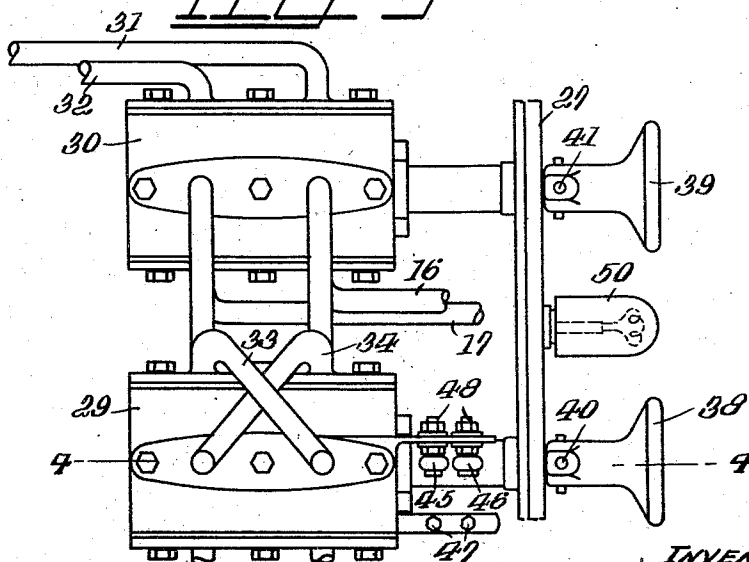


2,212,591

3 Sheets-Sheet 1



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E. G. B. DE MANGHI

2,212,591

AUTOMATIC HYDRAULIC LIFTING DEVICE FOR VEHICLES

Filed Sept. 13, 1938

3 Sheets-Sheet 2

FIG 4

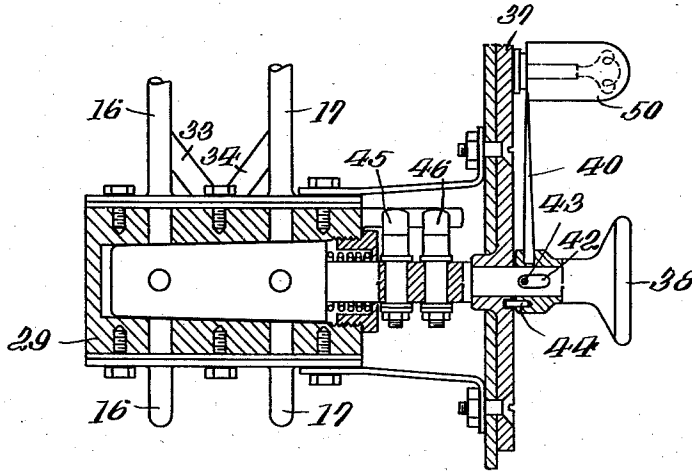
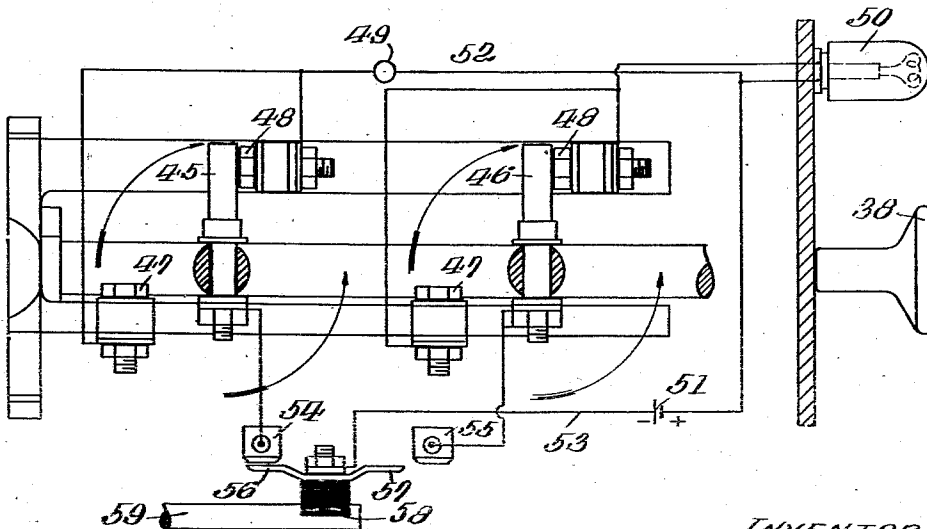


FIG 5



INVENTOR

Elda Graciana Bergolli de Manghi

By

N. V. O'Kendall

ATTORNEY

Aug. 27, 1940.

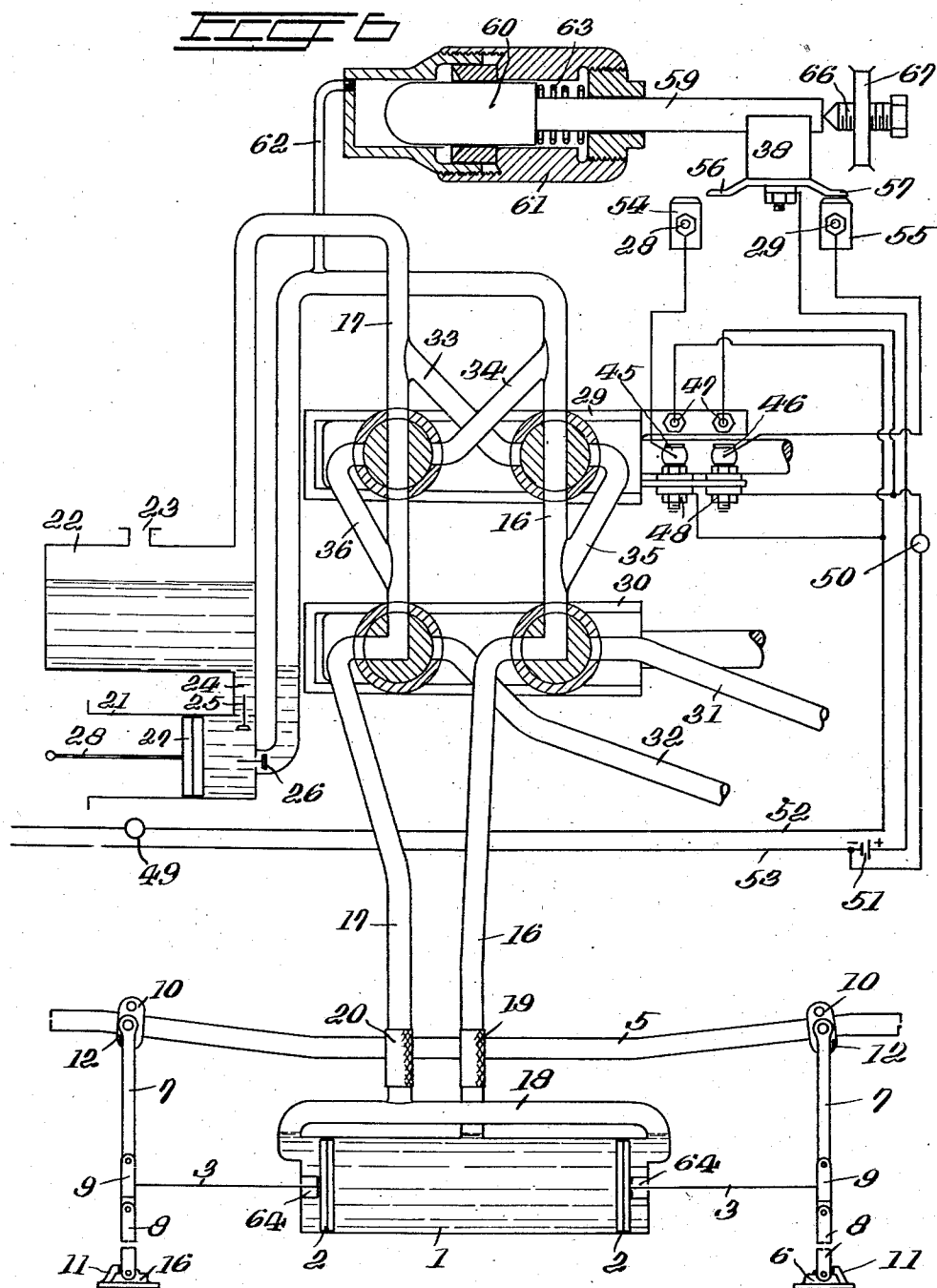
E. G. B. DE MANGHI

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AUTOMATIC HYDRAULIC LIFTING DEVICE FOR VEHICLES

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3 Sheets-Sheet 3



Elda Graciana Bergolli de Manghi

By

E. F. Alexander

ATTORNEY

UNITED STATES PATENT OFFICE

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AUTOMATIC HYDRAULIC LIFTING DEVICE
FOR VEHICLESElda Graciana Bergolli de Manghi
Buenos Aires, Argentina

Application September 13, 1938, Serial No. 229,778

2 Claims. (Cl. 254—86)

This invention relates to an automatic hydraulic lifting device for automotive vehicles in general.

Particularly, the lifting device subject of the present invention is characterized essentially in that it provides two hydraulic driving elements constituted by a plurality of chambers within each of which coaxially act two pistons constituting the drive transmission means corresponding to the lifting cycle; said means having an articulated connection between the ends of the vehicle axle and a plurality of bearing shoes. Each chamber has two shoes joined together, in pairs, by a bar acting as a means for maintaining the proper separation of the shoes. Said bars are joined longitudinally to the lower portion of the chambers by resilient anchoring means projecting from the chambers and serving to avoid the sudden lowering of the shoes when in inoperative position.

A feature of the present invention resides in the provision for each chamber of tubular alternative intercommunication means between a hydraulic compressor pump and a fluid supply tank communicating with the atmosphere, intercommunication being provided between said pump and supply tank by means of a tubular branch controlled by a check valve. The tubular means intercommunicating the chambers and pump, constitute the high pressure conduits, while the tubular means intercommunicating the chambers and the supply tank constitute the low pressure conduits. The high pressure conduits project from the central portion of each chamber, while the low pressure conduits project from an intermediate branch coupled to both ends of the respective chamber, and since two pistons act coaxially in each chamber, the latter is thus divided into three compartments, viz; a central high pressure compartment and two lateral low pressure compartments, said division being determined directly by the pistons and the variable cubic capacity depending on the stroke of the pistons.

A further feature of the invention resides in the interpolation, in the high and low pressure conduits, and in the group thereof providing the intercommunication of the chambers, for example the chamber corresponding to the front axle of the vehicle with the compressor pump and fluid supply tank, of two two-way valvular means for controlling the circulation of fluid, one of said valvular means constituting a cut-off valve controlling the passage of fluid to either chamber in the high pressure cycle, while the other valvular

means constitutes a reversing valve to control the passage of fluid to either chamber in the low pressure cycle. These valves are hand actuated from the driver's cabin.

A further feature of the invention resides in the provision of communicating means between the high pressure conduits and the low pressure conduits, said communicating means consisting of intermediary branches interpolated between the reversing valve and said conduits. This communication is complementary between the high and low pressure conduits and is intended to establish, in alternate cycles, the feed of the high pressure chambers, whether through the central portion of said chambers, corresponding to the lifting cycle, or through the end portions corresponding to the vehicle lowering cycle.

A still further feature of the invention resides in the provision of an electromotive element for driving the pressure pump, said element being actuated directly by the vehicle battery. The starting or shutting off of said element takes place automatically by the synchronization thereof with a circuit breaker acting in a chamber branched to the high pressure conduit, said circuit breaker being constituted by a stem which projects from a piston acting in the chamber and which is counteracted upon by an expansion spring having its tension graduated at a pressure slightly smaller than that required to establish the operating cycle of the chambers. The said circuit breaker also constitutes a current deflecting element, since it automatically and alternately establishes the closing or opening of the electric circuit between the electromotive agent and an electric lamp located on the vehicle panel or elsewhere within the driver's sight, and serving to indicate the termination of both the lifting and the lowering operative cycles.

In order that the invention may be more clearly understood and readily carried into practice, same has been illustrated by way of example and in a preferred embodiment in the accompanying drawings, wherein:

Figure 1 is a side elevation and partly sectional view of a chamber constituting the hydraulic driving means with the several elements forming same.

Figure 2 is a plan view of the assembly shown in Figure 1, showing the manner in which same is coupled to the corresponding vehicle axle, in the present case and merely for illustrative purposes, the front axle.

Figure 3 is a plan view of the valvular means

controlling the circulation of oil between the pump and tank to the chambers and the return thereof to the tank.

Figure 4 is an elevation and sectional view taken on the line 4—4 of Figure 3.

Figure 5 is a schematic view of the electric control of the operation of the device.

Figure 6 is a general schematic view of the device, showing the functional relation between the parts thereof.

The same reference characters indicate like or equivalent parts or elements throughout the different figures.

The subject of the present invention comprises two hydraulic driving chambers, one for each axle of the vehicle, although for illustrative purposes only that corresponding to the front axle has been shown in the drawings. Said chambers comprise a cylindrical tubular casing 1, as shown in Figure 1, within which are coaxially located two pistons 2. The piston rods 3 project outside the chambers through suitable packing glands 4, and are connected to both ends of the corresponding axle, in the case shown the front axle 5, and the shoes 6. The connection between the rods, axle and shoes comprises two end sets of connecting rods 7 and 8. The connecting rods 7 are articulated between one end of a cross-head 9 fixed to the rear end of the rods 3 and the central portion of a suitable supporting clamp 10, fixed to either end of the axle 5, while the connecting rods 8 are articulated to the opposite end of the cross-heads 9 and the upper end of the shoes 6. Shoes 6 are provided with shoulders 11 which together with projections 12 formed at one end of the clamps 10 constitute safety stops for keeping the chamber stabilized during the vehicle lifting cycle. As only one chamber is shown in the drawings, i. e. that corresponding to the front axle, for the sake of simplicity the details of the device will also be explained based on said chamber.

Both shoes 6 are connected to each other by means of a bar 13, serving to keep them permanently spaced apart. In turn, said bar 13 is placed in front of anchoring elements constituted by springs 14 of fork-shaped profile and projecting from the bottom of the chamber 1, the bar 13 being held within said springs when the device is in inoperative position or folded against the axle, thus preventing any eventual fall thereof in case there is a lack of hydraulic pressure in the chamber ends.

As shown in Figure 6, the chamber has connected thereto two tubular conduits, a high pressure conduit 16, connected to the center of the chamber, and a low pressure conduit 17 connected to both ends of the chamber through an intermediary branch 18 connected to both ends of the chamber. The coupling of the conduit 16 to the central portion of the chamber, and of the conduit 17 to the branch 18, is effected by interpolating flexible sleeves 19, and 20, respectively. The elasticity of these sleeves facilitates the displacement of the chamber in the initial lifting and lowering cycle thereof, respectively.

The high pressure conduit 16 is connected to a compressor pump 21, as shown in Fig. 6, while the low pressure conduit is connected with the oil feed tank 22 communicating with the atmosphere by means of an orifice 23. Both the pump 21 and the tank 22 are intercommunicated by means of a branch 24 carrying a common check valve 25, the latter serving to prevent the loss

of pressure. The check valve 25 is aided by a similar valve 26, arranged at the mouth of the pump communicating with the conduit 16. The pump 21 is provided with a corresponding plunger 27 which by means of its rod 28 is connected to the electromotive element actuating the same in the manner hereinafter described.

Interpolated in the high and low pressure conduits of the chamber 1 are two suitably spaced valve structures 29 and 30, of the two-way type. Valve structure 29 includes a valve which controls the circulation of fluid between one chamber and the other in the high pressure cycle, while valve structure 30 includes a valve also controlling the circulation of fluid between both chambers, but in the low pressure cycle. These valves are schematically illustrated in Figure 6, which also shows two auxiliary conduits, viz; a high pressure conduit 31 and a low pressure conduit 32, which extend to the chamber provided on the rear axle.

The high and low pressure conduits 16 and 17 intercommunicate by means of intermediary branches 33 and 34, connected to the valves 29. Communication between both conduits 16 and 17 is secured by means of the branch 33 and a tubular extension 35 connected to the cut-off valve and the conduit 16, while communication between 17 and 16, viz; in the opposite direction, is secured by means of the branch 34 and a tubular extension 36, similar to the extension 35. This arrangement serves to establish the feed of the high pressure chambers in both lifting and lowering operating cycles, in an alternate manner.

Both valve structures 29 and 30 include two valves which are actuated from the front part of a panel 37, as shown in Figures 3 and 4, through suitable knobs 38 and 39 connected to the respective valve stems. These knobs are provided with position indicating arrows 40 and 41, which extend through the projecting stem of the corresponding male part of the valve structures, as shown in Figure 4, for the knob 38, by means of a groove 42 having a transverse pin 43. The stems of the respective knobs are provided with a stop 44 fitting in suitable perforations made in the panel 37, for the purpose of anchoring the knobs in the position corresponding to the pre-established cycle of the device.

The stem of the valves 29 has connected thereto a rotary positive electric contact 45 and a rotary negative electric contact 46, rotating in conjunction with the rotation given to the stem through the knob 38. These contacts act alternatively on fixed contacts 47 and 48 (Figures 3, 4 and 5). Contacts 47 close the circuit of the motor 49, while contacts 48 close the circuit with the lamp 50 provided in the panel 37 and indicates the final vehicle lifting and lowering cycles.

The motor 49 is connected to the battery 51 (Figures 5 and 6) through electric conductors 52 and 53, which are series connected by intermediary shuntings connected to each other, between contacts 45, 46, 47, 48, to plates 54 and 55. Plate 54 is in the circuit between the battery and motor, while plate 55 is in the circuit between the battery and lamp. The metallic terminals 56 and 57 cooperate therewith for opening and closing the respective circuits. The cores of said terminals 56 and 57 are connected, by means of a clamp 58 made of insulating material, to the circuit breaker 59 operated by a compressor chamber 61, said circuit-breaker projecting from a piston 60. Compressor chamber 61 communi-

cates with the high pressure conduit 16 through an intermediary tubular branch 62. The piston 60 is acted upon by a spring 63, bearing against the rear portion of the chamber and having the tension thereof graduated at a pressure slightly smaller than that required to establish the functional cycle of the device.

The stroke of the pistons in the chamber 1 in either direction is limited, for the high pressure cycle corresponding to the lifting of the vehicle, by stops 64 arranged at opposite ends of the chamber, and for the low pressure cycle corresponding to the lowering of the vehicle, by means of suitable ribs 65 provided on the confronting faces of the pistons 2. The purpose of the elements 64 and 65 is to provide a relative space between the rear faces of the pistons and the ends of the chambers, and between the opposing faces of the pistons when the device is in inoperative position, in order to enable the free circulation of fluid during the different operating stages of the device.

The operation of the device is as follows: The circuit between the battery and motor is closed by connecting the rotary contacts 45, 46 with contacts 47, thus starting the operation of the pump 21 connected to the motor through its rod 28 in any known manner, and starting therefore the circulation of fluid through the high pressure conduit 16 to the central portion of the chamber 1. During this first stage the circuit breaker 59 is in circuit with the motor and maintains the circuit with the lamp 50 open. Upon the pistons 2 reaching the limit of their stroke and engaging the stops 64, the fluid concentrated within the chamber due to the continuous operation of the motor reaches its maximum pressure, at which time it is communicated with the chamber 61, striking the rod 60 and causing the displacement of the circuit breaker 59 in opposite direction to the pressure of spring 63 until it engages a stop 66 fixed to a support 67 (Figure 6) at which time the terminal 57 contacts the plate 55, thereby closing the circuit with the lamp 50 and opening the circuit with the motor, indicating to the driver the termination of the vehicle lifting cycle. At this time the driver rotates the knob 38 of the reversing valve until the rotary contacts remain separated from the fixed contacts, which he will control through an indication on the vehicle panel by the arrow 40, thereby blocking all hydraulic communications and leaving the device at a maximum pressure sufficient to maintain the vehicle in a lifted position, without danger of sudden downward displacements.

To lower the vehicle, once the operations which caused the lifting thereof have been carried out, the driver again actuates the knob of the reversing valve and turns same towards a pre-established guide indication on the panel indicating the communication of the valve ways, intercommunicating the high pressure conduit 16 with the low pressure conduit 17 by 35, 36, through branches 34 and 33, thus causing the free circulation of fluid back to the tank 22, lowering the pressure in the chamber between the pistons 2 to its lowest limit, equivalent to one atmosphere. Due to the communication established between the high pressure and low pressure conduits, through the branches 34 and 35, the circuit breaker simultaneously starts moving backwards, through the action of spring 63, upon the pressure in chamber 61 being reduced due to the fluid therein escaping through the branch 62. This causes the circuit breaker to again close the cir-

cuit with the motor when the terminal 56 engages plate 54, and the backward motion of the circuit breaker causes the opening of the circuit with lamp 50. This re-starts the motor 49 which again drives the pump 21, the latter sending fluid at a high pressure to the end portions of the chamber, thus causing the advance of the pistons 2 towards the central portion of the chamber, thereby starting the lowering of the vehicle as a result of the folding of the connecting rods 7 and 8. The device closes gradually and upon the pistons reaching their final position determined by the stops 65, the pressure will be raised to the maximum, at which time the circuit breaker again moves backwardly to establish the opening of the circuit of the motor and the closing of the circuit of the lamp 50 thereby lighting the same. The device thus remains with chamber 61 at a maximum pressure commensurate with that in the end portions of the chamber, and the device is shut-off. The knob 38 of the reversing valve 29 is again actuated so as to separate the rotary contacts from the fixed contacts, which causes the opening of the circuit with the lamp, while the valve interrupts all conduits, fixing the device at the maximum pressure and interrupting all electric circuits, stabilizing the closed position of the device with the aid of the bar 13 engaged in the grooves 14.

The above description was made with reference to the chamber corresponding to the front axle 5, and as regards the chamber corresponding to the rear axle, not shown in the drawings, the operation thereof is similar to that described for the front chamber, it being sufficient to rotate the cut-off valve 30 by an angle of 45°, establishing the connection of the high pressure and low pressure conduits 15 and 17 with the respective tubular extensions 31 of conduit 16, and 32 of conduit 17, thereby cutting off the communication of the rear chamber with pump 21, tank 22 and the other operating and control elements.

What is claimed is:

1. An automatic hydraulic lifting device for vehicles comprising a chamber, a pair of pistons acting coaxially within said chamber, a piston rod fixed to each piston projecting outside of said chamber, a cross head fixed to the end of said piston rod projecting outside of said chamber, a shoe for each piston rod, connecting rods connecting each cross head to said shoe and to the axle of the vehicle, means for supplying fluid under pressure, means for supplying fluid to said means for supplying fluid under pressure, high pressure and low pressure conduits connecting said chamber with said means for supplying fluid under pressure, an electromotive driving agent for driving said means for supplying fluid under pressure, a source of electric current supplying a circuit connecting said electromotive driving agent with said source of supply, hydraulic automatic means located in said circuit operated by the pressure in said conduits controlling said circuit and valve means in said conduits controlling communication between said chamber, said means for supplying fluid under pressure and said fluid supply means.

2. An automatic hydraulic lifting device for vehicles comprising a chamber, a pair of pistons acting coaxially within said chamber, a piston rod fixed to each piston projecting outside of said chamber, a cross head fixed to the end of said piston rod projecting outside of said chamber, a shoe for each piston rod, connecting rods connecting each cross head to said shoe and to

the axle of the vehicle, means for supplying fluid under pressure, means for supplying fluid to said means for supplying fluid under pressure, high pressure and low pressure conduits connecting said chamber with said means for supplying fluid under pressure, a bar connecting the shoes at each end of said chamber, resilient locking means for said bar on said chamber, an electromotive driving agent for driving said means for supplying fluid under pressure, a source of electric cur-

rent supplying a circuit connecting said electromotive driving agent with said source of supply, hydraulic automatic means located in said circuit operated by the pressure in said conduits controlling said circuit and valve means in said conduits controlling communication between said chamber, said means for supplying fluid under pressure and said fluid supply means.

ELDA GRACIANA BERGOLLI

DE MANGHI.