Oct. 4, 1966 A. MÜLLER ET AL 3,276,547

STATIONARY HYDRAULIC LIFTING APPARATUS

Filed April 15, 1964 2 Sheets-Sheet 1

Fig. 1

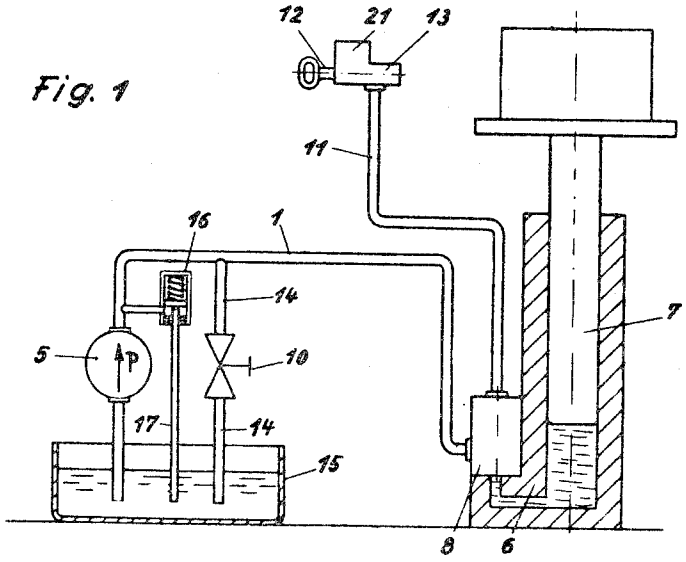


Fig. 2

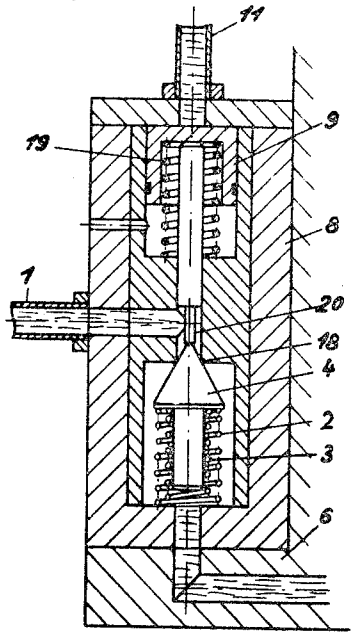
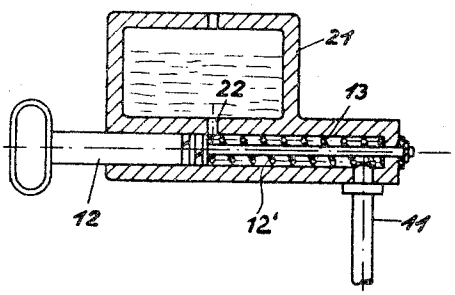


Fig. 3



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Filed April 15, 1964 2 Sheets-Sheet 2

Fig. 4

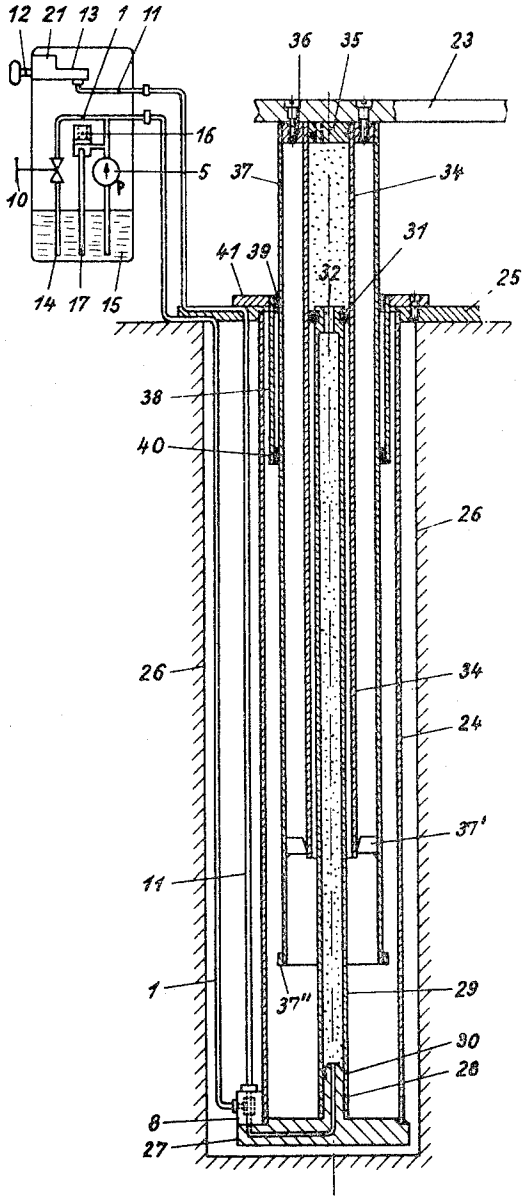
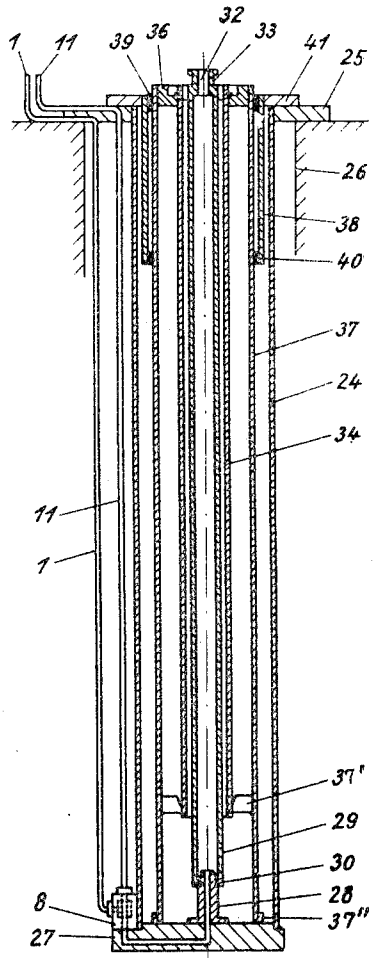


Fig. 5



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STATIONARY HYDRAULIC LIFTING APPARATUS

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14 Claims. (Cl. 187—8.41)

The present invention concerns a stationary hydraulic lifting apparatus, particularly for lifting motor vehicles or the like. Apparatus of this type conventionally comprises a hydraulic lifting mechanism which carries a platform for carrying a load and mounted on top of said lifting mechanism, preferably also being rotatable about the vertical axis of this mechanism.

It has been found that conventional lifting apparatus of this type are characterized by a rather involved and therefore rather expensive construction.

It also has been found that conventional apparatus of this type does not afford safety for the operator or user of the apparatus to a sufficient degree.

It is therefore one object of this invention to provide for a stationary hydraulic lifting apparatus which is free of the inconveniences or drawbacks of conventional apparatus of this type.

It is another object of this invention to provide for apparatus as set forth which is comparatively simple in its construction and very easy to operate including the carrying out of maintenance or repair work.

It is still another object of this invention to provide for apparatus of the type mentioned above which affords maximum safety for the operator or user.

With above objects in view the invention includes stationary hydraulic lifting apparatus, particularly for lifting vehicles, comprising, in combination, a substantially vertical pit of predetermined depth and transverse dimensions; cylindrical housing means comprising a tubular shell of a diameter smaller than any transverse dimension of said pit, a bottom plate at its lower end, and a flange at its upper end which rests on the edge of said pit so that the entire housing means is freely suspended in said pit; a tubular lifting cylinder means vertically movable within said housing means; guide means for slidably guiding said tubular lifting cylinder means within said housing means during its movements; stationary tubular piston means within said cylinder means and supported by said bottom plate, said piston means being near its upper end open and including sealing means for fluid-tight sliding engagement with the inner surface of said cylinder means; a platform for carrying a load and mounted on top of said cylinder means; and pressure fluid supply and control means for operating said movable lifting cylinder means and including a single fluid duct means terminating at one end at the bottom end of said piston means for introducing fluid through said piston means into said lifting cylinder means and for draining in opposite direction said fluid from said lifting cylinder means, pressure pump means at the other end of said duct means, manually operable relief valve means in parallel with said pump means, a controllable check valve means mounted in said duct means at said bottom of said housing means for permitting said fluid to be introduced under pressure into said lifting cylinder means and for automatically blocking return flow thereof when no pressure fluid is delivered by said pump means, and control means for causing when desired said check valve means to open and to permit return flow of said fluid provided that simultaneously said relief valve means is opened.

It will be seen from the following description of preferred embodiments of the invention that an apparatus according to the invention is characterized by a substantially cylindrical housing which is mounted within a pit in the ground which may or may not be also cylindrical or substantially cylindrical in shape. However, the above mentioned cylindrical housing which has an outer cylindrical shell and a bottom plate is not solidly fixed in cast concrete in the pit but is rather suspended as a whole assembly in the pit which has a greater transverse dimension than any transverse dimension of the housing so that the housing assembly can easily be removed from the pit whenever desired. For this purpose the upper end of the housing is provided with a surrounding flange which rests on the edge of the pit where it may be projecting above ground level or may be lodged in a suitable recess so as to have its top level with the surrounding ground. In this manner it is easy to place the entire lifting mechanism into the pit or to remove it from the pit whenever desired or required.

However, it is another characteristic of the invention that not only the outer housing with all its contents can easily be lifted out of the pit but all the other components of the lifting mechanism which are cylindrical or tubular elements may be introduced for the purpose of assembly into the housing singly or in groups and similarly be removed singly or in groups therefrom because all the essential components of the lifting mechanism consist of plain smooth tubes which may be conventional steel tubes as available on the market and therefore rather inexpensive. Thus, whenever the lifting mechanism has to be disassembled it is extremely simple to lift any one of the tubular members so as to remove it partly or wholly from the assembly which can be done even without the aid of a crane.

This advantage is of particular importance with respect to the lifting piston which is also only a plain steel tube because this element is not firmly connected with the bottom plate of the housing but, in accordance with the invention, the lower end of this piston tube is simply slipped over a plug member arranged at the center of the bottom plate of the housing and fitting into the lower end of the piston tube, a sealing ring or the like mounted on that plug producing a fluidtight engagement between piston tube and plug.

In accordance with the invention the above mentioned plug located at the center of the bottom plate of the housing has in accordance with the invention a predetermined length so that the plug projects sufficiently above the bottom plate for permitting the piston tube to be lifted with its upper end above the top of the corresponding lifting cylinder for obtaining access to a sealing device carried by the upper end of the piston tube and engaging the inner surface of the corresponding cylinder. The point is that in this manner the sealing device at the upper end of the piston tube can be repaired or exchanged while the lower end of the piston tube still remains in fluidtight engagement with the sealing ring at the upper end of the plug. Thus no pressure fluid is lost during such repair work and after taking care of whatever has to be done with the sealing device at the upper end of the piston tube the latter may simply slip back into its previous lower position and the mechanism is again in operative condition. This is a very remarkable advantage over the prior art because in known lifting mechanisms of this general type the exchange or repair of the sealing means between the lifting piston and the lifting cylinder constituted always a very complicated and bothersome job. It will be seen that in a similar manner also the lifting and repair or maintenance of all the other tubular components of the lifting mechanism according to the invention is greatly facilitated by the characteristic structure of the apparatus according to the

invention. While the above mentioned characteristics of the arrangement according to the invention most satisfactorily solve the problem of providing for a hydraulic lifting mechanism which is comparatively simple and inexpensive in structure and easy to maintain, the arrangement according to the invention furthermore distinguishes from the prior art by the extremely great safety for operator or user particularly during the operation of lowering the load carrying platform of the mechanism. A safety arrangement according to the invention is so constructed that in a sturdy housing portion attached to or incorporated in the bottom plate of the housing of the lifting mechanism an automatic check valve is mounted while being connected in a duct for pressure fluid between a motor driven pump which furnishes fluid under pressure, on one hand, and the lifting mechanism, particularly the lifting cylinder, on the other hand. The use of check valves between the pump and the lifting cylinder is of course well known, but in accordance with the invention the check valve is mounted directly on or in the bottom plate of the lifting mechanism so that no connecting pipes are required between the check valve and the lifting cylinder which pipes constitute also a factor of danger since such pipes may develop a leak or burst. In such case of course the check valve would remain without any effect. However, in an arrangement according to the invention as just mentioned one can be sure that the check valve will safely prevent an undesired lowering of the lifting cylinder with the load platform thereon by automatically closing the passage of fluid through said duct connection as soon as the supply of fluid under pressure is discontinued by stopping the pump.

However, according to the invention the above mentioned check valve is further improved and the safety and reliability of its function enhanced because an undesired or too rapid lowering of the lifting cylinder with the load platform is prevented under all circumstances. This is achieved according to the invention by providing the standard spring-loaded check valve with an auxiliary control device which permits lifting of the movable valve member of the check valve from its seat only when an auxiliary control device is operated. Since normally a hydraulic lifting mechanism comprising only a single duct for pressure fluid between pump and cylinder is equipped with a bypass valve or relief valve for draining the fluid under pressure from the lifting mechanism when lowering of the load platform is desired, it will be seen that the arrangement according to the invention is so constructed that the platform can be lowered only when the operator simultaneously actuates the above mentioned auxiliary control device for opening the check valve and also opens the relief or bypass valve. Thus the lowering of the load platform can be brought about by an operator only by means of two-hand control whereby the safety of operation is enormously increased.

The novel features which are considered as characteristic for the invention are set forth in particular in the appended claims. The invention itself, however, both as to its construction and its method of operation, together with additional objects and advantages thereof, will be best understood from the following description of specific embodiments when read in connection with the accompanying drawings, in which:

FIG. 1 is a diagrammatic, partly sectional, elevation showing the essential elements of a hydraulic lifting apparatus equipped according to the invention with a controllable check valve mounted directly at the lower end of the lifting mechanism and combined with auxiliary control means;

FIG. 2 is a sectional elevation at larger scale illustrating a controllable check valve according to the invention;

FIG. 3 is a sectional elevation of auxiliary control means for controlling the check valve according to FIG. 2;

FIG. 4 is a diagrammatic sectional elevation of a complete hydraulic lifting apparatus according to the invention, having a rotatable load carrying platform and comprising pressure fluid supply and control means, the lifting mechanism being shown in partly lifted position; and

FIG. 5 is a similar sectional elevation of the arrangement according to FIG. 4, but illustrating only a portion of the lifting mechanism in a position in which the sealing device at the upper end of the piston tube is made accessible for repair or exchange.

In the structure of the lifting apparatus according to FIG. 1 which is particularly well suited for lifting vehicles, and illustrated by FIGS. 1–3 a lifting piston **7** is vertically movable in a cylinder housing **6** into which oil under pressure is forced by a motor driven pump **5** via duct **1** (while the bypass or relief valve **10** in the bypass duct **14** is closed) and through the check valve **8**. The check valve **8** comprises a central channel communicating with the fluid duct **1** and terminating in a valve seat **18** against which a conical movable valve member **4** is continuously urged by two pressure springs **2** and **3** which are made of non-corroding metal and wound in opposite directions, one of these springs being a safety reserve for the case of breakage of the other.

When for the purpose of lifting a load the pump **5** is started and the pressure in the fluid exceeds the counteraction of the springs **2** and **3**, then fluid under pressure is forced through the check valve into the cylinder housing **6** without having to pass through connecting pipe lines between the check valve and the cylinder housing. Consequently the piston **7** is lifted until the operation of the pump **5** is stopped or until a member associated or connected with the lifting piston **7** abuts against a fixed stop in which case the fluid under pressure would escape through a conventional pressure relief valve **16** and return through a duct **17** into the oil tank **15**.

Whenever during a lifting operation the pump **5** is stopped e.g. by switching off its drive motor the upward movement of the lifting piston **7** likewise stops immediately and the check valve springs **2** and **3** press the movable valve member **4** into closing engagement with the valve seat **18**. Thus the check valve has automatically closed and a flow of oil from the cylinder housing **6** and consequently a lowering of the load platform, be it desired or undesired, is absolutely prevented. This is even the case when a leak or break of the oil duct **1** or a failure or inadvertent opening of the relief valve **10** should occur.

However, an intentional lowering of the load platform with the piston **7** can be initiated and carried out if the operator not only opens the manually operable relief valve **10** but additionally operates an auxiliary control device as illustrated in detail by FIG. 3, namely by forcing manually or otherwise an auxiliary piston **12** against the action of a return spring **12'** into an auxiliary cylinder **13** which is always filled automatically through a lateral bore **22** with oil from a small container **21** so that oil under pressure is forced through a connecting duct **11** into the upper portion of the check valve housing **8**. As can be seen from FIG. 2 the upper portion of the housing **8** contains an auxiliary cylinder in which an auxiliary piston **9** is movable between a normal position assumed under the action of the spring **19** and an operative position in which upon the influx of pressure oil through the duct **11** the piston **9** moves a correspondingly guided pin **20** against the tip of the check valve member **4**. In this manner by the actuation of the piston **12** the check valve is opened. Consequently now in response to the two-hand control carried out by the operator the piston **7** carrying the load is permitted to move downwardly while forcing the oil in the housing **6** back through the open check valve **6** and line **1** into the bypass line **14** and through open valve **10** into the oil tank **15**.

The arrangement according to FIGS. 4 and 5 comprises the same operational system including the con-

trollable check valve as described above. However the actual lifting mechanism is illustrated in a more detailed manner in FIGS. 4 and 5. As can be seen the advantage of the construction of the lifting mechanism as illustrated by FIGS. 4 and 5 mainly resides in the fact that this lifting mechanism is mainly composed of plain tubular members e.g. steam tubes which can be assembled and disassembled in an extremely convenient manner. A load carrying platform **23** is mounted on a lifting cylinder assembly and rotatable about the axis of said assembly together with the latter. The actual lifting mechanism comprises a tubular substantially cylindrical outer housing which includes a shell **24** fitted with a supporting flange **25** at its upper end and resting on the edge of the pit **26**, the transverse dimensions of the pit **26** being all around larger than the transverse dimensions of the housing **24** so that the latter is suspended freely within the pit **26**. The pit should have a depth somewhat exceeding the maximum length of the housing **24** including a heavy bottom plate **27** attached to the lower end of the housing **24**.

Mounted at the center of the bottom plate **27** is a substantially cylindrical plug **28** which has a central bore for permitting flow of pressure fluid from the outside into the lifting mechanism and back from the lifting mechanism to the outside. The diameter of the plug **28** corresponds to the inner diameter of the stationary piston tube **29** the lower end of which is slipped over the plug **28** as can be seen from FIG. 4. The piston tube **29** should fit closely over the plug **28** but for safety's sake a seal **30** is mounted near the upper end of the plug **28** for fluidtight engagement with the inner surface of the piston tube **29**. The length of the plug **28** projecting above the level of the bottom plate **27** is sufficiently great that the lower end of the piston tube **29** remains in engagement with the seal **30** even when the piston tube **29** is lifted sufficiently to permit access to the groove **33** above the top of the lifting cylinder assembly when a seal **31** normally engaging the inner surface of the lifting cylinder **34** lodged in the groove **33** is to be removed or exchanged. This situation is illustrated by FIG. 5.

The piston cylinder **29** normally rests with its lower end on the bottom plate **27** and is surrounded by the lifting cylinder **34** which is open at its lower end and pushed over the piston cylinder **29** in a telescoping manner. The cylinder tube **34** is closed at its upper end by a removable closure piece **35** and held therein flush with its upper end by means not shown e.g. by threads. In FIG. 5 the closure **35** has been removed in order to obtain access to the upper end of the piston cylinder **29**. However, the actual lifting cylinder **34** is coupled with a concentric guide tube **37** of larger diameter which is connected with the lifting cylinder **34** and spaced therefrom at the upper end by an annular space ring **36** while near the lower end of the lifting cylinder **34** the guide tube **37** is held in concentric position by spacer pieces **37'**. The lifting cylinder **34** together with the surrounding guide tube **37** and with the closure **35** and ring **36** carry on their top faces the load platform **23** so that the latter is lifted as soon as the lifting cylinder **34** is filled with fluid under pressure through the interior of the piston cylinder **29** and through its top opening **32**. The guide tube **37**, in turn, is guided in another concentric and still wider guide sleeve **38**, with guide or spacer rings **39** and **40** interposed therebetween as illustrated, so that the lifting cylinder assembly **34**, **37** together with the load platform **23** is not only movable in vertical or axial direction but also rotatable about the center axis of the whole lifting mechanism. The guide sleeve **38** is also provided at its top with a flange **41** which rests on the edge of the flange **25** of the housing **24** and may be attached thereto by screws or the like as illustrated.

As far as the reference numerals 1–22 appear in FIGS. 4 and 5, they refer to the same assembly or combination of pressure producing and control means which have been described in greater detail in reference to FIGS. 1–3. It will be noticed that also in FIGS. 4 and 5 the check valve **8** is connected through a corresponding duct within the bottom plate **27** with the inner channel of the plug **28** whereby a connection with the interior of the piston tube **29** and thus with the interior of the lifting cylinder **34** is established.

When the motor driven pump **5** is started oil is sucked from the reservoir **15** and caused to flow through the pipe connection **1** into the housing **8** of the check valve mounted on the bottom plate **27** of the housing **24** and from there through the bottom plate **27** and through the plug **28** into the hollow piston cylinder **29** whereafter it issues through the upper opening **32** thereof into the upper portion of the lifting cylinder **34** which is sealed by the sealing ring **31**. Hereby the lifting cylinder **34** together with the coupled guide tube 37 and the load platform **23** is lifted, the maximum lift being limited by a stop ring **37''** arranged at the lower end of the guide tube **37**. When the platform **23** is to be lowered together with the guide tube **37** and the lifting cylinder **34** then it is necessary to move mechanically the conical valve member **4** which was automatically pressed against the seat **18**, from this seat because only under these circumstances the oil can flow back and be drained from the lifting cylinder **34** through the check valve **4**, **18** and the duct **1** into the reservoir **15**. The conical valve member **4** is lifted from its seat by means of the pin **20** of the auxiliary check valve control and this is accomplished by the action of the auxiliary piston **9** as soon as the latter is subjected to fluid pressure through a separate oil duct **11** upon actuation of the auxiliary piston **12** pushed preferably manually into the auxiliary cylinder **13**. Of course, simultaneously with the actuation of the check valve control **12**, **13** the bypass valve **10** had to be opened by the operator so that now the oil returning from the lifting cylinder **34** is permitted to flow through the bypass line **14** into the reservoir **15**.

It will be understood that each of the elements described above, or two or more together, may also find a useful application in other types of stationary hydraulic lifting apparatus, particularly for lifting vehicles, differing from the types described above.

While the invention has been illustrated and described as embodied in stationary hydraulic lifting apparatus, particularly for lifting vehicles, including a lifting mechanism comprising tubular members and a controllable check valve, it is not intended to be limited to the details shown, since various modifications and structural changes may be made without departing in any way from the spirit of the present invention.

Without further analysis, the foregoing will so fully reveal the gist of the present invention that others can by applying current knowledge readily adapt it for various applications without omitting features that, from the standpoint of prior art, fairly constitute essential characteristics of the generic or specific aspects of this invention and, therefore, such adaptations should and are intended to be comprehended within the meaning and range of equivalence of the following claims.

What is claimed as new and desired to be secured by Letters Patent is:

1. Stationary hydraulic lifting apparatus, particularly for lifting vehicles, comprising, in combination, a substantially vertical pit of predetermined depth and transverse dimensions; cylindrical housing means comprising a tubular shell of a diameter smaller than any transverse dimension of said pit, a bottom plate at its lower end, and a flange at its upper end which rests on the edge of said pit so that the entire housing means is freely suspended in said pit; a tubular lifting cylinder means vertially movable within said housing means; guide means for slidably guiding said tubular lifting cylinder means within said housing means during its movements; stationary tubular piston means wtihin said cylinder means

and supported by said bottom plate, said piston means being near its upper end open and including sealing means for fluid-tight sliding engagement with the inner surface of said cylinder means; a platform for carrying a load and mounted on top of said cylinder means; and pressure fluid supply and control means for operating said movable lifting cylinder means and including a single fluid duct means terminating at one end at the bottom end of said piston means for introducing fluid through said piston means into said lifting cylinder means and for draining in opposite direction said fluid from said lifting cylinder means, pressure pump means at the other end of said duct means, manually operable relief valve means in parallel with said pump means, a controllable check valve means mounted in said duct means at said bottom of said housing means for permitting said fluid to be introduced under pressure into said lifting cylinder means and for automatically blocking return flow thereof when no pressure fluid is delivered by said pump means, and control means for causing when desired said check valve means to open and to permit return flow of said fluid provided that simultaneously said relief valve means is opened.

2. A lifting apparatus as claimed in claim 1 wherein said tubular lifting cylinder means include a lifting cylinder of comparatively small diameter and a concentric surrounding guide cylinder of greater diameter rigidly mounted in relation to said lifting cylinder, and wherein said guide means comprise a cylindrical guide sleeve surrounding said guide cylinder and having guide members in sliding contact therewith, said guide sleeve being provided at its upper end with a flange which rests on said flange of said housing means.

3. A lifting apparatus as claimed in claim 2, wherein said bottom plate of said housing means is provided with an upwardly projecting central plug carrying seal means and fitting thereby fluid-tightly into the lower end of said tubular piston means, said duct means terminating in said plug and communicating therethrough with the interior of said piston means, all said tubular members namely said housing means, said lifting cylinder means, said guide means, and said piston means being individually and in groups movable in axial direction relative to each other and to said pit so that they can be removed for repair and maintenance and returned to operative position whenever desired.

4. A lifting apparatus as claimed in claim 3, wherein said plug has sufficient length above said bottom plate that said piston means may be lifted with its upper end above the top of said lifting cylinder for obtaining access to said sealing means while the lower end of said piston means is still in fluid-tight engagement with said seal means of said plug.

5. A lifting apparatus as claimed in claim 1, wherein said controllable check valve means include a valve seat, a movable valve member, bias means for urging said valve member into closing position in engagement with said seat, an auxiliary piston means movable from an idle position into an operative position in which said movable valve member is lifted from said seat against the action of said bias means, and bias means for urging said auxiliary piston means into said idle position, and wherein said control means include auxiliary fluid pressure producing means and duct means for applying fluid pressure produced by said pressure producing means to said auxiliary piston means in said check valve means.

6. An apparatus as claimed by claim 5, wherein said auxiliary fluid pressure producing means include an auxiliary cylinder and a manually operable piston therein.

7. Stationary hydraulic lifting apparatus, particularly for lifting vehicles, comprising, in combination, a substantially vertical pit of predetermined depth and transverse dimensions; cylindrical housing means comprising a tubular shell of a diameter smaller than any transverse dimension of said pit, a bottom plate at its lower end upwardly spaced from the bottom of said pit, and a flange at its upper end which rests on the edge of said pit so that the entire housing means is freely suspended in said pit; a tubular lifting cylinder means vertically movable within said housing means; guide means including a cylindrical guide sleeve of an outer diameter smaller than the inner diameter of said tubular shell and connected at the upper end thereof to said flange of said housing means for slidably guiding said tubular lifting cylinder means within said housing means during its movements; stationary tubular piston means within said cylinder means and supported by said bottom plate, said piston means being near its upper end open and including sealing means for fluid-tight sliding engagement with the inner surface of said cylinder means; a platform for carrying a load and mounted on top of said cylinder means; and pressure fluid supply and control means for operating said movable lifting cylinder means.

8. A lifting apparatus as claimed in claim 7 wherein said tubular lifting cylinder means include a lifting cylinder of comparatively small diameter and a concentric surrounding guide cylinder of greater diameter rigidly mounted in relation to said lifting cylinder, and wherein said guide means comprise further annular guide members on said guide sleeve in sliding contact with said guide cylinder, said guide sleeve being provided at its upper end with a flange which rests on said flange of said housing means.

9. Stationary hydraulic lifting apparatus, particularly for lifting vehicles, comprising, in combination, a substantially vertical pit of predetermined depth and transverse dimensions; cylindrical housing means comprising a tubular shell of a diameter smaller than any transverse dimension of said pit, a bottom plate at its lower end upwardly spaced from the bottom of said pit, and a flange at its upper end which rests on the edge of said pit so that the entire housing means is freely suspended in said pit; a tubular lifting cylinder means vertically movable within said housing means; guide means including a cylindrical guide sleeve of an outer diameter smaller than the inner diameter of said tubular shell and connected at the upper end thereof to said flange of said housing means for slidably guiding said tubular lifting cylinder means within said housing means during its movements; stationary tubular piston means within said cylinder means and supported by said bottom plate, said piston means being near its upper end open and including sealing means about said upper open end of said piston means for fluid-tight sliding engagement with the inner surface of said cylinder means; a platform for carrying a load and mounted on top of said cylinder means; and pressure fluid supply and control means for operating said movable lifting cylinder means and including a single fluid duct means terminating at one end at the bottom end of said piston means for introducing fluid through said piston means into said lifting cylinder means and for draining in opposite direction said fluid from said lifting cylinder means, and pressure pump means at the other end of said duct means.

10. A lifting apparatus as claimed in claim 9, wherein said bottom plate of said housing means is provided with an upwardly projecting central plug carrying seal means and fitting thereby fluid-tightly into the lower end of said tubular piston means, said duct means terminating in said plug and communicating therethrough with the interior of said piston means, all said tubular members namely said housing means, said lifting cylinder means, said guide means, and said piston means being individually and in groups movable in axial direction relative to each other and to said pit so that they can be removed for repair and maintenance and returned to operative position whenever desired.

11. A lifting apparatus as claimed in claim 10, wherein said plug has sufficient length above said bottom plate that said piston means may be lifted with its upper end above the top of said lifting cylinder for obtaining access to said sealing means about said upper open end of said piston

means while the lower end of said piston means is still in fluid-tight engagement with said seal means of said plug.

12. In a stationary hydraulic lifting apparatus, particularly for lifting vehicles, in combination, a hydraulic lifting mechanism for lifting a load by application of a fluid under pressure, said lifting mechanism including a lifting cylinder and piston combination; and pressure fluid supply and control means for operating said lifting cylinder and piston combination and including a single fluid duct means terminating at one end at the bottom end of said cylinder and piston combination for introducing fluid into the same so as to produce a lifting operation and for draining in opposite direction said fluid from said cylinder and piston combination, pressure pump means at the other end of said duct means, manually operable relief valve means in parallel with said pump means, a controllable check valve means mounted in said duct means at said bottom of said cylinder and piston combination for permitting said fluid to be introduced under pressure into said cylinder and piston combination and for automatically blocking return flow thereof when no pressure fluid is delivered by said pump means, and control means for causing when desired said check valve means to open and to permit return flow of said fluid provided that simultaneously said relief valve means is opened.

13. A lifting apparatus as claimed in claim **12**, wherein said controllable check valve means include a valve seat,

a movable valve member, bias means for urging said valve member into closing position in engagement with said seat, an auxiliary piston means movable from an idle position into an operative position in which said movable valve member is lifted from said seat against the action of said bias means, and bias means for urging said auxiliary piston means into said idle position, and wherein said control means include auxiliary fluid pressure producing means and duct means for applying fluid pressure produced by said pressure producing means to said auxiliary piston means in said check valve means.

14. An apparatus as claimed by claim **13**, wherein said auxiliary fluid pressure producing means include an auxiliary cylinder and a manually operable piston therein.

References Cited by the Examiner

UNITED STATES PATENTS

1,899,534	2/1933	Steedman	187—8.41
2,695,711	11/1954	Allan	254—93
3,061,044	10/1962	Shotmeyer	187—8.41

FOREIGN PATENTS

365,096	1/1932	Great Britain.

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