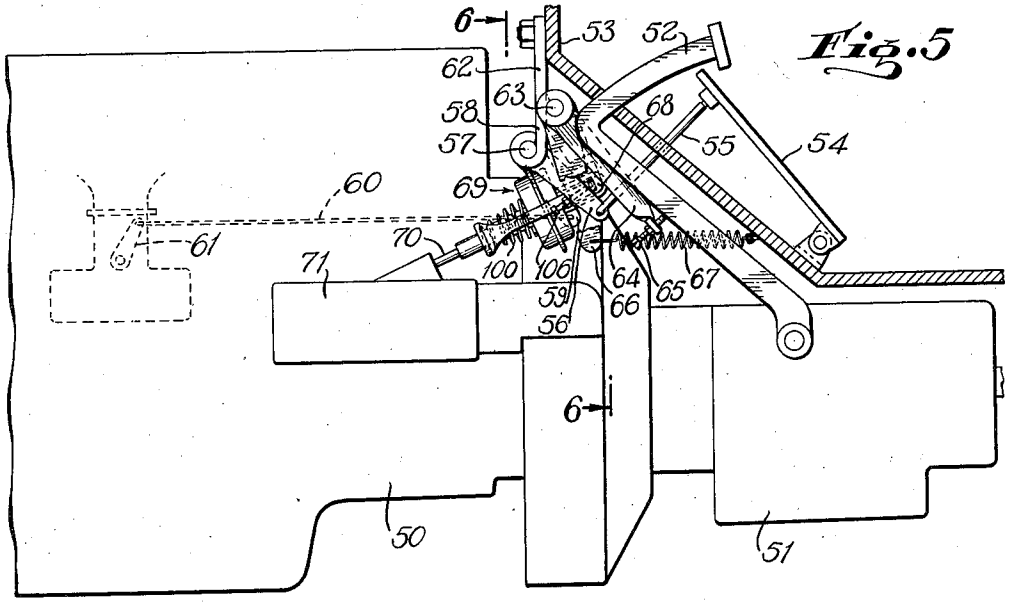


Fig. 6

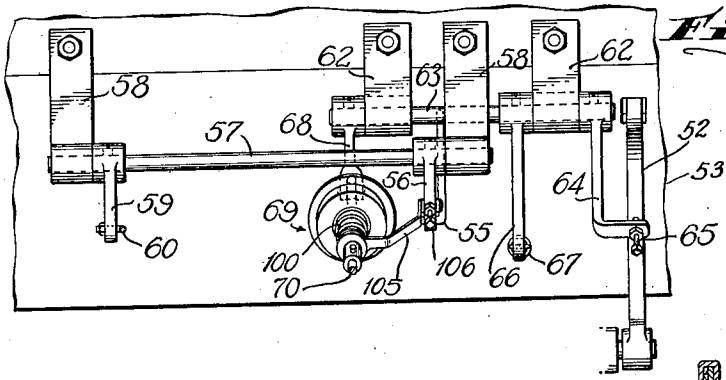


Fig. 8

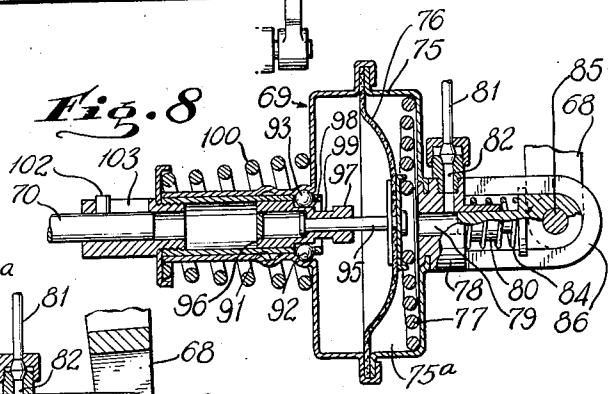
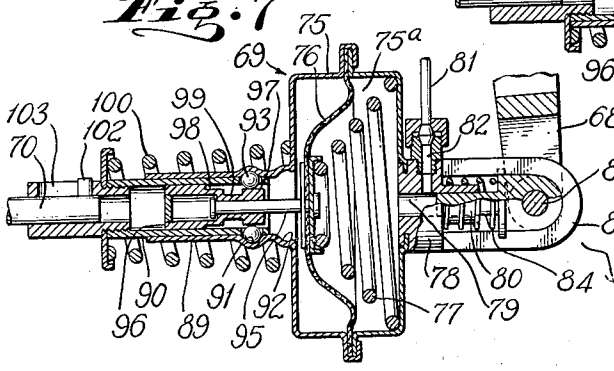


Fig. 7



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CONTROL MECHANISM FOR AUTOMOBILE ENGINES

Louis G. Hartdorn, Rego Park, N. Y.

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20 Claims. (Cl. 123—179)

The present invention relates to the control of motor driven vehicles and more particularly to means combining certain controls which heretofore have been separately actuable, so as to simplify the operation of the vehicle.

Motor vehicles driven by internal combustion engines are commonly provided with a starter pedal for starting the engine, an accelerator pedal for controlling the fuel supplied to the engine, a clutch pedal for disconnecting the engine from the transmission and a brake pedal for checking or stopping movement of the vehicle. However, the operator has only two feet to operate all of these pedals, hence, under conditions where more than two pedals would have to be operated, auxiliary hand controls must be used. But the use of such hand controls is bothersome and often confusing.

An object of the present invention is to provide a control system which will dispense with the starter pedal, thereby reducing the number of pedals that have to be operated, and also preventing accidental operation of the starter while the engine is running.

I am aware that a combined accelerator and starter control has been invented and is in commercial use. In this control operative connection between the starter and the accelerator exists only when the engine is stopped. As soon as the engine is started connection between the accelerator and the starter is broken by a suction device connected to the intake manifold of the engine. One of the disadvantages of this system is that the suction produced by the engine varies conisiderably with operating conditions and this results sometimes in permitting accidental connection to be established between the accelerator pedal and the starter so that the starter is actuated while the engine is running.

It is an object of my invention to provide a suction device to control the connection between the starter and the accelerator, which connection device is not affected by variations of suction of the engine, the parts being automatically locked in disconnected relation until the engine is stopped.

Another object of the invention is to provide a combined control which is primarily operated by the pedal of the engine clutch, such control being effective only when the engine is not running, to connect the clutch, starter and accelerator, so that by merely depressing the clutch pedal the engine will be started and at the same time the accelerator will be actuated to insure sufficient fuel supply for starting purposes.

A specific object of the invention is to provide suction means for automatically disconnecting the clutch, starter and accelerator after the engine has been started, so that the clutch and accelerator may be independently operated, and locking the connecting parts in disengaged position until the engine stops.

Other objects and advantages of my invention will appear in the following description of certain embodiments and thereafter the novelty and scope of the invention will be pointed out in the claims.

In the accompanying drawings;

Figure 1 is a top plan view of my combined accelerator and starter control as applied to an automobile engine, the latter being fragmentally shown;

Fig. 2 is a view in section taken on the line 2—2 of Fig. 1;

Fig. 3 i s a view in section taken on the line 3—3 of Fig. 1;

Fig. 4 is a view in longitudinal section and on an enlarged scale taken on the line 4—4 of Fig. 1;

Fig. 5 is a view in side elevation and partly broken away, of a combined clutch and starter control;

Fig. 6 is a view in section taken substantially on the line 6—6 of Fig. 5;

Fig. 7 is a vew in longitudinal section of the suction actuator used in the structure shown in Figs. 5 and 6, the parts being in idle position; and

Fig. 8 is a similar view showing the parts in actuated postion.

In Figure 1, the reference numeral 10 is used to indicate an automobile engine provided with a carburetor 11 and throttle lever 12. A push rod 13 extends from this lever through the dash board 14 of the automobile, as best shown in Fig. 2, and is connected to an accelerator pedal 15. A starter for the motor is shown at 16 and is provided with an operating push rod 17. The latter is suitably connected to an arm 18 fixed on a shaft 19 which is journaled in suitable brackets 20 and 21 secured to the engine. A rearward extension 22 of the arm 18 carries an adjustable stop 23 normally engaging the bracket 20.

An arm 24 is carried by the opposite end of the shaft and normally (when the engine is not running) this arm engages a recess 25 in the push rod 13. The arm 24, however, is hinged to the shaft 19 on a pin 26 that is normal to the shaft 19, so that the arm may be swung clear of the recess when the engine is running to disconnect the starter from the accelerator. To this end a

suction device is provided for withdrawing the arm.

As so far described the invention corresponds to that referred to above as having previously been used. However, my invention is an improvement on such previously used control in the fact that it employs a suction actuator which is not affected by variations of suction in the engine and which will lock the arm 24 in disconnected position as long as the engine is running.

My improved suction actuator is shown in detail in Fig. 4. It comprises a casing 29 fixed in the bracket 20 and in which a piston operates. This piston, in the form illustrated, consists of a flexible diaphragm 30 which is normally pressed toward the right, as viewed in the figure, by a spring 31. However, a tube 32 connects the left hand side of the casing to the intake manifold or to any other part in which suction is developed while the engine is running. This suction draws the diaphragm toward the left against the pressure of the spring 31. The diaphragm has a stem 33 secured thereto. The stem has at its outer end, a head 34 having limited play in a thimble 35 within a pair of telescoping sleeves 36 and 37. The outer one of these sleeves 36 forms an extension of the casing 29, while the inner sleeve 37 is connected by a rod 38 to the arm 24. Suitable means, such as a turn-buckle 39 are provided for adjusting the effective length of the rod 38, and a ball joint 39*a* provides for oscillation of the arm 24 with respect to the rod 38.

A spring 40 normally urges the sleeve 37 outward, or toward the right, as viewed in Fig. 4. The sleeve 37 serves as a carrier for a set of balls 41, being provided adjacent its inner end with openings in which the balls are loosely held, these balls being normally retained in the openings between the outer sleeve 36 and the stem 33. When the diaphragm 30 is drawn toward the left by suction, the inner end of the thimble strikes the balls 41 and thereby draws the sleeve 37 inward against the pressure of spring 40. At the base of the sleeve extension 36 there is an enlargement or recess 42 into which the balls will spread as soon as they have been drawn into registry therewith permitting a reduced portion 43 of the thimble to ride between them and the stem 33 and lock the sleeves in telescoped position.

The operation of the device will now be explained. To start the engine it is merely necessary to depress the accelerator pedal 15 and since the arm 24 is normally in engagement with the recess 25 the shaft 19 will be turned and the starter will therefore be operated. However, as soon as the engine starts it will produce suction in the line 32 and in the casing 29 back of the diaphragm 30 so that the latter will be drawn inward against the pressure of spring 31. This will result in drawing the thimble 35 toward the left and hence drawing the sleeve 37 in the same direction. The arm 24 connected to the sleeve 27 will thus be drawn out of engagement with the recess 25 and the accelerator pedal will then be free to operate without further depression of the starter. Once the balls 41 have been forced into the recess 42 by the spreader portion 43 of the thimble the parts will remain in locked position despite variations of suction of the engine; for as the suction varies the head 34 of the stem 33 will merely move idly within the thimble 35. However, when the suction is reduced practically to zero the spring 31 will force the stem outwardly, far enough for the head 34 to engage the outer end of the thimble 35, thereby withdrawing the spreader portion 43 from the balls 41 and permitting the spring 40 to force the sleeve 37 outwardly and move the arm 24 into the recess 25. If at the moment the recess is not alined with the arm 24, the latter will be spring-pressed against the accelerator rod 13 until the accelerator pedal returns to normal and brings the recess 25 into proper alinement, whereupon the arm 24 will immediately snap into the recess, so as to be ready to operate the starter upon depression of the accelerator pedal.

In the constructions shown in Figs. 5 to 8 inclusive, the operation of the starter is controlled by actuation of the clutch pedal. In Fig. 5 the engine is indicated at 50 and the engine clutch at 51. The latter is operated by a clutch pedal 52 which projects in the usual manner through the dash board 53 of the vehicle.

An accelerator pedal 54 engages a push rod 55 which is connected to a crank 56 fixed to a shaft 57. The latter is suitably supported in brackets 58 which may be attached to the dash board. The shaft 57 also carries a crank arm 59 which is connected by a rod 60 to the throttle 61 of the engine.

Parallel to the shaft 57 and also suitably journaled in bearings 62 secured to the dashboard, is a second shaft 63. This shaft has a crank 64 fixed to one end thereof and the crank carries an adjusting screw 65 which normally bears against the clutch pedal lever. Also secured to the shaft 63 is an arm 66 which is connected by spring 67 to the dashboard. This spring normally presses the adjusting screw 65 against the pedal 52. A third arm 68 is fixed to the shaft 63 and this is connected through suitable suction means, generally indicated at 69, to the operating push rod 70 of the starter 71 of the engine.

The suction actuator 69 is similar in many respects to the suction actuator shown in Fig. 4, but differs therefrom mainly in providing means for locking the parts in active and also in inactive position. The actuator also includes means for preventing premature operation of the parts which might result from suction produced on turning the engine over, so that the starter will not be disconnected until after the engine is actually started and is operating on its own power.

As shown in Figs. 7 and 8, the suction actuator comprises a casing 75 having a transverse flexible diaphragm 76 and providing a working chamber 75*a* at the right hand side of the diaphragm, as viewed in said figures. A spring 77 urges the diaphragm toward the left tending to expand the working chamber. A valve controls communication between the working chamber 75*a* and the intake manifold of the engine. This valve consists of a body 78 having a bore 79 in communication with the working chamber and a plunger 80 is adapted to slide in this bore. A pipe 81 leading to the intake manifold communicates through a lateral port 82 with the bore 79, said port being controlled by the plunger 80. The latter is normally held in its outer position, as shown in Fig. 7, by spring 84, so that the port is normally open. The plunger at its outer end is connected by a pivot pin 85 to the crank 68. A U-shaped keeper 86 serves to limit the outward movement of the plunger under action of spring 84.

Communicating with the casing at the opposite side of the diaphragm are two telescoping sleeves 89 and 90, the outer sleeve 89 constituting an extension of the casing and being formed with two annular recesses 91 and 92 respectively, in which

balls 93 carried by the inner sleeve 90 may be seated. The diaphragm 76 carries a stem 95 formed with a head at its outer end which has a certain amount of free play in a thimble 96. This thimble is provided with two spreader steps 97 and 98 separated by an intermediate groove 99.

A spring 100 urges the inner sleeve 90 outwardly so that it normally occupies the position shown in Fig. 7. This sleeve has a pin-and-slot connection with the push rod 70 of the starter, the pin and slot being indicated respectively by the reference numerals 102 and 103. Projecting laterally from the sleeve 90 is an arm 105 (Fig. 6) which is hooked over the arm 56. A screw 106 carried by arm 56 is adapted to engage the hooked end of the arm 105 and provide an adjustable one-way connection between said arms.

The operation of the device is as follows: Assuming that the engine is not running, the actuator parts will be in the normal position shown in Fig. 7. In this position the sleeve 90 is fully extended and locked in such extended position by the balls 93 which are seated in the outer recess 91, being held there by the inner spreader surface 97 of the thimble 96. Since the actuator is in fully extended position the pin 102 will be located at the right hand end of the slot 103. When the clutch pedal 52 is depressed it will turn the shaft 63 by reason of its engagement with the arm 64, and when said shaft is turned the plunger 80 will move inward against the pressure of spring 84, closing the suction port 82. Thereafter further movement of the shaft 63 will cause the suction actuator to move bodily outward or toward the left, as viewed in Fig. 7, depressing the push rod 70 and thereby causing the starter 71 to turn the engine over. However, because the suction port 82 is closed such suction as may result from turning over engine will not affect the suction actuator. At the same time that the starter is operated by advance of the suction actuator as a whole, the arm 105 will pull the arm 56 forward and thereby actuate the throttle 61 to supply sufficient fuel for starting the engine. As soon as the engine starts the operator releases the clutch pedal 52 and the plunger 80, being returned by the spring 84, uncovers the suction port 82. As a result, suction of the engine will draw the diaphragm 76 toward the right, as viewed in Fig. 8, and in so doing the thimble 96 will be withdrawn, permitting the balls 93 to drop into the groove 99. Thereupon continued movement of the thimble will draw the sleeve 90 inward until the balls 93 come into register with the inner recess 92, and in this recess they will be seated by the outer spreader surface 98. Thus, the suction actuator as a whole is contracted, as shown in Fig. 8, and is locked in such contracted position. When the actuator is thus contracted the arm 105 is withdrawn from the arm 56 so that the accelerator is released. Because of the pin-and-slot connection 102—103, subsequent action of the clutch pedal will not affect the starter as long as the engine is running. As the engine operates and suction produced thereby varies under different operating conditions, the head of the stem 95 will operate idly within the thimble 96. However, when the suction ceases by stopping of the engine, the spring 77 causes the head of said stem to strike the outer end of the thimble 96, withdrawing the spreader surface 98 and permitting the balls to drop into the groove 99 clear of the recess 92. The spring 100 then forces the sleeve 90 outwardly to the position shown in Fig. 7, in which position it is again locked by seating of the balls 93 in the outer recess 91. The actuator is now expanded and ready to operate the starter upon the next depression of the clutch pedal.

Adjustments 65 and 106 are provided so as to insure proper setting of the parts to obtain the desired operative relation. The screw 106, for instance, provides for adjusting the parts to the desired throttle setting on starting the engine. In hot weather for instance it may not be desirable to operate the throttle when starting the engine. In such case the screw 106 may be withdrawn sufficiently to prevent actuation of the throttle when the starter is operated.

It will be observed that I have provided a connection between the clutch pedal and the starter which connection is shortened while the engine is running so that it is no longer effective to operate the starter, said connection being extended as soon as the engine stops, so that upon the next operation of the clutch pedal the starter will be actuated.

While I have described two embodiments of my invention I wish it to be understood that these are to be taken as illustrative and not limitative and that I reserve the right to make various changes in form, construction and arrangement of parts without departing from the spirit and scope of my invention as pointed out in the following claims.

I claim:

1. In combination with an engine and a starter therefor, a pedal, a normally operative connection between the pedal and the starter, means responsive to a running condition of the engine for rendering such connection inoperative, a lock controlled by said means for maintaining the connection in inoperative condition, and means for restoring the connection to operative condition as soon as the engine stops.

2. In combination with an engine and a starter therefor, a pedal, a normally operative connection between the pedal and the starter, and means actuated by suction of the engine for rendering such connection inoperative, said means including a locking device for maintaining the connection in such inoperative condition while the engine is running.

3. The combination with an engine and a starter therefor, of a pedal, a normally operative connection between the pedal and the starter, means responsive to suction of the engine for rendering such connection inoperative, a lock controlled by said means for maintaining the connection in inoperative condition, and means for restoring the connection to operative condition as soon as the engine stops.

4. In combination with an engine and a starter element therefor, a pedal element, a connector attached to one of the elements and adapted to engage the other element whereby the starter may be actuated by depression of said pedal, means responsive to a running condition of the engine for disengaging the connector from said other element, a lock controlled by said means for maintaining the connector in disengaged condition while the engine is running, and means for restoring the connector to engaging condition when the engine stops running.

5. In combination with an engine and a starter therefor, a pedal, a connector attached to the starter and adapted to engage the pedal whereby the starter may be actuated by a depression of said pedal, means responsive to a running con-

dition of the engine for disengaging the connector from the pedal, a lock controlled by said means for maintaining the connector in disengaged condition while the engine is running, and means for restoring the connector to engaging condition when the engine stops running.

6. In combination with an engine and a starter therefor, a pedal, a connector attached to the starter and adapted to engage the pedal whereby the starter may be actuated by depression of said pedal, means responsive to suction of the engine for disengaging the connection from the pedal, a lock controlled by said means for maintaining the connector in disengaged condition while the engine is running, and means for restoring the connector to engaging condition when the engine stops running.

7. In combination an engine, a starter therefor, a pedal, an expansible connector adapted in expanded condition to operatively connect the pedal and starter, spring means normally urging the connector to expanded condition, means responsive to a running condition of the engine for contracting the connector and thereby operatively disconnecting the pedal from the starter, and a lock controlled by the latter means for maintaining the connector in contracted condition as long as the engine is running.

8. In combination an engine, a starter therefor, a pedal, an expansible connector adapted in expanded condition to operatively connect the pedal and starter, spring means holding the connector normally in expanded condition, means actuated by suction of the engine for contracting the connector and thereby operatively disconnecting the pedal from the starter, and a lock controlled by the suction means for maintaining the connector in contracted condition as long as the engine is running.

9. In combination an engine, a starter therefor, a pedal, an expansible connector adapted in expanded condition to operatively connect the pedal and starter, a spring urging the connector to expanded condition, means actuated by suction of the engine for contracting the connector and thereby operatively disconnecting the pedal from the starter, and a lock controlled by the suction means for maintaining the connector in contracted condition as long as the engine is running and for maintaining the connector in expanded condition when the engine is not running.

10. In combination with an internal combustion engine, a starter therefor, a fuel controller for the engine, a normally operative connection between the controller and the starter, means actuated by suction of the engine for rendering such connection inoperative, and a lock controlled by said means for maintaining the connection in such inoperative condition as long as the engine is running.

11. In combination with an internal combustion engine, a throttle therefor, a pedal depressible to operate the throttle, a starter for the engine, a normally operative connection between the pedal and the starter whereby depression of the pedal will actuate the starter as well as the throttle, means actuated by suction of the engine for rendering such connection inoperative, and means controlled by the suction means for locking the connection in inoperative condition as long as the engine is running.

12. In combination with an internal combustion engine, a clutch therefor, a pedal for operating the clutch, a starter for the engine, a normally operative connection between the pedal and the starter whereby depression of the pedal will actuate the starter while disconnecting the clutch, means actuated by suction of the engine for rendering such connection inoperative, and a locking device controlled by said means for maintaining the connection in inoperative condition regardless of variations of suction as long as the engine is running.

13. In combination an engine, a clutch therefor, a pedal for operating the clutch, a starter for the engine, an expansible connector adapted in expanded condition to operatively connect the pedal and the starter, spring means urging the connector to expanded condition, means responsive to a running condition of the engine for contracting the connector and thereby operatively disconnecting the pedal from the starter, and a lock controlled by the latter means for maintaining the connector in contracted condition as long as the engine is running.

14. In combination an engine, a clutch therefor, a pedal for operating the clutch, a starter for the engine, an expansible connector adapted in expanded condition to operatively connect the pedal and the starter, spring means urging the connector to expanded condition, means actuated by suction of the engine for contracting the connector and thereby operatively disconnecting the pedal from the starter, and a lock controlled by the latter means for maintaining the connector in contracted condition as long as the engine is running.

15. In combination an engine, a clutch therefor, a pedal for operating the clutch, a starter for the engine, an expansible connector adapted in expanded condition to operatively connect the pedal and the starter, spring means urging the connector to expanded condition, means actuated by suction of the engine for contracting the connector and thereby operatively disconnecting the pedal from the starter, and a lock controlled by the suction actuated means for maintaining the connector in contracted condition as long as the engine is running and for maintaining the connector in expanded condition while the engine is not running.

16. In combination an internal combustion engine, a fuel controller therefor, a starter for the engine, a clutch for the engine, a pedal depressible to operate the clutch, means operatively connecting the pedal and the starter whereby depression of the pedal will actuate the starter, said means being also connected to the fuel controller to actuate the same when the starter is actuated, means actuated by suction of the engine for rendering the connection between the starter and the pedal and between the starter and the controller inoperative, and means for locking the connector in such inoperative condition as long as the engine is running.

17. The combination with an internal combustion engine having a throttle and a clutch, of a starter for the engine, a pedal for operating the clutch, a connection normally operatively connecting said starter with the throttle and the pedal whereby depression of the pedal will open the throttle and start the engine, means actuated by suction of the engine for rendering such connection inoperative, said means including a locking device operating to maintain the connection in such inoperative condition as long as the engine is running.

18. The combination with an engine and a starter therefor, of a pedal, a normally operative connection between the pedal and the starter,

means actuated by suction of the engine for rendering such connection inoperative, means actuated by depression of the pedal initially to disconnect the suction means from suction and thereafter to start the engine whereby said connection will not be rendered inoperative until after the pedal is released, and a locking device controlled by the suction means for maintaining the connection in such inoperative condition as long as the engine is running.

19. In combination an engine, a starter therefor, a pedal, an expansible connector adapted only when in expanded condition to operatively connect the pedal and the starter, means urging the connector to expanded condition, means actuated by suction of the engine for contracting the connector, a valve actuable by depression of the pedal to disconnect the suction means from suction of the engine when said connector is expanded but adapted to reestablish such connection with the suction means when the pedal is released, and a lock for holding the contractor in contracted condition as long as the engine is running.

20. A pneumatic actuator, comprising a casing, a piston reciprocable therein, said piston being operable in one direction by pneumatic pressure, a spring normally urging the piston in opposite direction, a reciprocable member movable to one position by the piston, a second spring urging said member to an opposed position, and locking means controlled by the piston for locking said member in each of said positions, said locking means including a lost motion connection with the piston, whereby the latter may move freely between predetermined limits without unlocking said member.

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