July 1, 1930. H. NATTRASS 1,769,534

LIFTING JACK ATTACHMENT FOR MOTOR VEHICLES

Filed April 18, 1929

FIG. 1

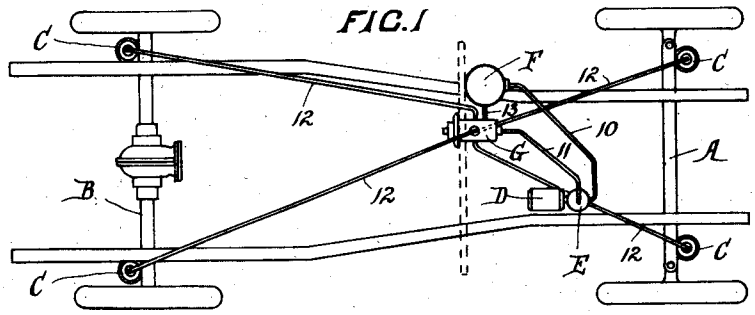


FIG. 2

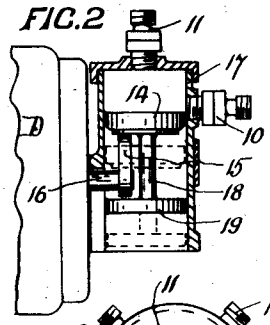


FIG. 3

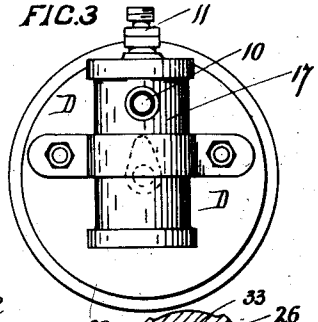


FIG. 10

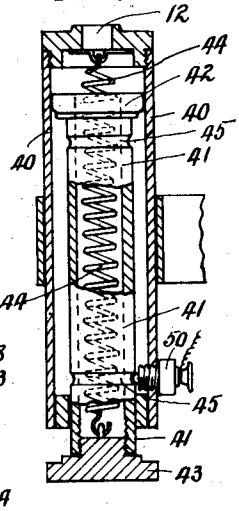


FIG. 4

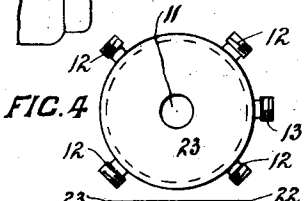


FIG. 8

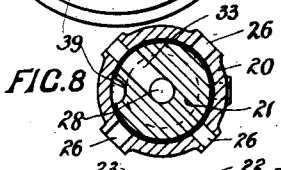


FIG. 5

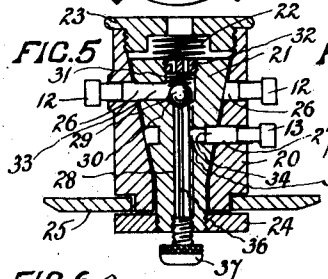


FIG. 7

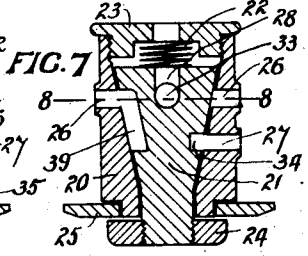


FIG. 11

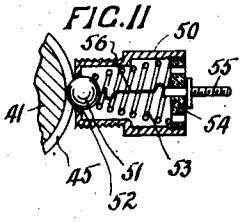


FIG. 6

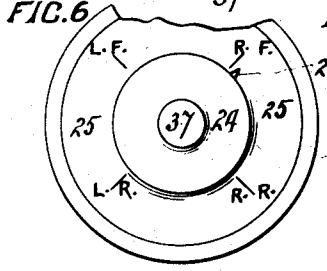
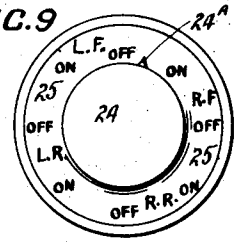


FIG. 9



H. Nattrass
INVENTOR

By Marks & Clerk
Attys.

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UNITED STATES PATENT OFFICE

HOWARD NATTRASS, OF NAPIER, NEW ZEALAND

LIFTING-JACK ATTACHMENT FOR MOTOR VEHICLES

Application filed April 18, 1929, Serial No. 356,209, and in New Zealand July 27, 1928.

This invention has been devised with the object of providing lifting jack equipment for a motor vehicle by means of which a hydraulic jack is combined with each end of each axle as a permanent attachment thereto and is designed to be brought into operation to raise that corner of the vehicle by power obtained from an electric motor deriving its power from the storage batteries with which the vehicle is equipped. This motor may be the usual starter motor for the engine.

The invention comprises the combination with hydraulic jacks of special nature attached to the axles, of a pump, adapted to operate such jack, that is in turn adapted to be operated by the electric starter motor, and selector valve mechanism of special design through which the pump may be connected with any one of the jacks to operate it to raise the vehicle, and through which also the jacks may be connected to exhaust, to lower the vehicle again.

The essential feature of novelty in the invention comprises the combination with an electric motor, of a pump connected therewith, so that it is operated thereby when a control switch is closed, a set of hydraulic jacks attached to convenient parts of the vehicle, a reservoir containing a supply of fluid for actuating such jacks, and a selector valve for connecting any one of the jacks with the fluid supply, through the pump, and for connecting each of such packs with the reservoir.

In giving effect to the invention it is desired to employ the engine starter motor with which the vehicle is equipped, as the motor for operating the jack pump, as the system lends itself to such use and the expense of a special motor will not be entailed, and furthermore the usual electric starter switch may be employed for controlling operation of the pump from the starter motor.

In the accompanying drawings:—

Figure 1 is a plan view of a vehicle chassis showing the whole of the jack equipment in a suitable form of lay out.

Figure 2 is a sectional side elevation of the jack pump.

Figure 3 is an end elevation thereof.

Figure 4 is a front end elevation of one form of selector valve suitable for this invention.

Figure 5 is a longitudinal section, and

Figure 6 is a rear end view thereof.

Figure 7 is a longitudinal section of an alternative form of selector valve.

Figure 8 is a cross section thereof on the line 8—8 of Figure 7.

Figure 9 is a rear end view thereof.

Figure 10 is a vertical section of an approved form of jack for use with this invention.

Figure 11 is a detail section of an automatic tell tale switch that may be embodied in the jack.

Referring to Figure 1, A represents the front axle and B the rear axle. C represents the jacks attached to the respective ends of the two axles to provide for the vehicle being raised at any corner for the usual purposes. D represents the starter motor of the standard modern vehicle equipment and E the pump operated thereby. F is an oil or other fluid containing reservoir that is placed in any convenient position, as for instance, on the front of the body dashboard. G is the selector valve apparatus that is conveniently placed on the body dashboard so that its operating end projects from the face thereof,

These parts are connected together so that a supply pipe 10 leads from the reservoir F to the inlet of the pump E, and a delivery pipe 11 leads from the pump outlet to the forward end of the selector valve G. Branches 12 then lead from the valve to the respective jacks C, and a bye pass 13 from the valve to the reservoir F.

The arrangement thus provided and the construction of the parts, are designed to allow for the valve G being turned to place any one of the jacks C into communication with the pump delivery 11 through its branch 12. Then on the motor D being driven by the closing of its usual control switch or an additional switch to operate the pump, fluid will be pumped from the reservoir F into the jack to be actuated, to raise the corresponding vehicle corner, and to hold it raised

after pumping has ceased, by the locking of the fluid therein. Then when it is desired to lower the vehicle, the valve may be again actuated to connect the jack to the reservoir F, through the bye pass 13, to cause the fluid to exhaust back into such reservoir.

In Figures 2 and 3 a pump suitable for the invention purposes is shown as coupled to and driven from the shaft of the starting motor D. This pump is of the reciprocatory kind, its plunger 14 being actuated by a cam 15 fixed on the end of the motor spindle 16 remote from its connection with the connecting gear with the engine. The pump cylinder 17 is clamped suitably onto the end of the motor casing so that it extends vertically, its inlet 10 and outlet 11 connecting with the upper end through the usual non-return valves common to pumps. The plunger rod 18 has a lower guide piston 19 attached to it and the cam 15 fits between the plunger and guide piston, to actuate the plunger in the required manner on the operation of the starter motor. Any other form of reciprocating or rotary pump may, however, be used and coupled to the spindle 16 by any approved mechanism.

The form of selector valve shown in Figures 4 to 6 is one that will permit of each of the four jacks being actuated independently of the others and also will provide for them being operated in succession without letting down those first actuated. This will permit of any wheel, or number of wheels, being raised as desired. The valve also will provide for the jack, or jacks, that is, or are, raised being let down by connection to exhaust.

Its construction provides a cylindrical casing 20 in which a plug 21 is fitted to project out through its one end. The casing and the plug are preferably tapered to provide for a close fluid tight fit being obtained, the plug being held in close engagement by means of a compression spring 22 disposed between its inner end, and a cover 23 screwed on the corresponding casing end. A turning knob 24 is screwed on to the projecting end of the plug to engage that end of the casing. A disc plate 25 is also fitted on this end of the casing, such assembly providing for the valve fitting upon the dashboard of a motor vehicle so that the casing projects forwardly from the front of the dashboard while the knob 24, and the disc plate 25, are on the rear surface of such dashboard, facing the driver of the vehicle.

The casing cover 23 receives the pipe connection 11 leading from the pump outlet. The wall of the casing is formed with four ports 26 at equal distances apart around its circumference and in the same circumferential line. These ports receive the respective pipe branches 12 leading to the four jacks. The casing is also formed with another single port 27, at a point further from its front end, which port receives the bye pass pipe 13 leading to the reservoir F.

The plug 21 is made with a bore 28 extending centrally right through its length such bore being enlarged at its forward end to form a chamber in which a ball valve 29 loosely fits, such ball being adapted to fit upon a seat 30 formed in the bore and to seal the forward end of the bore. It is kept normally on such seat by a compression spring 31 engaging its outer side and held in tension by a perforated plug 32 screwed into the bore end. A port 33 opens from this larger end of the bore out through the side of the plug and in the circumferential line of the ports 26. By rotating the plug therefore this port 33 may be brought into coincidence with any one of the ports 26 and the branch 12 leading therefrom, or may be caused to engage a solid part of the casing wall.

The plug 21 is also formed with a circumferential groove 34 in its periphery, arranged in coincidence with the single port 27, and this groove connects by a port 35 with the smaller end of the central bore 28.

A pin 36 is screwed into the rear end of the bore 28 to extend through it, the screwed portion closing the bore end. This pin is a loose fit in the bore and it is adapted when screwed right in, to engage the ball valve 29 and force it away from its seat 30, and thereby to open connection between the larger and smaller ends of the bore. A thumb nut 37 is secured on the outer end of the pin for use in turning it.

The turning of the plug 21 to connect any one of the branches 12 with the port 33, is effected by the knob 24, and to permit of a particular branch being selected, the knob may have a pointer 24a, while the disc plate 25 is marked with markings to indicate the positions to which the plug has to be turned to connect with each of the jacks, as for instance as shown in Figure 6.

In the operation of this valve, its plug is turned to connect the required jack, and the pump is then operated by closing the motor switch. The fluid thus passes along the branch 12, the ball valve 29 being forced back on to its seat 30. When the jack has been operated to the required extent the switch is opened to stop the pump and the plug is turned to bring its port 33 against a solid part of the casing wall, thereby confining the fluid within the jack and its connections, to keep it raised. Then when the jack is to be exhausted, the pin 36 is screwed in to engage the ball valve 29 and force it from its seat, and the plug is turned back to connect with the branch 12 concerned. The fluid will then exhaust back through the branch and

pass into the smaller end of the bore 28 and from thence through the port 35, groove 34 and port 27, to the bye pass 13 and into the reservoir F.

The starter motor D is equipped with the usual starter coupling universally known in the motor vehicle industry as a "Bendix" drive and in accordance with the principle of operation of this coupling, when the speed of revolution of the starter motor is reduced below a certain value, it does not operate to establish a driving connection between the starter motor and the vehicle engine. This condition prevails when the valve is adjusted to operate a jack, the load imposed on the motor D reducing the speed of the latter to a point where the coupling is prevented from establishing a driving connection with the vehicle engine, and thus the entire energy of the motor is utilized to operate the jack, wholly independent of the engine. On the other hand, when the jack is not in use, a by-pass for the pump is provided through the pipe 11, open valve 29, bore 28, port 35, groove 34, by-pass 13, reservoir F and pipe 10, and thus only a negligible resistance is offered by the pump to the rotation of the motor shaft, and the starter motor may be operated as usual to start the engine.

It will readily be seen that each jack may be operated in turn, without exhausting the others by maintaining the ball valve 29 on its seat, and then each be exhausted in turn, by opening the ball valve and operating the plug 21.

The form of selector valve shown in Figures 7 to 9 is of simpler construction and is designed to provide for the independent operating of each jack. In it the construction resembles the valve shown in Figures 4 to 6 as far as the connection between the pump and the several branches is concerned, but varies the means for exhausting each jack by connecting it with the exhaust port 27.

This construction provides that the plug 21 is formed with a groove 39 extending longitudinally in its periphery at a convenient circumferential distance from the port 33. This groove is made long enough to extend from the line of the ports 26 and to enter the circumferential groove 34 in the plug's periphery. Thus it may, by the turning of the plug 21 to the appropriate position, be made to connect any one of the ports 26, and the corresponding branch 12, with the exhaust port 27 and bye pass 13. The port 33 and the groove are positioned to follow one upon the other in the turning of the plug in a clockwise direction, so that the port 33 may be connected to a jack to operate such jack and then turned to a neutral midway position to hold the fluid in the jack and then turned a further portion of a turn to connect such jack with the exhaust. For this purpose the disc plate 25 will be appropriately marked with the "On" and "Off" positions for each jack.

It will readily be understood that the selector valve employed may be varied in a number of ways to provide for different sequences of operations in the connections of the jacks with the fluid supply and with exhaust.

The construction of jack shown in Figure 10 provides a cylinder 40 of approved diameter and length that is adapted to be locked upon the portion of the axle A or B to which it is to be attached, so that it extends approximately vertically and is rigid therewith. The upper end of the cylinder is closed and into this end, the branch 12 from the selector valve G leads. Within the cylinder a plunger rod 41 extends, such rod having a suitable plunger 42 on its upper end and projecting at its lower end through the open bottom end of the cylinder. This plunger rod at its lower end has a suitable foot 43 affixed to it. The plunger rod is formed hollow throughout its length and in such hollow a helical tension spring or springs 44 is, or are, placed, each spring having its upper end connected to the top end of the cylinder and its lower end to the bottom end of the plunger rod, and being so tensioned that it normally draws the plunger rod (which forms the jack spear) upwards into the cylinder.

The pumping of fluid into the upper end of the cylinder will therefore cause the plunger rod to be forced down against the spring's action to project from the cylinder, while the connection of the cylinder top with exhaust through the valve G, will cause the weight borne by the extended jack to act to force the plunger in and the fluid back to the reservoir F, the spring then acting to draw the plunger rod right up clear of the ground, when the weight is taken off the jack, and then to keep it there.

Such a device is shown in sectional detail in Figure 11 and in position in Figure 10. It is formed by a small cylinder 50 that is screwed to extend radially in through the jack cylinder 40 to project upon its inside and that contains a metallic ball 51 that is adapted to project for portion of its area through an opening 52 made in the cylinder inner end. This is kept projecting by means of a coil spring 53 placed between the ball and the outer end of the cylinder, which is closed by a cover 54 of insulated material. The ball is kept normally projecting from the cylinder end to engage the surface of the plunger rod by means of its spring and the jack's plunger rod is formed near each end with a groove 45 in its periphery into the appropriate one of which the ball will be pressed when the plunger rod is at its fully extended or fully retired position. The ball makes contact at all times with the plunger

rod and is therefore "earthed" to the vehicle in the formation of the lamp or signal circuit concerned.

Affixed to the cover of insulated material 54, is a terminal pin 55 which is designed to receive the positive of the lamp or signal circuit. This pin extends through to the inside of the cylinder and on its inner end has a springy contact finger 56 affixed which finger projects into the cylinder so that its end occupies a position that is clear of the ball 51 when the ball is forced outward into either groove 45 of the plunger rod, but is engaged by the ball when the ball is pushed inward through its contact with the portion of the plunger rod between the two grooves. Thus the lamp or signal circuit is completed while the plunger rod is moving between its two limits and will illumine the dash lamp, or cause any other approved form of electric signal to be actuated, and will be broken when the movement is completed, to cut off such signal and thereby indicate that the jack has fully performed its function.

The use of the vehicle starter motor as the actuating means for the pump has particular advantages in respect to the prevention of any trouble through excessive pumping into the jacks and their connections as the resistance caused by the back pressure when the system is fully charged will be sufficient to overcome the energy of the storage batteries driving the motor. This may be more effectually safeguarded by providing that when the motor is to be used to actuate the pump, a proportion only of the battery energy shall be brought into use, which may be done by having a separate circuit and switch connection to that controlling the motor for engine starting.

I claim:—

1. In combination, a wheel-mounted chassis carrying a propelling engine thereon, a starter mechanism for said engine, hydraulic jacks carried by the chassis, a pump directly connected with and driven by the starter mechanism, means for by-passing fluid from the pump delivery to the pump inlet whereby the starter mechanism is permitted to function normally as an engine starter, and means for selectively establishing communication between the pump and the jacks to effect operation thereof, the additional load imposed on the starter mechanism during operation of one of the hydraulic jacks acting to prevent normal operation of the starter mechanism to start the engine.

2. In combination, a wheel-mounted chassis carrying a propelling engine, a starter mechanism for the engine including a starter motor shaft, hydraulic jacks carried by the chassis, a fluid pump connected directly with the starter shaft and permitting normal operation of the starter mechanism to start the engine during inactivity of the hydraulic jacks, and means for selectively connecting the pump with the jacks to operate the latter, the additional load imposed on the starter shaft during operation of the jacks preventing normal operation of the starter mechanism to start the engine.

3. In combination, a wheel-mounted chassis carrying a propelling engine thereon, an independent starting motor for the engine including a shaft and a starting gear on said shaft acting in response to rotation of the starter shaft at a relatively high velocity to establish a driving connection between the starter shaft and engine, hydraulic jacks carried by the chassis, a selector valve, fluid conduits connecting the valve with the jacks, a fluid pump having a fluid outlet connected with the valve and a fluid inlet, said pump being directly driven from the starter shaft, by-pass means permitting free passage of fluid from the outlet to the inlet whereby, during periods of inactivity of the jacks, the starter shaft may attain a velocity sufficient to establish a driving connection between the starting gear and engine whereas, when the pump is connected with one of the jacks, the additional load imposed on the starter shaft reduces the velocity of the latter sufficiently to prevent normal operation of the starter gear.

In testimony whereof, I affix my signature.

HOWARD NATTRASS.