May 24, 1955 I. V. K. HOTT ET AL 2,708,986

VEHICLE LIFT

Original Filed Sept. 29, 1948 3 Sheets-Sheet 1

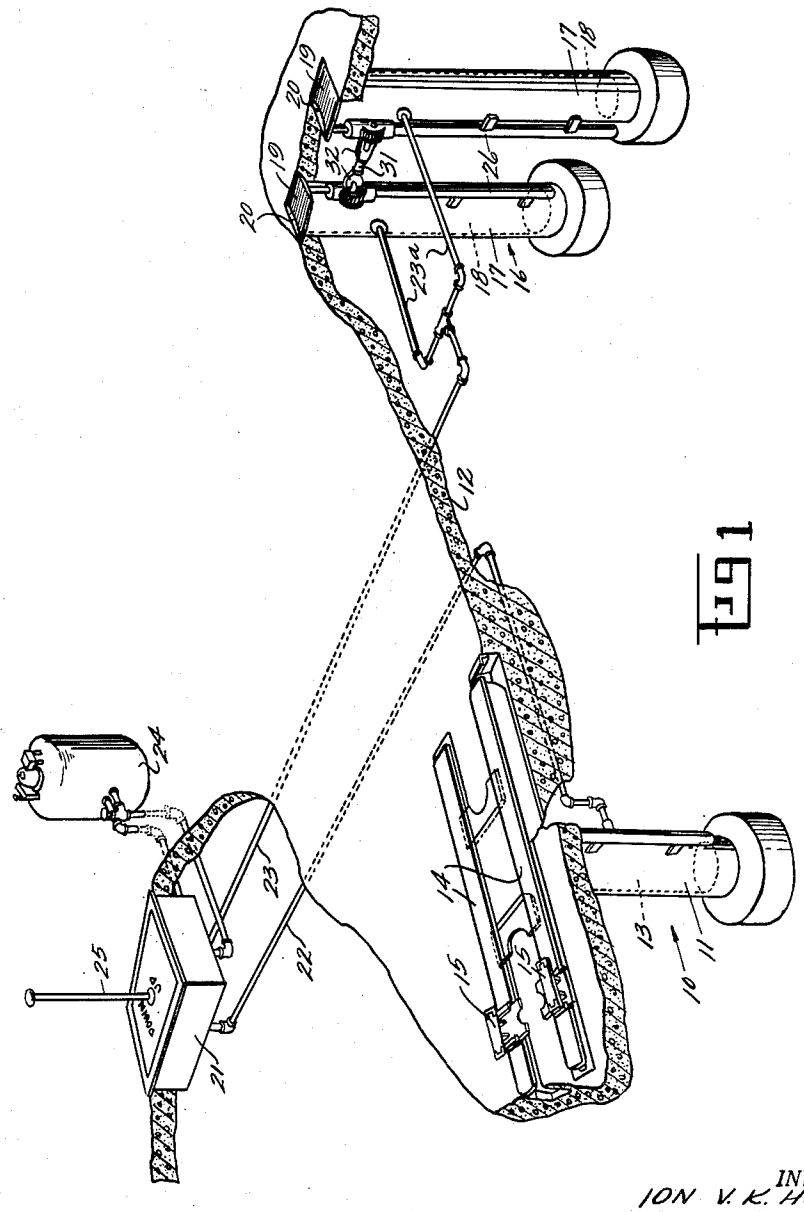


Fig. 1

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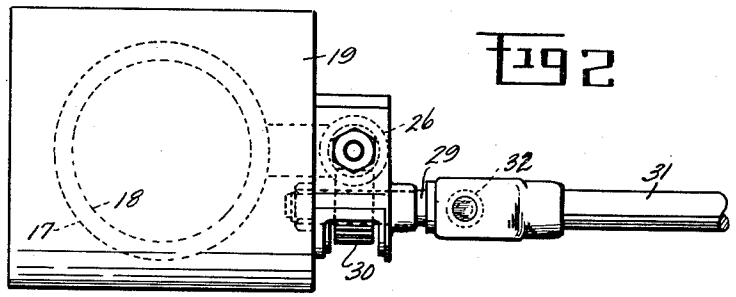


Fig 2

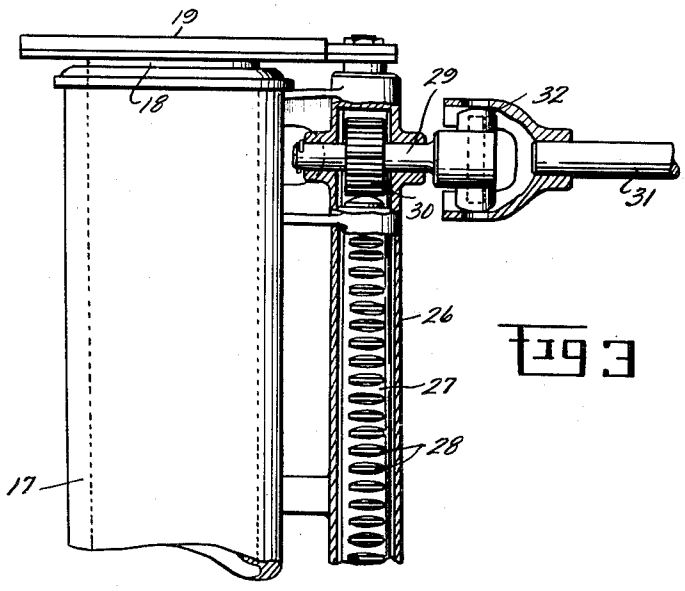


Fig 3

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VEHICLE LIFT

Original Filed Sept. 29, 1948 3 Sheets-Sheet 3

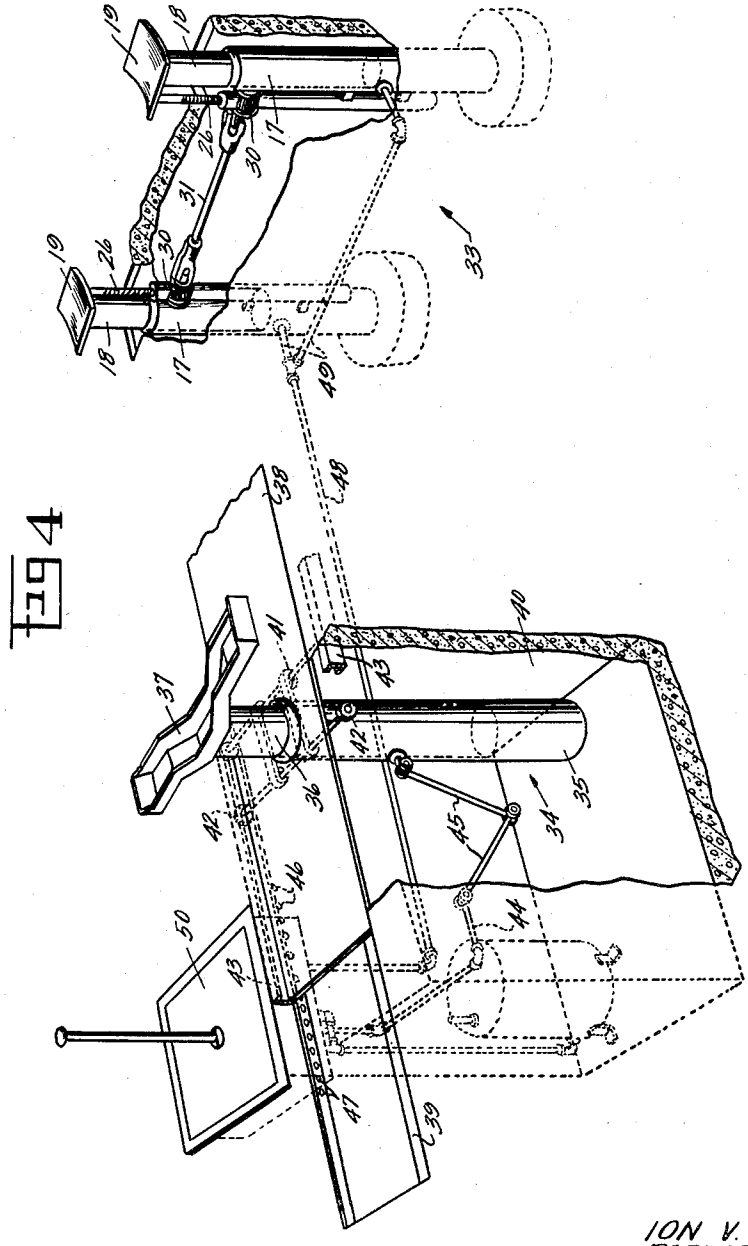


Fig 4

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2,708,986

VEHICLE LIFT

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Original application September 29, 1948, Serial No. 51,668, now Patent No. 2,681,077, dated June 15, 1954. Divided and this application September 5, 1951, Serial No. 245,169

8 Claims. (Cl. 187—8.41)

This invention relates to vehicle lifts and more particularly to multipost lifts for busses, trucks, and other vehicles. The present invention is a division of the application filed by us September 29, 1948, Serial No. 51,668, and now Patent No. 2,681,077 granted June 15, 1954.

One object of the invention is to provide a fluid operated vehicle lift comprising two lifting units to support and elevate the respective ends of a vehicle, at least one of said units including two lifting mechanisms to support the respective ends of one axle of the vehicle.

A further object of the invention is to provide such a lift having means for controlling the movements of the lifting mechanisms of the two units to maintain both the body and the axles of a vehicle thereon in substantially horizontal positions regardless of variations in the loads on the respective lifting mechanisms.

A further object of the invention is to provide a lifting unit comprising two lifting mechanisms to support the respective ends of one axle of a vehicle and having means to maintain said end portions of said axle substantially in predetermined relative positions during the operation of the lifting unit.

A further object of the invention is to provide such a lifting unit having means controlled by the relative weights of the loads on the respective lifting mechanisms to cause said lifting elements to move at substantially the same speed regardless of variations in the relative weights of the loads thereon.

A further object of the invention is to provide such a mechanism which is simple in construction and positive in operation.

Other objects of the invention may appear as the mechanism is described in detail.

In the accompanying drawings Fig. 1 is a perspective view of a vehicle lift embodying the invention; Fig. 2 is a top plan view of one of the lifting mechanisms; Fig. 3 is a side elevation, partly in section, of the upper portion of the lifting mechanism of Fig. 2; and Fig. 4 is a perspective view of a different vehicle lift embodying the invention.

In these drawings we have illustrated one embodiment of the invention, together with a modification thereof, and have shown the same as applied to a multipost lift, but it is to be understood that the lift as a whole, as well as the several parts thereof, may take various forms without departing from the spirit of the invention.

In the form here shown the invention is applied to a two-post lift comprising two lifting units, **10** and **16**, spaced one from the other to support the respective ends of a vehicle. The unit **10** comprises a single lifting mechanism including a cylinder **11** mounted below a floor **12**, a lifting element, or piston, **13** in said cylinder and a load supporting structure connected with the upper end of the lifting element and comprising parallel rails **14** on each of which is mounted a longitudinally adjustable axle engaging device **15**. The second lifting unit, **16**, comprises two lifting mechanisms spaced laterally one from the other to support the respective ends of the other axle of the vehicle. Each lifting mechanism of the second unit includes a cylinder **17** supported below the floor and a lifting element, or piston, **18** within the cylinder, and connected with the upper end of each lifting

element **18** is a load supporting member **19**, which in the present instance is adapted to engage and support the wheels at the respective ends of said other axle. As here shown the wheel engaging members **19** are concave and are supported in cavities **20** in the floor when the lifting elements are in their lowered positions. The cylinders **11** and **17** may be connected with any suitable source of propellent fluid, such as oil, and a control mechanism is interposed between the source of fluid and the respective cylinders. In the present instance the control mechanism is the same as the mechanism shown in our above mentioned application for patent and comprises a valve mechanism, not here shown, enclosed in a casing **21** and connected by a conduit **22** with the cylinder **11** and by a conduit **23** with the cylinders **17**, the conduit **23** being branched, as shown at **23a**, to connect the same with the two cylinders **17**. The conduits **22** and **23** are connected through the valve mechanism with a source of fluid under pressure, such as the tank **24**, and the valve mechanism is controlled by an actuating member **25** to regulate the flow of fluid to the cylinders of the two units so as to maintain the vehicle in a substantially horizontal position regardless of differences in the weights on the two units. Either unit, **10** or **16**, may support either the front end or the rear end of the vehicle and for present purposes the unit **10** may be considered as the front unit and the unit **16** may be considered as the rear unit.

It sometimes happens that the load on the lifting unit **16** will be unevenly divided between the lifting elements **18** and that the lifting element having the lighter load will tend to move upwardly at a speed greater than the speed at which the other lifting element moves. For the purpose of causing the two lifting elements to move at substantially uniform speeds an equalizing device is interposed between the two lifting elements. This equalizing device may take various forms but as here shown it comprises tubular guides **26** rigidly supported on the respective cylinders **17** and extending lengthwise thereof on adjacent sides of the cylinders. Slidably mounted in each tubular guide is a bar **27** provided with rack teeth **28** and rigidly connected at its upper end with the corresponding lifting element **18**, as by rigidly securing the same to a projecting part of the wheel supporting member **19**. Rotatably mounted in each guide **26**, adjacent the upper end thereof, is a short shaft **29** to which is rigidly secured a pinion **30** which meshes with the stationary rack bar **27** and is thus rotated by the vertical movement of the lifting element. The adjacent ends of the two shafts **29** are connected one with the other, for rotation in unison, by a shaft **31** which is connected with the respective shafts **29** by universal joints **32**. Inasmuch as the pinions of the two lifting mechanisms **17** of this unit are thus caused to rotate in unison it will be obvious that if one lifting element tends to move at a speed greater than the speed of movement of the other lifting element a portion of the force exerted on the first mentioned lifting element will be transmitted through the pinions to the last mentioned lifting element, and the two lifting elements will thereby move at the same speed at all times regardless of any variation in the relative weights of the loads thereon.

In Fig. 4 there is illustrated an application of the invention to a vehicle lift in which one of the lifting units is bodily movable toward and from the other lifting unit. The rear or two cylinder unit **33** is of the same construction as that above described but the front or single cylinder unit **34** is adjustable lengthwise of the lift toward and from the rear unit. As there shown the lifting mechanism of the unit **34** comprises a cylinder **35** and a lifting element **36** having on its upper end an axle supporting structure **37**. The cylinder **35** and therefore the unit as a whole is supported on a plate **38** which is slidably mounted on the floor **39** and constitutes a

closure for the open end of a pit **40**. The plate may be supported in any suitable manner and as here shown it is mounted on a carriage **41** which is provided at its sides with rollers **42** which travel on tracks **43** mounted on the side walls of the pit. The fluid supply conduit **44** is made extensible, as by providing it with pivotally connected sections **45**. The plate **38**, and therefore the lifting unit **34**, may be adjusted lengthwise of the pit in any suitable manner. In the present instance the plate is provided with a series of holes **46** through which an actuating rod may be inserted and engaged with another series of holes **47** in a fixed part of a structure beneath the edge of the plate and the plate thus moved step by step in either direction. The fluid is supplied to the two lifting units by the conduit **44** and by a second conduit **48** which is branched for connection with the two cylinders of the unit **33**.

Thus the unit **34** may be adjusted lengthwise of the lift to accommodate it to vehicles having wheel bases of different lengths and the control of the flow of fluid to the two units may be controlled by a valve mechanism in the casing **50** in the manner above described to maintain the load supporting structures **37** and **19** at substantially the same distance above the floor, and the two lifting elements of the unit **33** are automatically adjusted by variations in the weights of the loads thereon to cause the same to move at substantially the same speeds.

Thus it would be apparent that by regulating the supply of fluid to the two lifting units the lifting elements **10** and **16**, or **34** and **33**, may be so controlled as to maintain the vehicle in a substantially horizontal position, and any variations in the weights of the loads on the load supporting elements of the unit **16**, or **33**, will automatically equalize the movements of those supporting elements to prevent the tilting of the axle supported by those members.

While we have shown and described certain embodiments of our invention we wish it to be understood that we do not desire to be limited to the details thereof as various modifications may occur to a person skilled in the art.

Having now fully described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A lifting unit comprising two laterally spaced fluid operated mechanisms, each mechanism including an upright cylinder, a piston in said cylinder, a load supporting member connected with said piston, a downwardly extending toothed bar connected with said load supporting member for movement therewith, and a pinion rotatably supported on said cylinder and meshing with said toothed bar, a shaft interposed between the pinions of the two mechanisms, universal joints connecting said shaft with the respective pinions, and means for supplying propellent fluid to said cylinders simultaneously and at substantially equal pressures.

2. A lifting unit comprising two laterally spaced fluid operated mechanisms, each mechanism including an upright cylinder, a piston in said cylinder, a load supporting member connected with said piston, a guide secured to and extending lengthwise of said cylinder, a rack bar connected with said load supporting member and movable thereby in said guide, and a pinion rotatably mounted on said guide and meshing with said bar, a shaft interposed between the pinions of the two mechanisms, universal joints connecting said shafts with respective pinions, and means for supplying propellant fluid to said cylinders simultaneously and at substantially equal pressures.

3. A fluid operated lift comprising two lifting units spaced one from the other to support the respective ends of a vehicle, one of said units comprising a single cylinder, a piston in said cylinder, and a structure carried by said piston to support one axle of said vehicle, the other of said units including two cylinders spaced laterally one from the other, a piston in each cylinder, and separate members connected with said pistons to support the respective ends of the other axle of said vehicle, means for simultaneously supplying propellent fluid to the cylinders of both units including means for regulating the flow of fluid to the cylinders of the two units to maintain said vehicle substantially in a horizontal position, and means controlled by the relative weights of the loads on the pistons of the two cylinder unit to prevent movement of the last mentioned axle about a transverse axis.

4. A fluid operated lift comprising two lifting units spaced one from the other to support the respective ends of a vehicle, one of said units comprising a single cylinder, a piston in said cylinder, and a structure carried by said piston to support one axle of said vehicle, the other of said units including two cylinders spaced laterally one from the other, a piston in each cylinder, and separate members connected with said pistons to support the respective ends of the other axle of said vehicle, means for simultaneously supplying propellent fluid to the cylinders of both units including means for regulating the flow of fluid to the cylinders of the two units to maintain said vehicle substantially in a horizontal position, an equalizing device interposed between the pistons of said two cylinder unit and drivingly connected with both pistons to cause said pistons to move at substantially the same speed.

5. A fluid operated vehicle lift comprising two units spaced one from the other to support the respective ends of a vehicle, one of said units comprising a cylinder in said piston and a load supporting structure on said piston, means for supporting said unit for movement lengthwise of said vehicle with relation to the other of said units, the other of said units comprising two cylinders spaced laterally one from the other, a piston in each cylinder, and load supporting members separately supported on said pistons, means for supplying propellent fluid to the cylinders of both units and for regulating the flow of fluid to said units to maintain said vehicle substantially horizontal in all positions of said movable unit, and a device interposed between and drivingly connected with the pistons of said two cylinder unit to maintain the load supporting members of said unit substantially in horizontal plane regardless of variations in the weight of the loads on the respective pistons.

6. A fluid operated lift comprising tripodal lift means, each of said means comprising a single cylinder, a piston in said cylinder, a vehicle engaging structure carried by the piston for supporting a portion of a vehicle, a pair of said lift means being spaced laterally one from the other, an equalizing means for causing only said pair of lift means to move in unison, a common source of fluid for actuating all of said lift means simultaneously, and means interposed between said source and the lift means for regulating the relative flow of fluid between said pair of lift means and the other lift means.

7. A fluid operated lift according to claim 6, wherein the pair of lift means supports one end of the vehicle, and the other lift means supports the other end of the vehicle.

8. A fluid operated lift according to claim 6, wherein the distance between said pair of lift means and the other lift means may be adjusted to accommodate vehicles of differing lengths.

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