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Millar

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[54] **ELECTRO-HYDRAULIC JACK**

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[52] **U.S. Cl.** ..... **254/93 R;** 417/415

[51] **Int. Cl.**[2] **B66F 3/24**

[58] **Field of Search** ..... 254/93 R, 93 H, 93 HP, 254/133, 134, 2 R, 2 CB, 98, 100, DIG. 4; 417/415; 60/477, 480; 248/357

[56] **References Cited**

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Primary Examiner—Othell M. Simpson
Attorney, Agent, or Firm—Criddle & Thorpe

[57] **ABSTRACT**

A jack intended for use with automobiles including a compact, easily positioned jack assembly, a hydraulic power unit connected to the jack assembly, and means for electrically operating the hydraulic power unit. The jack assembly has a head support that will adapt to use with a bumper or that will provide a ram head to be used under axles and the like.

3 Claims, 4 Drawing Figures

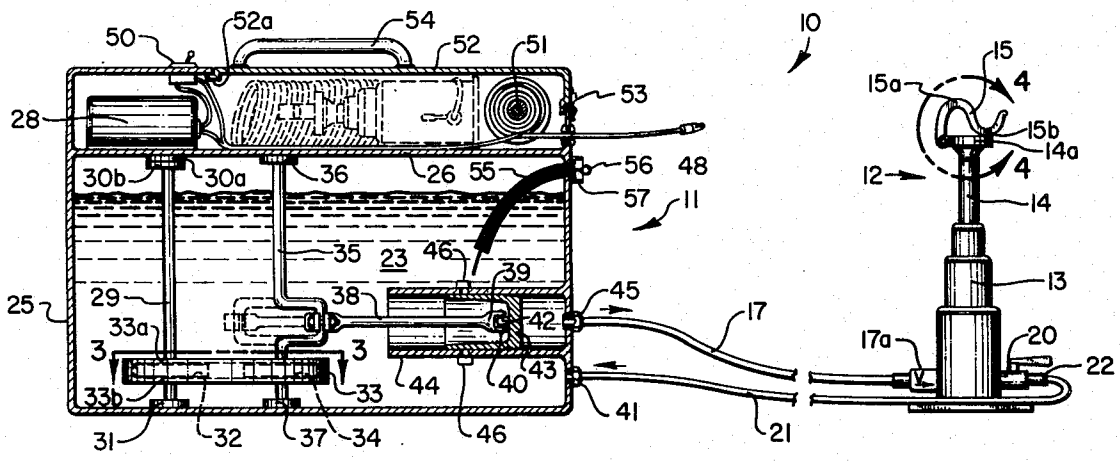


FIG 1

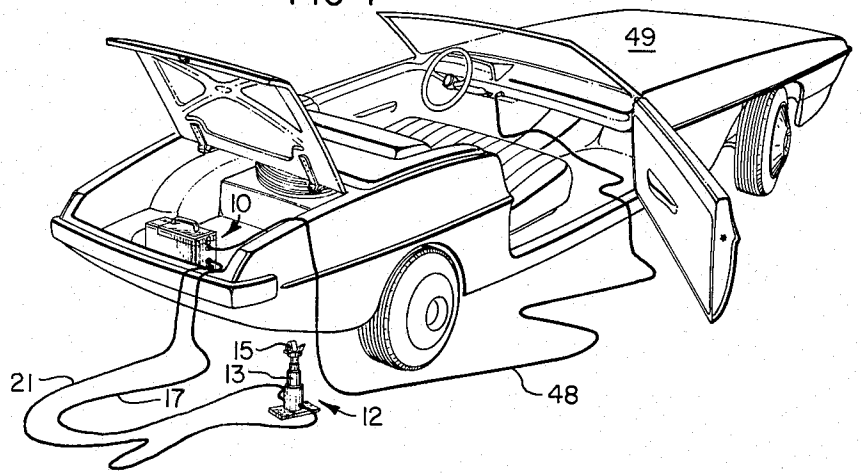


FIG 2

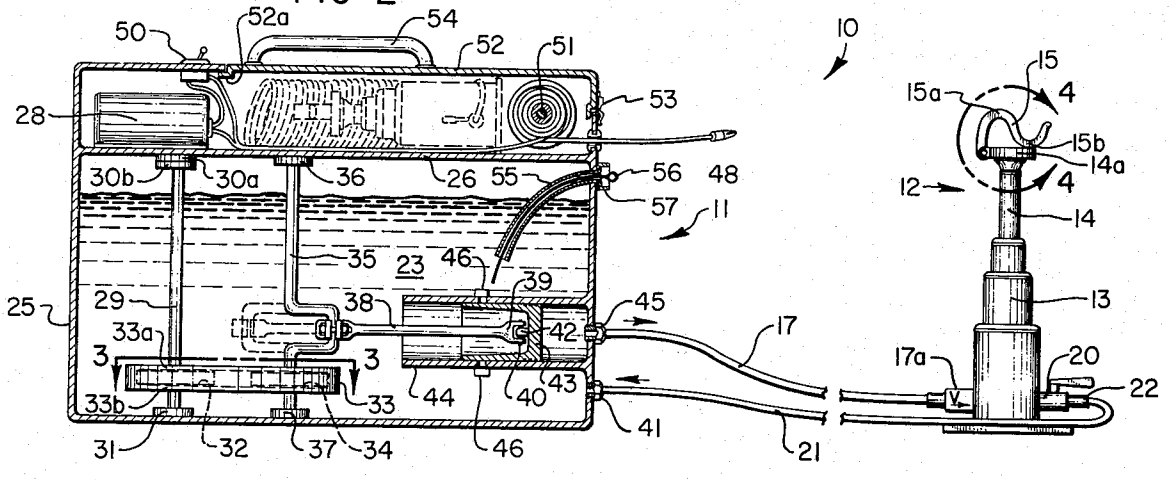


FIG 3

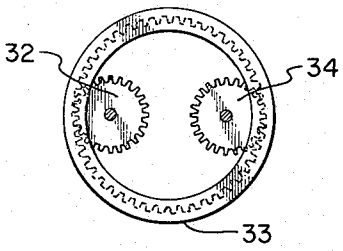
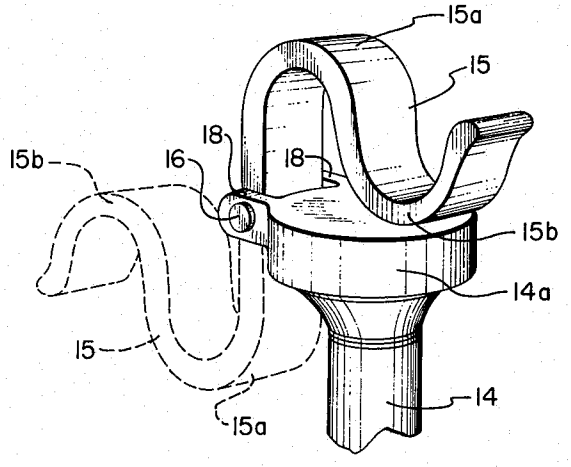


FIG 4



ELECTRO-HYDRAULIC JACK

BRIEF DESCRIPTION OF THE INVENTION

1. Field of the Invention

This invention relates to jacks and particularly to jacks used with automobiles.

2. Prior Art

The need for a jack that does not require manual operation and that can even be operated by handicapped persons, women and others, without a great deal of physical exertion, has long been recognized.

U.S. Pats. Nos. 1,969,408, 2,034,605 and 2,420,910, for example, all show jacks that are hydraulically and electrically powered, with the control for a hydraulic pump being provided through an electrical connection to a vehicle battery or other such electrical power source.

While these aforementioned prior art patents do show electro-hydraulic jack units, they have not, to my knowledge, come into common usage. It would appear that there has not heretofore been available a jack that can be conveniently used, since in the prior units it is necessary that a housing containing electric motor, hydraulic pump and all of the control structures therefore be moved from place to place in positioning the units for use. Also, none of the aforementioned patents disclose means for alternatively using the jacks disclosed either as bumper jacks or as axle jacks in the lifting of vehicles.

SUMMARY OF THE INVENTION

Principal objects of the present invention are to provide a jack arranged to have a relatively lightweight, easily positioned jack assembly that is used to actually lift a vehicle; a power unit, including pump, hydraulic reservoir, and electric motor that is remote from, but hydraulically connected to the jack assembly; and long connector means to connect the electric motor to the vehicle battery or other suitable energy source.

Principal features of the invention include a telescoping jack assembly having a jack head that can be pivoted between a bumper engaging position and a ram position, and a power unit contained within a housing.

The power unit comprises an electric motor, a hydraulic reservoir, and a hydraulic pump within the reservoir and powered by the electric motor.

The jack assembly is connected to the power unit through flexible hydraulic hoses and is conveniently stored within the power unit housing when not in use.

Additional objects and features will become apparent to those skilled in the art from the following detailed description and claims, taken with the accompanying drawings.

THE DRAWINGS

In the drawings:

FIG. **1** is a perspective view of the invention as used with a vehicle;

FIG. **2**, a view showing the power unit of the invention in vertical section (the storage position of the jack assembly being shown in phantom) and with the jack assembly shown in side elevation, connected to the power unit;

FIG. **3**, a horizontal section, taken on line **3—3** of FIG. **2**, showing the gearing between electric motor and pump; and

FIG. **4**, an enlarged, fragmentary perspective view of the jack head, as taken within line **4—4** of FIG. **2**, and with the alternate positions of the jack head shown in solid and dotted lines, respectively.

DETAILED DESCRIPTION

Referring now to the drawings:

In the illustrated preferred embodiment, the jack of the invention, shown generally at **10**, FIG. **2**, comprises a jack assembly **11** and a power unit **12**. The jack assembly **11** includes a telescoping body **13** (which may be constructed like the telescoping body shown in U.S. Pat. No. 1,969,408, for example) and that has a ram **14** as the most extended member when the body **13** is telescoped. The body **13** is supported on an enlarged platform base **13***a*. Ram **14** has a jack head **15** pivotally connected by a pivot pin **16** that extends through spaced flanges **18** on the end of the ram and through one end of the head. The head **15** is made of flat stock and is of generally S-shape and is connected to the ram such that when it is positioned to extend above the ram one curve **15***a* of the head projects above the bearing surface **14***a* and the other curve **15***b* rests on the bearing surface. The curve portion **15***a* can then be used as a bearing surface and to provide an overall length increase to the jack assembly. Under certain jacking conditions, such extended height is necessary or desirable to insure proper lifting of a vehicle.

In its alternate position the jack head is pivoted off the bearing surface **14***a* and hangs downwardly alongside the ram. Curve **15***a* is then low and will conveniently accommodate a vehicle bumper and curve **15***b* extends upwardly from curve **15***a* to hold the bumper in place.

Hydraulic fluid under pressure is supplied to the bottom of jack assembly **11** through a flexible hose **17** that is connected to a one-way check valve **17a** at the inlet to the housing. A quickdisconnect valved coupling **19** allows the hose to be readily disconnected. Discharge of fluid from the assembly **11** is through a manually controlled valve **20** at the housing outlet and through a flexible hose **21** that is connected thereto by a quick disconnect valved coupling **22**. Oil **23** is supplied to the jack assembly **11** from a reservoir **24** formed in the lower part of a housing **25** of the power unit **12**.

A partition **26**, separates the reservoir **24** from an upper compartment **27** in the housing **25**, and an electric motor **28** is fixed in position in the compartment. The drive of the motor **28** is connected to a shaft **29** that extends through partition **26** and through an oil seal **30***a*, bearing **30***b* on the underside of the partition, through reservoir **24** and into a bearing **31** on the bottom of the housing **25**.

A spur gear **32** is fixed to shaft **29** near the bottom of reservoir **24** and rotation of shaft **29**, in response to operation of motor **28**, will turn gear **32** and a large internal ring gear **33** that is in mesh with gear **32**.

Ring gear **33** has ring-shaped flanges **33***a* and **33***b* welded or otherwise affixed to the top and bottom thereof to engage opposite sides of gear **32** so that the ring gear will not move out of mesh with the spur gear **32** and with another spur gear **34** that is fixed to the lower part of the axle of a crank shaft **35**. The upper and lower ends of crank shaft **35** are respectively journalled in bearings **36** and **37**, fixed to the bottom of partition **26** and the bottom of housing **25**.

One end of a link **38** is journalled on the eccentric of crank shaft **35**, and the other end of the link has a clevis **39** thereon that is pivotally connected by a pin **40** to an ear **42** that projects from a piston **43**.

Piston **43** reciprocates within a sleeve **44** forming a piston cylinder and the sleeve **44** is fixed to and projects inwardly from a wall of housing **25**.

A fitting **45** extends through the wall of housing **25** centrally of sleeve **44** and the hose **17** is connected to fitting **45**. Ports **46** are provided through sleeve **44** so that when piston **43** is moved to its position most remote from fitting **45** oil can flow from reservoir **24** into the piston cylinder. As the piston is moved towards the fitting **45** the ports **46** are closed off by the piston skirt and the usual piston rings prevent flow past the piston head. Consequently, the oil in the piston cylinder is then forced through fitting **45**, conduit **17** and valve **17a** into the jack assembly.

With valve **20** closed the jack assembly will be telescoped to move any load placed on or engaged by the jack head. If valve **20** is subsequently opened, the oil will be released from the jack assembly, and back to reservoir **24**, through hose **21** and a fitting **41** through the wall of the housing **25**, to which flexible hose **21** is connected. A pressure relief valve (not shown) can be provided, if desired, to open and to allow flow through hose **21** when the jack assembly has been fully extended.

In operation, a power line **48** connected to motor **28** is plugged into the cigarette lighter of a vehicle **49**, or is otherwise connected to a suitable power source. A switch **50**, mounted on the outside of housing **25** and connected in the power line **48**, is then actuated to start operation of motor **28**. A cord reel **51** is provided in the housing **25** and the line **48** is rolled onto the reel for storage and is pulled off, through housing **25** to be connected to the power source.

An upper portion of housing **25** is open to allow conduits **17** and **21** to be coiled and stored in the housing on partition **26**. The jack assembly, when fully retracted, can be similarly stowed.

A lid **52** has a lip **52*a*** that extends over portions of the walls of housing **25** to be latched thereto at **53**. So arranged, a handle **54** on the lid can be used to remove the lid when the latch **53** is uncoupled, or when the lid is properly positioned to carry the entire assembly.

All bearings and meshing gears, except for bearings **30*b*** and **36** are completely immersed in oil **23**. Consequently, the immersed bearings and gears are constantly lubricated and long life can be expected. In addition, there is enough agitation and splash within the reservoir when the motor is operating that the bearings **30*b*** and **36** are thoroughly splashed and lubricated.

Oil is supplied to the reservoir **24** through a filler tube **55** that is threaded through one side of the housing **25**. A dip stick **56** extends through a cap **57** on the upper end of the filler tube to allow oil level in the reservoir to be checked. A filter in the cap **57** prevents oil loss through the cap while allowing sufficient air into the reservoir to prevent any air lock from occurring within the reservoir.

Although a preferred embodiment of my invention has been herein described, it is to be understood that the present disclosure is made by way of example and that variations are possible, without departing from the scope of the hereinafter claimed subject matter, which subject matter I regard as my invention.

I claim:

1. An electro-hydraulic jack comprising

a jack assembly having telescoping body sections and a ram adapted to project therefrom as the outermost extending body section, and an enlarged bearing surface on the end of the ram projecting from the body;

a power unit including a housing, a reservoir in the housing, oil in the reservoir, a pump in the reservoir, an electric motor in the housing, means coupling said motor to said pump whereby operation of the motor operates said pump to pump said oil, said means including

a shaft extending through the reservoir and connected to an output of the motor,

a crank shaft having a principal axis extending parallel to the shaft,

gear means interconnecting the shaft and the principal axis of the crank shaft, and

a link pivotally connected to the eccentric of the crank shaft and to a piston of the pump;

flexible conduit means including one-way valve means, interconnecting the pump and the interior of the jack assembly;

flexible conduit means interconnecting the interior of the jack assembly and the reservoir; and

control valve means in the conduit means interconnecting the interior of said jack assembly and said reservoir.

2. An electro-hydraulic jack as in claim **1**, wherein the gear means interconnecting the shaft and the principal axis of the crank shaft comprises

a first spur gear fixed to the shaft;

a second spur gear fixed to the principal axis of the crank shaft;

and a ring gear surrounding and in mesh with the first and second spur gears.

3. An electro-hydraulic jack as in claim **2**, wherein the pump comprises

a sleeve fixed to and projecting inwardly from a wall of the housing;

ports in the sleeve; and

a piston mounted to reciprocate in the sleeve.

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