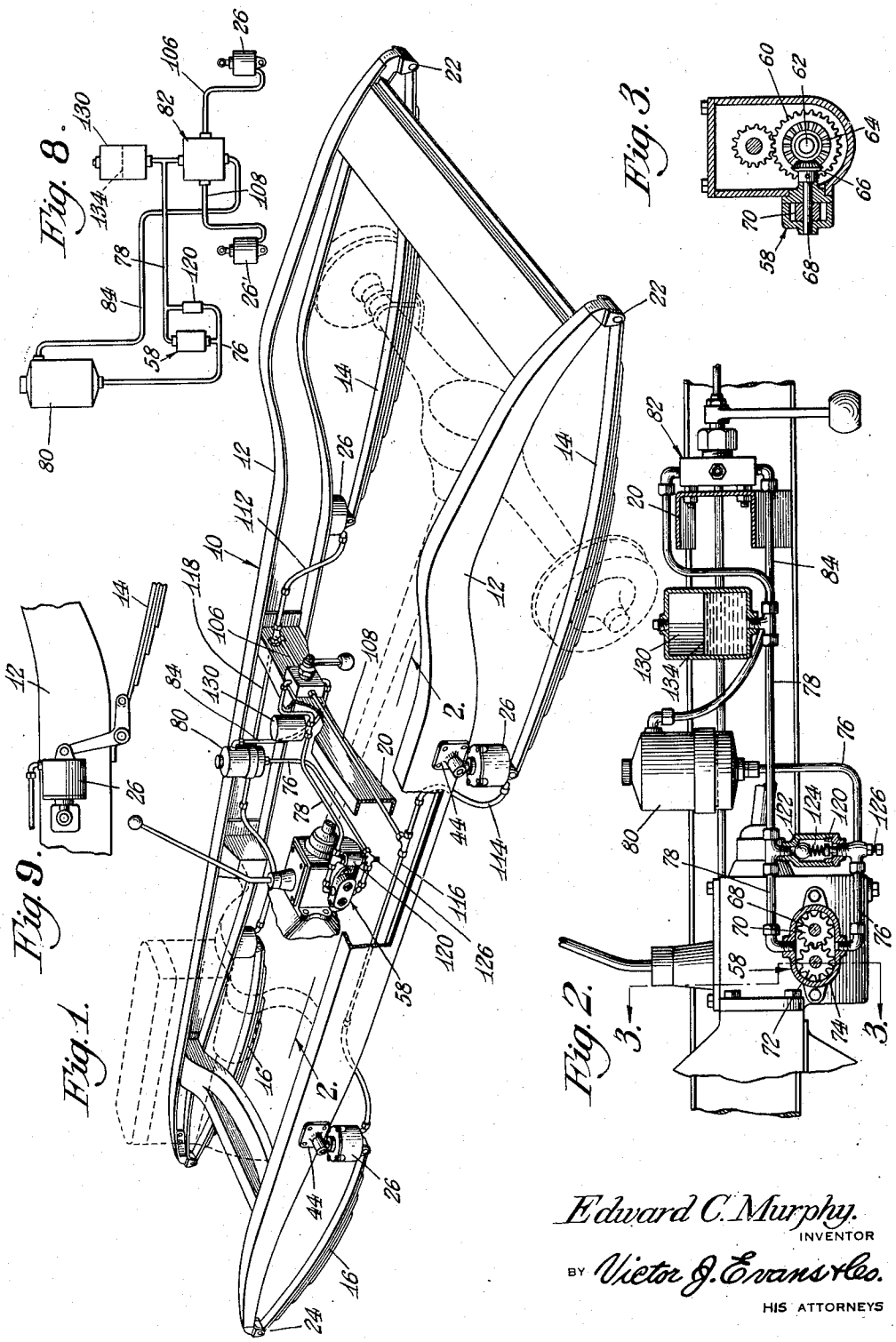
March 8, 1938. E. C. MURPHY 2,110,809

BALANCER

Filed June 2, 1934 2 Sheets-Sheet 1



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Filed June 2, 1934 2 Sheets-Sheet 2

Fig. 4.

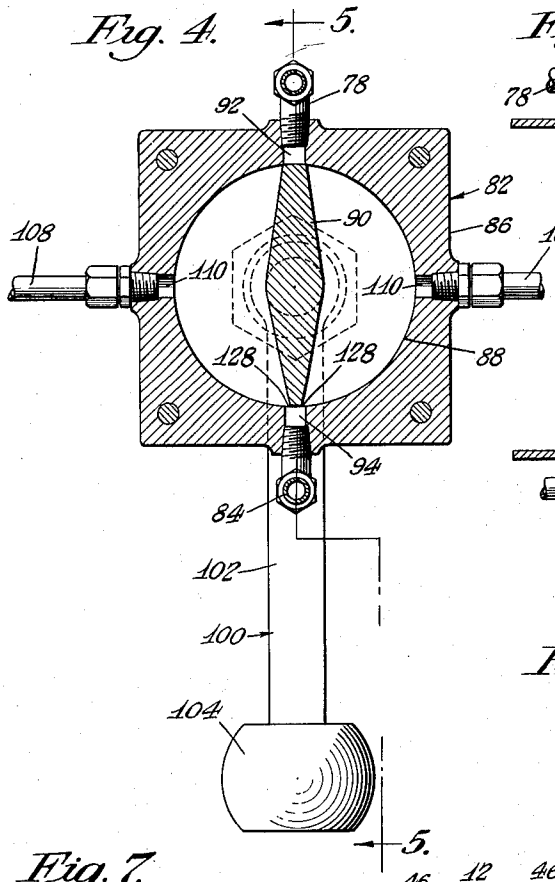


Fig. 5.

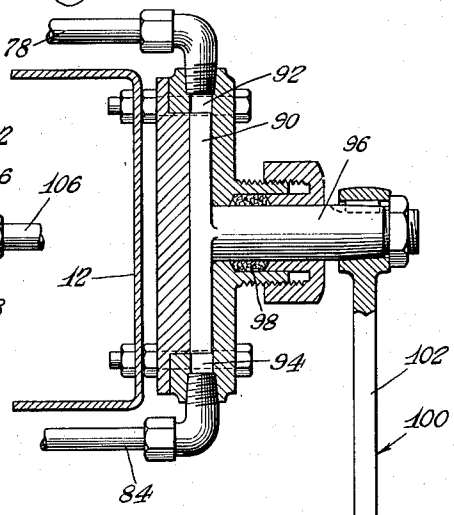


Fig. 6.

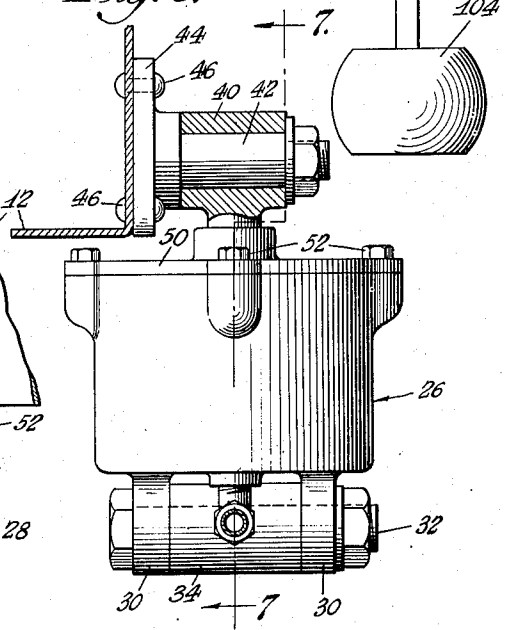
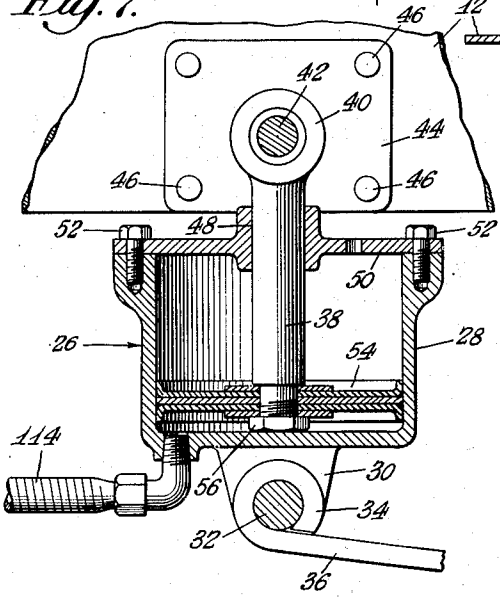


Fig. 7.



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Patented Mar. 8, 1938 2,110,809

UNITED STATES PATENT OFFICE

2,110,809

BALANCER

Edward C. Murphy, Chicago, Ill.

Application June 2, 1934, Serial No. 728,782

4 Claims. (Cl. 280—112)

My invention relates to power propelled vehicles, and has among its objects and advantages the provision of an improved balancer constructed and arranged to prevent tilting of the vehicle about its longitudinal axis as when the vehicle is passing around curves or moving over laterally inclined roadbeds.

In the accompanying drawings:

Fig. 1 is a perspective view of an ordinary chassis embodying the invention;

Fig. 2 is a view taken along the line 2—2 of Fig. 1;

Fig. 3 is a sectional view taken along the line 3—3 of Fig. 2;

Fig. 4 is a sectional view of my pendulum operated valve;

Fig. 5 is a sectional view taken along the line 5—5 of Fig. 4;

Fig. 6 is an elevational view of one of the cylinders associated with the supporting springs for the vehicle;

Fig. 7 is a view taken along the line 7—7 of Fig. 6;

Fig. 8 is a diagrammatic view of the operating circuit; and

Fig. 9 is a detail view of a different form of a shackle cylinder.

In the embodiment selected to illustrate my invention, I make use of an automobile chassis 10 comprising the usual frame members 12 provided with conventional rear springs 14 and front springs 16 associated with the supporting wheel and axle structure 18. I illustrate a cross beam 20 as interconnecting the two frame members 12. Referring to Fig. 1, the rear ends of the rear springs 14 are pivotally connected with the frame members 12 at 22, while the front ends of the front springs 16 are similarly connected with the frame members at 24. The opposite ends of the front and rear springs are operatively connected with the frame members 12 through the medium of shackle cylinders 26.

Referring to Figs. 6 and 7, each of the shackle cylinders 26 comprises a cup 28 provided with lugs 30 on its bottom for supporting a bolt 32 arranged to support the loop 34 of the spring leaf 36 of one of the springs 14 or 16.

Means for swingably connecting the shackle cylinder 26 with the frame 12 comprises a rod 38 having a loop 40 pivotally mounted upon a shaft 42 comprising an integral part of the plate 44 riveted to the frame at 46. The rod 38 is slidably positioned within an opening 48 in the cover 50 closing the open end of the cup and secured thereto by bolts 52. In Fig. 7, I illustrate the inner end of the rod 38 as being provided with a piston 54 fastened to the rod by means of a nut 56. Thus, the shackle cylinders 26 are mounted for pivotal movement about the shafts 42 thereby performing the function of the usual spring shackles.

I design the shackle cylinders 26 to perform an additional function in that a fluid pressure circuit is associated therewith for shifting the pistons 54 as a function incident to the tilting of the vehicle about its longitudinal axis when passing around curves, or over laterally inclined roadbeds, to maintain the vehicle in a level condition. To this end, I provide a suitable pump 58 having a geared connection with a gear 60 of the conventional transmission cluster gears mounted upon the usual countershaft 62 through the medium of a bevel gear 64 connected with the gear 60. The gear 64 is arranged in mesh with a bevel gear 66 connected with a shaft 68 upon which a pump gear 70 is associated in operative relation with a second gear 72. Of course, other pumps than the gear pump illustrated may be employed.

The pump casing 74 is provided with an inlet conduit 76 and an outlet conduit 78. I connect the conduit 76 with a fluid supply tank 80, and the conduit 78 with a control valve 82 mounted upon the cross beam 20. A conduit 84 connects the control valve 82 with the supply tank 80.

Referring to Figs. 4 and 5, the control valve 82 comprises a housing 86 having a circular compartment 88 within which a valve blade 90 is mounted. In the position illustrated in Fig. 4, one end of the blade closes the inlet port 92 communicating with the conduit 78, while the opposite end of the blade is aligned with the outlet port 94 communicating with the conduit 84. In Fig. 5, I illustrate the valve blade 90 as being provided with a shaft 96 extending through a bearing and packing gland 98. Upon the outer end of the shaft 96 I mount a pendulum 100 comprising a depending reach 102 having a weight 104 connected therewith. The pendulum 100 and the blade valve 90 is constructed and arranged in such a manner that the valve blade assumes the position illustrated in Fig. 4 when the vehicle is in a horizontal position from side to side. Thus, the operating fluid in the conduit circuit will not enter the control valve 82 when the valve blade is in the position of Fig. 4.

Operating connections between the control valve 82 and the shackle cylinders 26 comprise conduits 106 and 108 connected with the housing 86 and communicating with the compart-

ment 88 through the medium of ports 110 in the housing.

Referring to Fig. 1, the conduits 106 and 108 are associated with conduits 112 and 114, respectively, leading to the shackle cylinders 26 associated with the rear springs 14. Similarly, the conduits 106 and 108 are connected with conduits 116 and 118, respectively, for connection with the shackle cylinders 26 associated with the front springs 16. Referring to Fig. 7, it will be noted that the conduits 112 to 118 communicate with the space between the bottom of the cup 28 and the piston 54 of their respective shackle cylinders 26. Thus, when fluid under pressure is forced into the cylinders, the pistons will rise tending to lift the chassis.

In operation, the pump 58 will tend to force liquid under pressure through the control valve 82. I connect the conduits 76 and the conduit 78 with a by-pass valve 120 (see Fig. 2). The spring pressed ball 122 will move away from its seat to permit the passage of fluid through the valve 120 when a predetermined pressure within the circuit has been attained, depending upon the amount of tension in the spring 124. The tension may be varied through the medium of an adjustment member 126. Thus, the valve 120 operates to maintain a uniform pressure of predetermined value within the circuit.

When the vehicle is caused to rotate bodily about the longitudinal axis of the vehicle, as when turning corners or moving over roadbeds having any appreciable lateral inclination, the pendulum 100 will rotate the valve blade 90 sufficiently far to permit fluid to be forced into the compartment 88. Such fluid will be forced into the two shackle cylinders upon the low side of the vehicle, thereby moving the pistons and raising the low side of the vehicle until it is in a horizontal position.

Referring to Fig. 4, the lower end of the valve blade 90 is slightly narrower than the port 94, whereby two slight bleeds 128 are provided. In this way, the necessary amount of fluid is returned to the pump side of the circuit when the part 92 is closed to permit the vehicle to assume its normal condition.

My invention does not in any way interfere with the easy riding qualities of the vehicle in that the shackle cylinders 26 permit free action of the supporting springs.

The ends of the conduits 112 to 118 connected with the shackle cylinders 26 comprise flexible tubing. In Fig. 1, I illustrate a pressure tank 130 connected with the conduit 78 in close proximity to the control valve 82. This tank is positioned at a lower altitude than the supply tank 80. The latter is provided with a small vent opening 132 in its top to permit free movement of the fluid on the low pressure side of the control valve 82. The supply of fluid within the circuit is such that the level in the supply tank will not raise to a point where there is any overflow. However, the tank 130 is only partly filled with fluid as indicated by the fluid level 134. The space above the liquid level comprises a compressed air compartment, which pressure is equal to the circuit pressure built up by the pump 58.

The purpose of the tank 130 is to provide a supply of fluid in close relation to the control valve 82, whereby an auxiliary supply of fluid is associated with the control valve in such a manner that that part of the circuit connecting the control valve with the shackle cylinders 26 will always be filled. As soon as the control valve 82 is opened, some of the fluid in the tank 130 will immediately flow into the conduits associated with the low side of the vehicle to lift the pistons associated with the shackle cylinders on that side of the vehicle. Of course, the fluid supply from the pump 58 may under ordinary conditions supply all or practically all of the fluid necessary to attain quick and efficient leveling of the vehicle, but the tank 130 is associated with the fluid circuit to assure quick and efficient action under all conditions of service. In Fig. 8, I have illustrated a diagram of the circuit for the sake of clearness.

In Fig. 9, I have illustrated a different arrangement of the shackle cylinder 136, in which the cylinder is pivotally connected at 138 with the frame member 140 in a horizontal position. The bottom of the cylinder is provided with a lug 142 operatively connected with the vehicle spring 144 through the medium of a bell crank lever 146 pivotally mounted at 148 upon a bracket 150 fastened to the frame member 140. The circuit fluid is introduced into the cylinder through its bottom as indicated by the conduit 152 in the same way as in connection with the shackle cylinders 26. In this modification, the opposite end of the vehicle spring is, of course, provided with the usual shackle to compensate for variations in the length of the spring.

The tank 130 is, of course, of air-tight construction and is provided with an air inlet valve 154 of conventional design to permit pressure to be applied to the tank.

Without further elaboration, the foregoing will so fully explain my invention that others may, by applying current knowledge, readily adapt the same for use under various conditions of service.

I claim:

1. The combination with a vehicle body having supporting wheels and spring means operatively connecting the body with the supporting wheels, of a closed liquid circuit, means for applying pressure to the liquid circuit, means comprising a part of the liquid circuit operatively connected with the body of the vehicle and the springs to shift the position of the vehicle with respect to its supporting wheels, and means actuated by gravity when the vehicle rotates about its longitudinal axis for delivering liquid from said closed circuit to certain of said second-named means, to elevate the low side of the vehicle.

2. The combination with a vehicle body having supporting wheels and conventional spring means operatively connecting the body with the supporting wheels, of a closed liquid circuit, means for applying pressure to the liquid circuit, piston means comprising a part of the liquid circuit operatively connected with the body of the vehicle and the springs to shift the position of the vehicle with respect to its supporting wheels, and means actuated by the tilting of the vehicle about its longitudinal axis for delivering liquid under pressure to certain of said pistons, to elevate the low side of the vehicle.

3. The combination with a vehicle body having supporting wheels and conventional spring means operatively connecting the body with the supporting wheels, of a closed liquid circuit, means for applying pressure to the liquid circuit, cylinder and piston means comprising a part of the liquid circuit operatively connected with the body of the vehicle and the springs to shift the position

of the vehicle with respect to its supporting wheels, and means actuated by the tilting of the vehicle for delivering liquid under pressure to certain of said cylinder and piston means, to elevate the low side of the vehicle.

4. The combination with a vehicle frame having wheels, of conventional supporting springs between the wheels and the frame, a cylinder and piston connection between one end of each spring and the frame, a closed circuit for liquid under pressure, said circuit being operatively connected with said cylinder and piston connections, and a gravity operated valve for controlling the movement of liquid under pressure to said cylinder and piston connections, said valve including a bleed for the liquid in the normal position of the valve.

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