Feb. 11, 1969 A. GEORGELIN 3,426,530

OLEOPNEUMATIC JACK WITH STAGED STRUCTURE

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Fig. 1

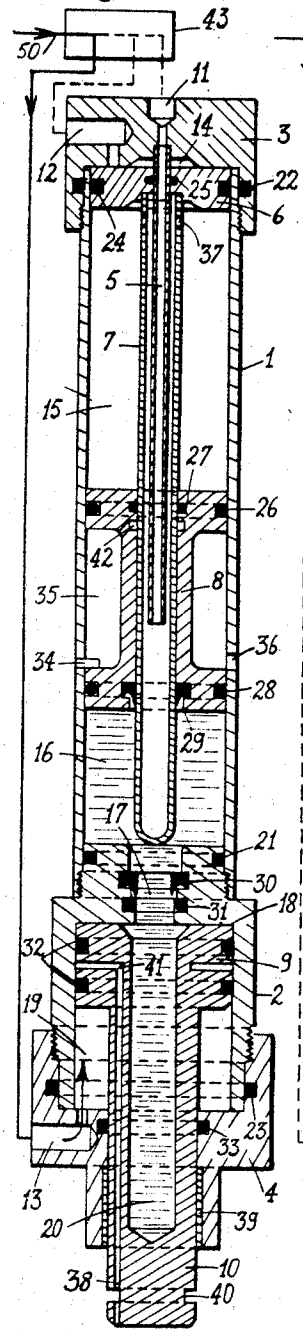



Fig. 2

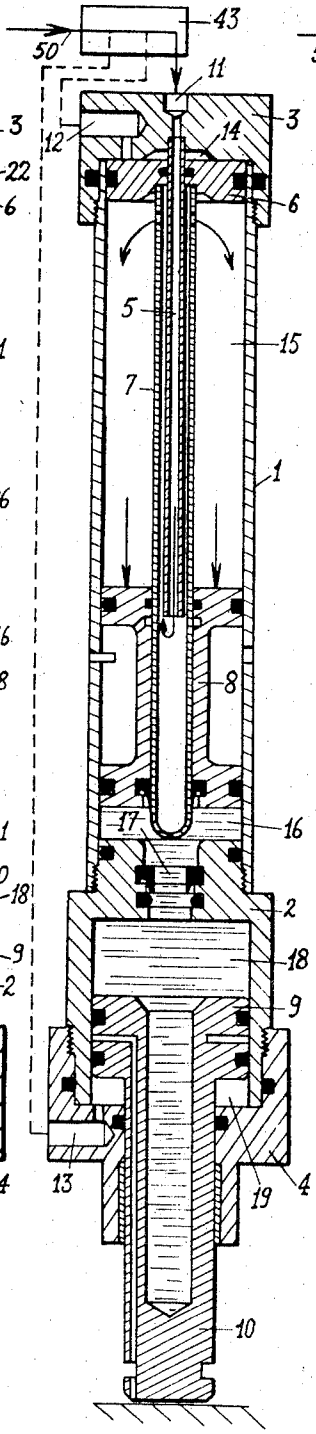
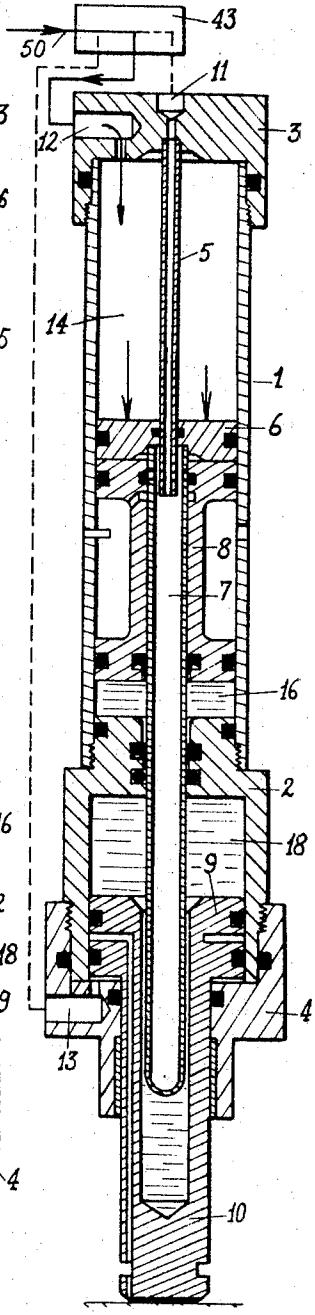



Fig. 3




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Fig. 4

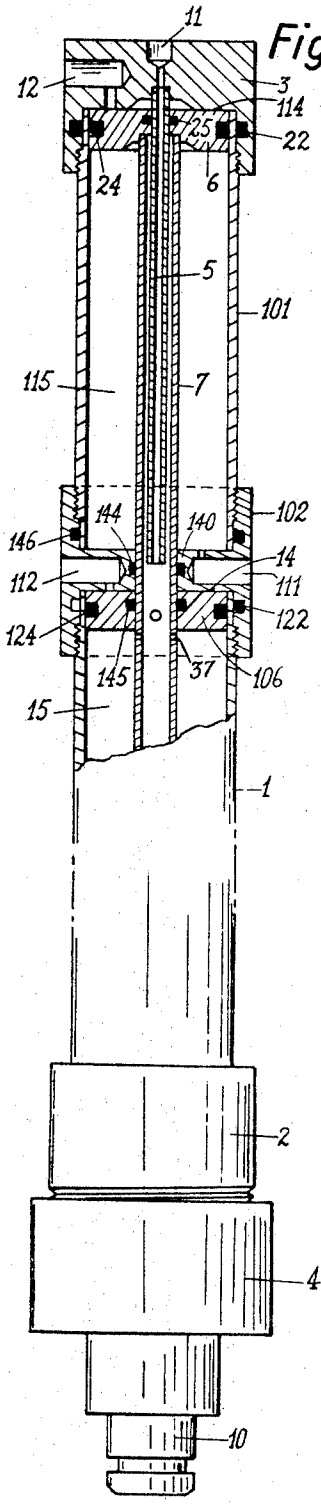
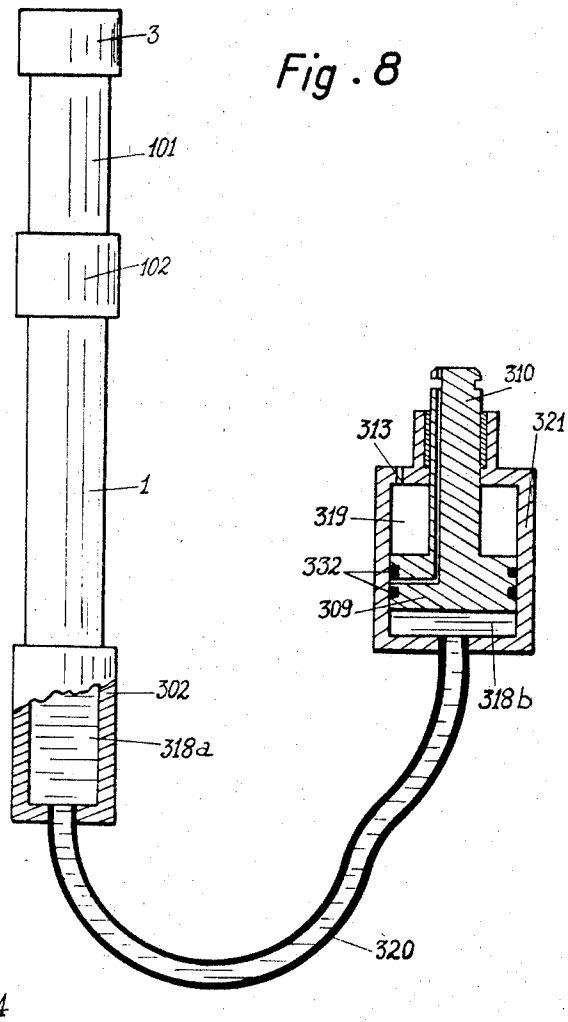



Fig. 8




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OLEOPNEUMATIC JACK WITH STAGED STRUCTURE

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Fig. 5

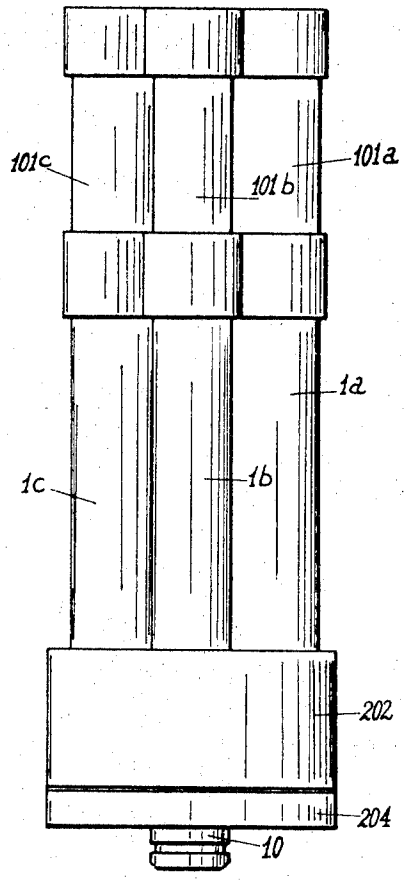



Fig. 6

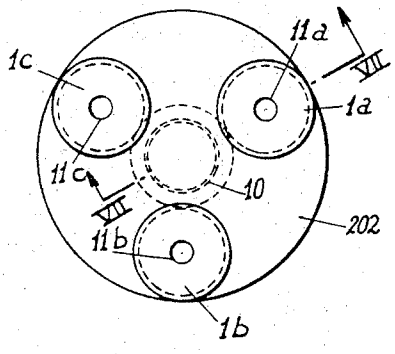
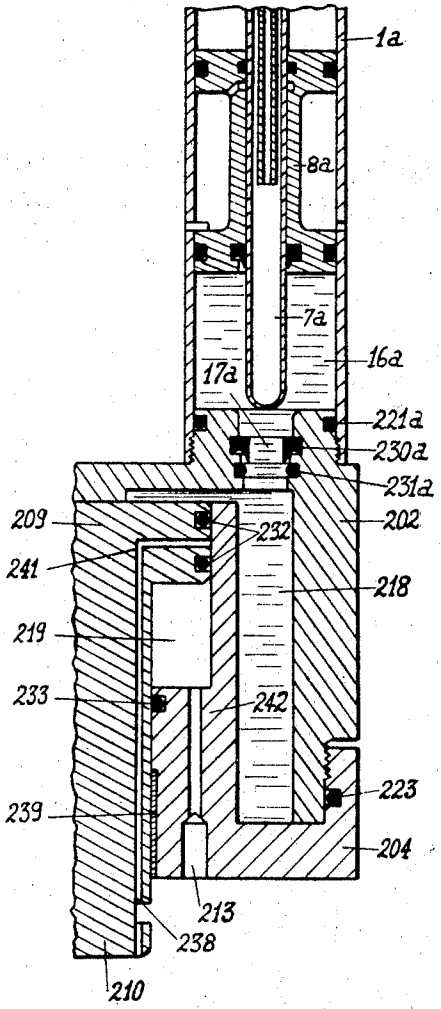



Fig. 7




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3,426,530

# OLEOPNEUMATIC JACK WITH STAGED STRUCTURE

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Claims priority, application France, Oct. 26, 1966, 81,641
U.S. Cl. 60—54.5 9 Claims
Int. Cl. F15b 7/00, 15/14

## ABSTRACT OF THE DISCLOSURE

An oleopneumatic jack having a staged structure for the purpose of producing a rapid advance followed by a slow advance comprises on the one hand a control cylinder inside which are slidably fitted a master piston secured to a hollow rod and a float which is adapted to slide along said hollow rod and on the other hand an actuating cylinder containing a driving piston which carries the thrust member. The space located between the float and the driving piston is filled with a liquid and divided into two chambers by a diaphragm which is obsturated by the hollow rod of the master piston at the moment of slow advance of the jack. Provision is made in addition for a compressed-air distributor in order that a driving fluid under pressure may be delivered at will between the master piston and the float for the purpose of initiating the rapid advance and between the master piston and the end of the control cylinder for the purpose of initiating the slow advance. Restoring means are also provided for the purpose of returning the moving components to their starting positions.

This invention relates to an oleopneumatic jack with staged structure. This jack is primarily suited for the execution of operations which call for the application of substantial forces.

The jack which is contemplated by the invention is designed to carry out a movement of rapid approach during the active travel until it comes into contact with an external element which acts in opposition to any further movement of extension. The movement of the jack is then transformed into a slow advance during the working travel and the moving parts of the jack then return rapidly to the initial position on completion of the working travel.

The device in accordance with the invention is particularly suitable as an equipment component in machines of the type which are designed to carry out such operations as die-stamping, straightening, rivetting and crimping. Generally speaking, the device can be employed in all cases which usually entail the use of jacks such as lifting operations, for example.

Irrespective of its intended purpose, the object of the invention will be designated by the name of oleopneumatic jack.

In accordance with the invention, the oleopneumatic jack with staged structure and rapid advance followed by slow advance is characterized in that it comprises on the one hand a control cylinder inside which are slidably fitted a master piston secured to a hollow rod and a float which is adapted to slide along said hollow rod and on the other hand an actuating cylinder containing a driving piston which carries the thrust member, the space located between the float and the driving piston being filled with a liquid and divided into two chambers by a diaphragm which is obturated by the hollow rod of the master piston at the moment of slow advance of the jack, provision being additionally made for a compressed-air distributor so that a driving fluid under pressure may



be delivered at will between the master piston and the float for the purpose of initiating the rapid advance and between the master piston and the end of the control cylinder for the purpose of initiating the slow advance, restoring means being provided in order that the moving parts may also return to their starting positions.

The filling liquid preferably consists of an oil or a fluid grease.

The driving fluid under pressure is preferably compressed air which is conveyed into a pneumatic distributor comprising three passageways each having an air drain. This distributor makes it possible to carry out separately and in the desired order the three phases of the cycle of operation of the oleopneumatic jack.

It is thus apparent that the introduction of compressed air in the control cylinder between the master piston and the float drives the liquid through the diaphragm and initiates a rapid advance of the driving piston and of its thrust member until this latter comes into contact with an external resistance element. This is the approach travel.

When the compressed air which has previously been admitted into the control cylinder is drained-off while compressed air is conveyed at the same time between the end of the control cylinder and the master piston, the displacement of the hollow rod which is rigidly fixed to the master piston is initiated, the hollow rod engages in the diaphragm and imprisons a certain mass of liquid within the chamber into which it has penetrated. Since the diaphragm is fluid tight, the hollow rod which also performs the function of piston exerts a pressure on the mass of liquid which in thus imprisoned and transmits to the thrust member a thrust which is increased in the same proportion as the ratio of the driving-piston area to the cross-sectional area of the hollow rod according to Pascal's principle. This second stage constitutes the slow travel or working travel.

Finally, in a third stage, the above-mentioned compartment of the cylinder is drained-off and compressed air is admitted within the actuating cylinder between the cylinder end and the driving piston. The moving components of the oleopneumatic jack will then return to their initial positions at a very high speed.

The oleopneumatic jack which is thus arranged has the advantage of a perfectly symmetrical structure of small radial size.

The efficiency of the jack can readily be enhanced by superposing one or a plurality of pistons which are rigidly fixed to the hollow rod, thereby increasing to a corresponding extent the thrust which is transmitted by said rod and consequently the work capacity of the thrust member. This result is achieved without thereby entailing any modification of radial dimensions.

It is possible in addition to increase the efficiency of the device still further by coupling in parallel a plurality of piston compartments which terminate in a single actuating cylinder. In such a case, the overall height remains unchanged.

Moreover, the oleopneumatic jack in accordance with the invention can be divided into two portions, one of which corresponds to the control cylinder whilst the other portion corresponds to the actuating cylinder, these two portions being connected by means of a flexible hose filled with liquid. This arrangement is very useful when it proves necessary to exert substantial force within small spaces which are not readily accessible.

Further properties and advantages of the invention will become apparent from the following description, reference being made to the accompanying drawings which are given solely by way of non-limitative example, and in which:

FIG. 1 is a view in sectional elevation taken through a diametral plane and showing one embodiment of the

oleopneumatic jack, the jack being in the rest position at the commencement of the high-speed active travel;

FIGS. 2 and 3 relate to the same embodiment and show the jack respectively at the end of the high-speed active travel and at the end of the low-speed active travel;

FIG. 4 is an elevation view, partly in section taken through a diametral plane and showing an embodiment of the oleopneumatic jack comprising two superposed piston compartments, the jack being shown in the rest position;

FIGS. 5, 6 and 7 relate to an embodiment in which three oleopneumatic jacks similar to the jack of FIG. 4 are grouped in parallel, their three actuating cylinders being combined in a single unit. FIG. 5 is an external view in elevation; FIG. 6 is an external plan view; and FIG. 7 is a view in sectional elevation along the radial plane VII—VII of FIG. 6;

FIG. 8 is an elevation view, partly in section, and showing an embodiment of an oleopneumatic jack in which the control cylinder and the actuating cylinder are independent and connected by means of a flexible hose.

Referring to FIGS. 1 to 3 of the accompanying drawings which illustrate a preferred embodiment of the invention, there can be seen the control cylinder **1** to which the actuating cylinder **2** is fixed by screwing, a leak-tight joint being provided by means of the O-ring seal **21**. A communication is established between said two cylinders by means of a throttled portion or diaphragm **17**. The free ends of said cylinders are fitted respectively with end-caps **3** and **4** and O-ring seals **22** and **23**.

A float **8** and a master piston **6** are capable of sliding independently of each other inside the control cylinder **1**. There is fixed at the center of said master piston a hollow rod **7** of relatively substantial length which traverses the float **8** and is slidably fitted therein. The master piston **6** which is fitted with an O-ring seal **24** provides a fluid-tight separation which serves to divide the control cylinder space between the cylinder end-cap **3** and the float **8** into two staged chambers **14** and **15**. As will become apparent hereinafter, the chambers **14** and **15** are intended to be supplied separately with a driving fluid under pressure such as compressed air. In FIGS. 1 and 2, the volume of the chamber **14** is practically zero.

The float **8** is designed in the form of a piston with a hollowed-out central portion. The sliding motion of the float is limited by a stop **34**. Said float also provides a fluid-tight separation between the chambers **15** and **16** by means of two O-ring seals **26** and **28** which are in contact with the internal surface of the control cylinder **1** and by means of two O-ring seals **27** and **29** which are in contact with the external surface of the hollow rod **7**. The recess **35** which is formed in the float **8** is continuously maintained at atmospheric pressure by virtue of the presence of the hole **36** formed in the wall of the control cylinder **1**.

The driving piston **9** which carries the thrust member **10** is adapted to slide within the actuating cylinder **2**. An axial bore **20** formed in the driving piston serves as a receiver for the hollow rod **7** during its displacement. By virtue of its O-ring seals **32**, said driving piston provides a fluid-tight separation between the two staged chambers **18** and **19** located between the diaphragm and the end-cap **4**. The volume of the chamber **18** is zero in the position shown in FIG. 1.

The chamber **19** is intended to be supplied with a driving fluid under pressure, in the same manner as the chambers **14** and **15**. The thrust member **10**, the end of which is provided with an annular groove **40**, is guided by the bushing **39** of the end-cap **4**, the sliding motion of said thrust member being rendered leak-tight by means of the O-ring seal **33**.

The chamber **18** is adapted to communicate with the chamber **16** by means of the diaphragm **17**. These two chambers contain a liquid such as oil or a fluid grease. The communication thus established may be suppressed by the hollow rod **7** when this latter is engaged within the diaphragm **17** after the fashion of a piston, fluid-tightness of which is ensured by means of O-ring seals **30** and **31**.

The end-cap **3** of the control cylinder is provided on the one hand with an aperture **12** which communicates with the chamber **14** and on the other hand with an axial aperture **11**. Said axial aperture **11** communicates with a hollow telescopic tube **5** which is secured to the end-cap **3** and housed within the hollow rod **7**. Said hollow telescopic tube **5** is adapted to slide axially inside the master piston fitted with the O-ring seal **25** and communicates with the chamber **15** by way of two holes **37** which are pierced in the hollow rod **7**.

The end-cap **4** of the actuating cylinder **2** is also provided with an aperture **13** which communicates with the chamber **19**.

An annular space **41** placed between the seals **32** of the driving piston **9** is adapted to communicate with the exterior via the duct **38**.

The compressed-air means which are provided for the purpose of actuating the oleopneumatic jack comprise in the example herein described a distributor **43** which is continuously supplied through the duct **50** from a compressed-air source (not shown in the drawings). Said distributor **43**, which is illustrated diagrammatically, comprises three passageways each fitted with an air drain and adapted to communicate with the oleopneumatic jack. The distributor is so designed that it can supply only one passageway with compressed air whilst the other two passageways are drained-off.

The oleopneumatic jack additionally comprises means for preventing the compressed air from mixing with the liquid and also for the immediate detection and location of faults arising from any leakage which may develop.

Mixing is prevented by means of seals which serve to separate the chambers and between which is formed an annular space having its opening in free air.

To this end, the chambers **18** and **19** are separated by the seals **32**, the annular space **41** being located between said seals and connected to the outside air by means of the duct **38**. So far as concerns the chambers **15** and **16**, these latter are separated by the seals **27** and **29** between which is located the annular chamber **42** having its opening in the recess **35** which is exposed to free air, and by the seals **26** and **28**.

The operation of the oleopneumatic jack as thus constituted comprises three successive stages:

(a) Rapid advance or approach travel until the thrust member bears on the external element which opposes its motion,

(b) slow advance or working travel during which the thrust member moves forward while exerting its full thrust on the external element,

(c) rapid return either to the initial work position or to the initial approach position.

The chambers **14** and **15** being drained-off, the compressed air is supplied through the aperture **13** and is admitted into the chamber **19**. The driving piston **9** moves towards the diaphragm **17**, forces back the liquid contained in the chamber **18** and stops when the float **8** which is displaced by the liquid as this latter flows into the chamber **16** accordingly comes up against the stop **34**. The displacement of the driving piston **9** also initiates the displacement of the hollow rod **7** which brings the master piston **6** into abutment against the end-cap **3**. The jack is then at rest in the initial approach position shown in FIG. 1.

When the chamber **15** is supplied with compressed air through the aperture **11**, the telescopic tube **5** and the holes **37**, the chamber **19** is simultaneously drained-off. The master piston **6** remains stationary. On the other hand, the float **8** is displaced under the pressure of the compressed air, with the result that the liquid contained in the chamber **16** is forced into the chamber **18** and that the driving piston **9** is displaced in its turn. The displace-

ments of the float **8** and of the driving piston **9** continue at a very fast rate until the thrust member **10** comes into contact with the external element which then stops further motion.

The oleopneumatic jack has then completed its approach travel and is in the initial work position shown in FIG. 2.

In a third stage, the chamber **15** is drained-off and the chamber **14** is supplied with compressed air through the aperture **12**. Under the pressure exerted by the compressed air, the master piston **6** is displaced and draws with it the hollow rod **7** which accordingly penetrates into the diaphragm **17**. The chambers **16** and **18** are isolated by the seal which is thus formed at the level of the diaphragm **17** between the hollow rod **7** and the O-ring seals **30** and **31**. The hollow rod **7** then extends into the chamber **18** and continues to move down until an equilibrium is established between the reaction force which acts in opposition to the outward extension of the thrust member **10** and the force produced by the pressure on the driving piston **9**.

The oleopneumatic jack has then completed its slow advance or work travel (FIG. 3) by operating in a manner which is comparable to a hydraulic press comprising a small piston constituted by the hollow rod **7** and a large piston constituted by the driving piston **9**.

Finally, by means of a suitable and adequate operation of the distributor **43**, the oleopneumatic jack can either return to its rest or initial approach position shown in FIG. 1 or return to the initial work position shown in FIG. 2, depending on operating requirements.

In accordance with the invention, the force transmitted by the thrust member is both proportional to the thrust exerted by the hollow rod **7** and to the ratio of the area of the driving piston **9** to the cross-sectional area of the hollow rod **7**.

In a practical application of the invention in which compressed air was employed at a pressure of 6 bars the dimensions of the essential components were as follows:

| | Cm.² |
|---|---|
| Internal cross-sectional area of the control cylinder **1** | 23 |
| Cross-sectional area of the telescopic tube **8** | 0.25 |
| Cross-sectional area of the hollow rod **7** | 1.5 |
| Cross-sectional area of the driving piston **9** | 28.25 |

During operation, the forces developed attained the following values:

| | Kgs. |
|---|---|
| Thrust exerted on the float (FIG. 2) | 130 |
| Thrust exerted on the master piston **6** (FIG. 3) | 135 |

Force applied by the thrust member **10**:

$$\frac{135 \times 28.25}{1.5} = 2.550$$

The second embodiment of the oleopneumatic jack which is illustrated in FIG. 4 differs from the preceding in that it comprises in superposition a compressed-air compartment which is similar to that of the control cylinder, which has the effect of virtually doubling the thrust exerted by the hollow rod.

The additional compressed-air compartment comprises a cylinder **101** which is joined to the control cylinder **1** by means of the internally threaded connector **102** and which is closed at the other end by means of the end-cap **3**. The connector **102** is fitted with seals **122** and **146** and provided with apertures **111** and **112** which open respectively into the chambers **115** and **14**. The end-cap **3** which is the same as in the previous embodiment is provided with the seal **22**, the apertures **11** and **12** and the telescopic tube **5**.

There is slidably fitted inside the cylinder **101** the master piston **6** of the previous embodiment which is rigidly fixed



to the extended hollow rod **7**. During its movement of displacement, the master piston **6** is permitted by its O-ring seals **24** and **25** to provide a fluid-tight separation within the space formed between the end-cap **3** and the bottom of the connector **102** and to divide said space into two staged chambers **114** and **115**. The two chambers **114** and **115** are intended to be supplied separately with the driving fluid under pressure.

The hollow rod **7** is adapted to pass in sliding relation through the base **140** of the connector **102** which is fitted with the O-ring seal **144**; inside the control cylinder **1**, said hollow rod is adapted to carry the piston **106** fitted with seals **124** and **145**. The piston **106** forms a fluid-tight separation between the two chambers **14** and **15** of the previous embodiment.

The remainder of the apparatus has not undergone any modification and is therefore the same as in the previous embodiment.

The operation of the oleopneumatic jack in accordance with the second embodiment is exactly as previously explained with reference to the first form of construction. Accordingly, it is merely necessary to supply in parallel from the distributor **43** the apertures **11** and **111** on the one hand and the apertures **12** and **112** on the other hand.

FIG. 4 shows the oleopneumatic jack in the rest position. The simultaneous admission of compressed air into the chambers **115** and **15** through the apertures **111** and **11** initiates the approach travel. Similarly, the simultaneous admission of compressed air into the chambers **114** and **14** through the apertures **12** and **112** initiates the working travel.

In this last-mentioned stage, the air pressure which is exerted both on the master piston **6** and on the piston **106** creates a thrust of the hollow rod **7** which is virtually double the thrust exerted by the rod in the first embodiment.

One noteworthy feature of this second embodiment is the fact that, although the radial dimensions remain the same, the oleopneumatic jack develops at the thrust member a force which is substantially double the force which is produced in the first embodiment.

In the example mentioned earlier, the force developed by the oleopneumatic jack and applied by the thrust member amounted to 2,550 kgs. After a modification has been made in accordance with the second embodiment, tests carried out with this apparatus have produced the following results:

| | Kgs. |
|---|---|
| Thrust exerted on the master piston **6** | 135 |
| Thrust exerted on the piston **106** | 130 |
| Total thrust transmitted by the hollow rod **7** | 265 |

Force applied by the thrust member **10**:

$$\frac{265 \times 28.25}{1.5} = 5,000$$

It is apparent that alternative forms of construction of the oleopneumatic jack can be contemplated in respect of the second embodiment hereinabove described and that any such variants would not constitute any departure from the scope of the invention.

The diameters of the cylinder **101** can be different from those of the control cylinder **1**. Similarly, it would be feasible to superpose a plurality of compressed-air compartments, the respective pistons of which are rigidly fixed to the same hollow rod.

The useful work performed by the thrust member is equal to the product of the force transmitted by this latter and of its displacement. It is clear that, compared with the first embodiment, the increase in the available power which results from an increase in the thrust exerted by the hollow rod can in turn only result in an increase

in the force transmitted by the thrust member while its travel remains unchanged. This case corresponds to the second embodiment which has just been described. It is also possible to obtain a longer travel whilst the force transmitted by the thrust member remains unchanged. Finally, the two variables referred to above, namely force and travel, can be modified at the same time, thereby permitting of a high degree of flexibility in the practical design of the oleopneumatic jack as well as the ready adaptation of this latter to operating conditions.

Similarly, the distributor can give rise to alternative forms of execution. The distributor continues to operate in three positions, but additional connections can be provided for the air apertures such as grouping of the apertures **13** and **111**; this mode of connection makes it possible to switch the oleopneumatic jack from the final work position to the rest position without stopping in the intermediate position. Provision can also be made for a distributor which comprises more than three positions, in which each position corresponds to a particular connection.

In accordance with a third form of construction which is contemplated in FIGS. 5 to 7, the oleopneumatic jack is provided in parallel with three control cylinders and additional pneumatic compartments which open into a single actuating cylinder.

This device is constituted by an actuating cylinder **202** on which are screwed in a leak-tight manner three control cylinders **1***a*, **1***b*, **1***c* which are identical in every respect, each cylinder being surmounted by an additional compressed-air compartment **101***a*, **101***b*, **101***c*. O-ring seals such as the seal **221***a* provide the necessary fluid-tightness. Compressed air is supplied to the top cylinder-ends through openings **11***a*, **11***b*, **11***c*.

Each control cylinder **1***a*, **1***b*, **1***c* which is designed and arranged as hereinabove described is adapted to communicate with the chamber **218** by way of diaphragms such as the diaphragm **17***a*. The chamber **218** and the three chambers such as the chamber **16***a* which thus communicate with each other are filled with oil. However, the communication thus established is not permanent and is cut off when the hollow rods such as the rod **7***a* which penetrate at the same time into the diaphragms prevent any circulation of liquid as a result of the presence of O-ring seals such as the seals **230***a* and **231***a*.

The end-cap **204** which is screwed onto the actuating cylinder **202** in a leak-tight manner by virtue of the seal **223** carries a cylinder **242** inside which is slidably fitted the driving piston **209** together with its thrust member **210**.

The driving piston **209** which is fitted with two O-ring seals **232** forms a fluid-tight separation between the chamber **218** and the chamber **219** which is intended to be supplied with driving fluid under pressure from the aperture **213**. Leak-tightness of the thrust member **210** which is guided by the bushing **239** is ensured by means of the seal **233**.

Finally, the annular space **241** which is formed between the seals **232** and connected to the discharge aperture **238** permits the evacuation of any leakage flow either of compressed air or oil.

The device hereinabove described corresponds in actual fact to a group of three oleopneumatic jacks which are intended to operate simultaneously.

The operation of the device is no different from that of the embodiments described earlier. The combinations of connection of the compressed-air distributor are also the same as before on condition, however, that the different grouped elements are supplied in parallel.

It can be mentioned by way of indication that, if three control cylinders with additional compartments having the dimensions indicated earlier and a driving piston having a triple piston area were employed in an actual apparatus, the characteristics of this apparatus would be as follows:

| | |
|---|---|
| Cross-sectional area of the driving piston **209** cm.$^2$ | 85 |
| Cross-sectional area of the three hollow rods **7** cm.$^2$ | 4.5 |
| Total thrust of the three hollow rods **7** kgs. | 795 |

Force transmitted by the thrust member **210**:

$$\frac{795 \times 85}{4.5} \text{ kgs.} = 15{,}000$$

Compared with the preceding embodiments, the overall height has not been modified, but the work capacity of the new device is multiplied by the number of elements which are grouped together.

This type of device is both more efficient and highly versatile since it permits of novel combinations between the force developed and the travel of the thrust member and is thus readily adaptable to operating conditions.

Finally, referring to FIG. 8, there is shown a fourth mode of construction of the oleopneumatic jack which is characterized in that it comprises a control cylinder and an actuating cylinder which have been constructed separately and connected by means of a flexible hose filled with liquid.

The control cylinder **1** is attached to the end-cap **302** which is fitted with a diaphragm.

As in the previous examples, the actuating cylinder **321** comprises a sliding driving piston **309** provided with its thrust member **310**. By means of its O-ring seals **332**, the driving piston **309** divides the internal volume of the actuating cylinder in a fluid-tight manner into two chambers **319** and **318***b*.

Compressed driving fluid is intended to be supplied to the chamber **319** through the aperture **313**.

The chamber **318***b* is connected to the chamber **318***a* by means of a flexible hose **320** which is capable of withstanding high pressures. These two chambers and the hose are filled with liquid.

The operation of the device is identical with that of the preceding embodiments.

The control cylinder **1** can be stationarily mounted whilst the actuating cylinder **321** which is of very small overall size can be displaced according to practical requirements.

It is apparent that alternative forms of execution arising from this fourth embodiment of the oleopneumatic jack may also be contemplated. For example, a plurality of flexible hoses leading to different control cylinders could be connected to the same actuating cylinder.

The operation of the distributor **43** could also be made dependent on a manometric relay for the purpose of switching the jack automatically from the rapid advance to the slow advance when the thrust member has come into contact with the obstacle.

What is claimed is:

**1**. An oleopneumatic jack with staged structure and rapid advance followed by slow advance, wherein said jack comprises on the one hand a control cylinder inside which are slidably fitted a master piston secured to a hollow rod and a float which is adapted to slide along said hollow rod and on the other hand an actuating cylinder containing a driving piston which carries the thrust member, the space located between the float and the driving piston being filled with a liquid and divided into two chambers by a diaphragm which is obturated by the hollow rod of the master piston at the moment of slow advance of the jack, provision being additionally made for a compressed-air distributor so that a driving fluid under pressure may be delivered at will between the master piston and the float for the purpose of initiating the rapid advance and between the master piston and the end of the control cylinder for the purpose of initiating the slow advance, restoring means being provided in

order that the moving parts may also return to their starting positions.

2. An oleopneumatic jack as claimed in claim 1, wherein the pneumatic distributor comprises three passageways each having an air drain and makes it possible to carry out separately and in the desired order the rapid-approach travel, the slow working travel, the rapid return travel to the initial rest position or the rapid return travel to the initial working position.

3. An oleopneumatic jack as claimed in claim 1, wherein the internal space of the hollow rod serves as a housing for a telescopic tube secured to the end-cap of the control cylinder, said telescopic tube being adapted to traverse the master piston in sliding relation therewith and to serve as a passageway for the driving fluid which is directed towards or discharged from the chamber located between said master piston and the float.

4. An oleopneumatic jack as claimed in claim 1, wherein the travel of the float is limited by a stop against which it is applied when the moving parts are in the rest position.

5. An oleopneumatic jack as claimed in claim 1, wherein the cross-sectional area of the driving piston is a number of times greater than that of the sliding hollow rod, an axial compartment being additionally provided inside the thrust member in order to accommodate said hollow rod during its sliding motion.

6. An oleopneumatic jack as claimed in claim 1, wherein said jack is provided for the purpose of separating the chambers with seals between which is formed an annular space which opens to free air in order to prevent mixing of the driving fluid under pressure with the liquid.



7. An oleopneumatic jack as claimed in claim 1, wherein said jack comprises in superposed relation at least one additional compressed-air compartment which is placed above the control cylinder, said compartment being traversed by a single hollow rod which carries a number of driving pistons corresponding to the number of compressed-air cylinders.

8. An oleopneumatic jack as claimed in claim 7, wherein said jack comprises in parallel a plurality of control cylinders which open into a single actuating cylinder, each of said control cylinders being fitted with a sliding hollow rod.

9. An oleopneumatic jack as claimed in claim 7, wherein said jack comprises an actuating cylinder which is separated from the control cylinder, these two components being connected to each other by a flexible hose filled with liquid.

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