(12) UK Patent Application (19) GB (11) 2 149 704 A

(43) Application published 19 Jun 1985

(21) Application No 8427581

(22) Date of filing 31 Oct 1984

(30) Priority data

(31) 548708 (32) 4 Nov 1983 (33) US

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(51) INT CL[4]
B25B 21/00 B60S 9/06

(52) Domestic classification
B3N 2AX 2E1
F2Q 7A3C1E 7A3C2A
U1S 1820 1873 B3N F2Q

(56) Documents cited
None

(58) Field of search
B3N

PATENTS ACT 1977
SPECIFICATION NO. 2149704A

The following corrections were allowed under Section 117 on 6 August 1985

Front page Heading (71) Applicant
for Casco Division of Sun Chemical Corporation (USA-Connecticut)
read Casco Products Corporation (USA-Delaware)

THE PATENT OFFICE
19 August 1985

(66) adapted to be received in the cigar lighter socket (86) in the dashboard (88) of a motor vehicle. In addition, both ends of the tubular socket (66) are exposed exteriorly of the housing (30) whereby the direction of rotation of the rotatable member (16,18) can be changed by reversing the orientation of the housing (30), whereby the rotatable member is slidably engaged in one of the axial ends of the tubular socket (66) as desired.

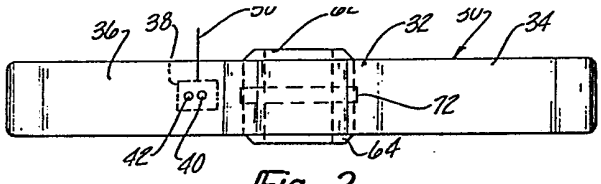

Fig-2

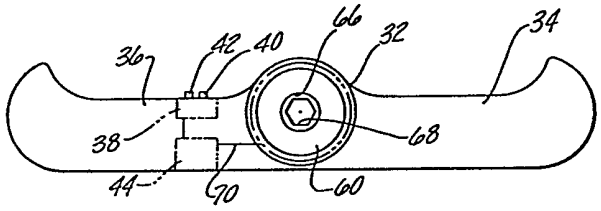

Fig-3

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(54) **A drive device for a jack**

(57) A drive device (10) for a jack intended to be used in conjunction with a scissors or parallelogram jack (12) having a rotatable member (16,18) as an actuator for raising and lowering the jack (12); the jack drive device (10) comprises a housing (30) having a tubular socket (66) rotatably mounted therein, an electric motor and a transmission for rotating the socket (66), a pair of handles (34,36) extending outwardly from the housing (30) for grasping and manipulating the housing (30), and a control switch (38,40,42) on the handle (36) for activating the electric motor (44). Preferably, the control switch (38,40,42) is connected in series with a power chord (50) having a plug (80) adapted to be received in the cigar lighter socket (86) in the dashboard (88) of a motor vehicle. In addition, both ends of the tubular socket (66) are exposed exteriorly of the housing (30) whereby the direction of rotation of the rotatable member (16,18) can be changed by reversing the orientation of the housing (30), whereby the rotatable member is slidably engaged in one of the axial ends of the tubular socket (66) as desired.

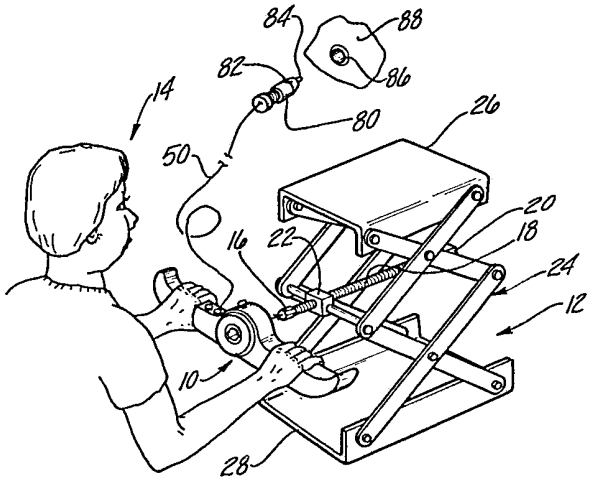

Fig-1

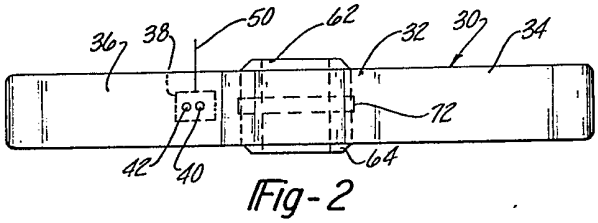

Fig-2

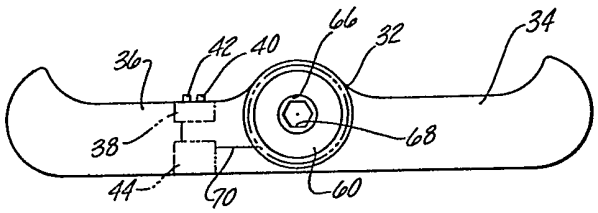

Fig-3

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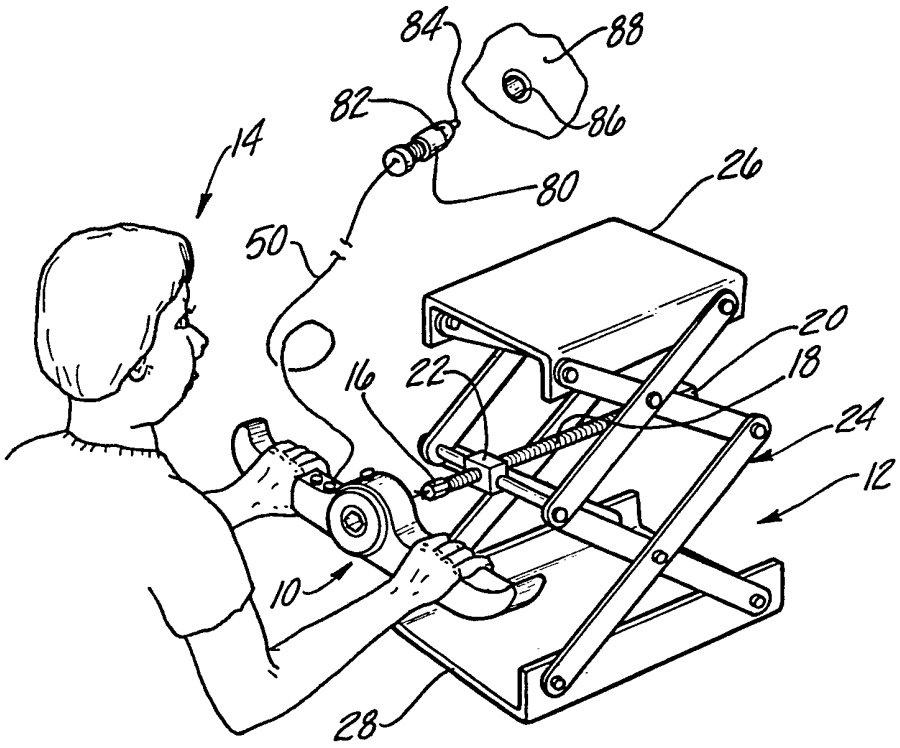

Fig-1

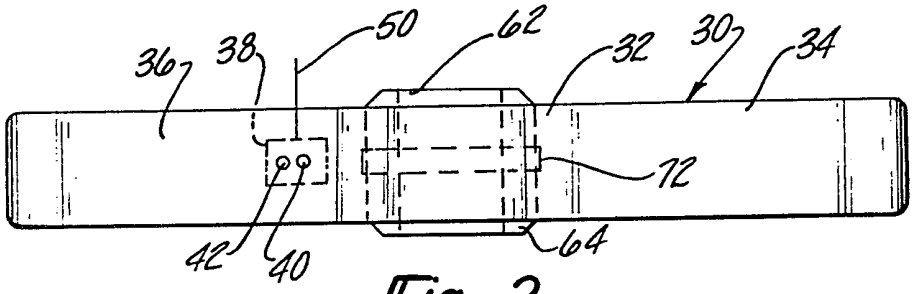

Fig-2

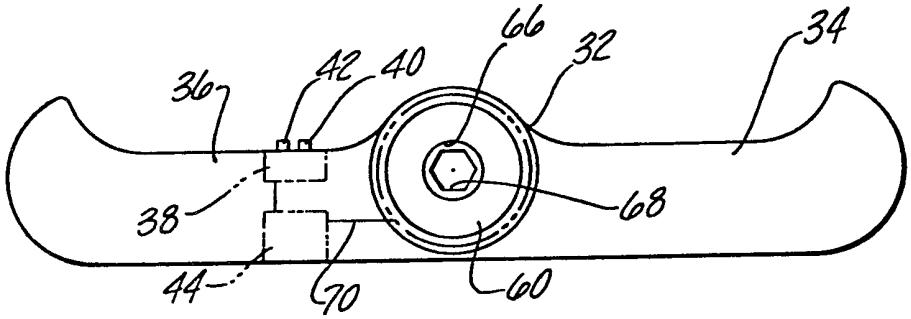

Fig-3

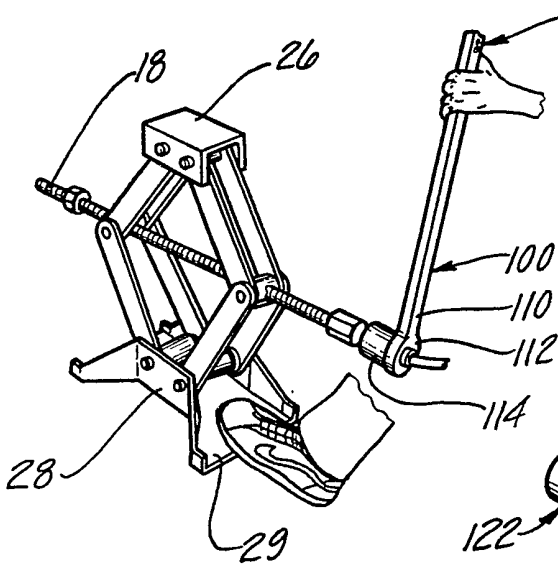

Fig-4

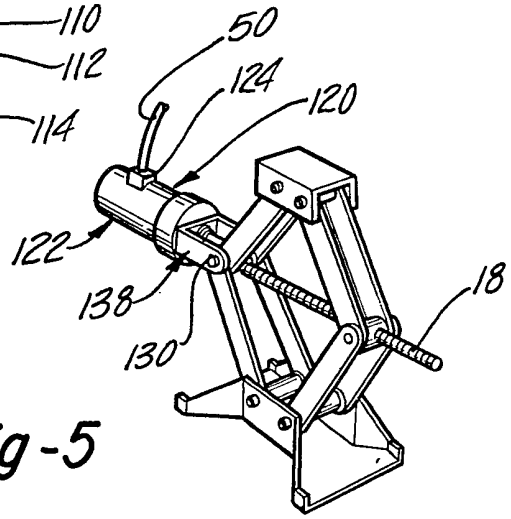

Fig-5

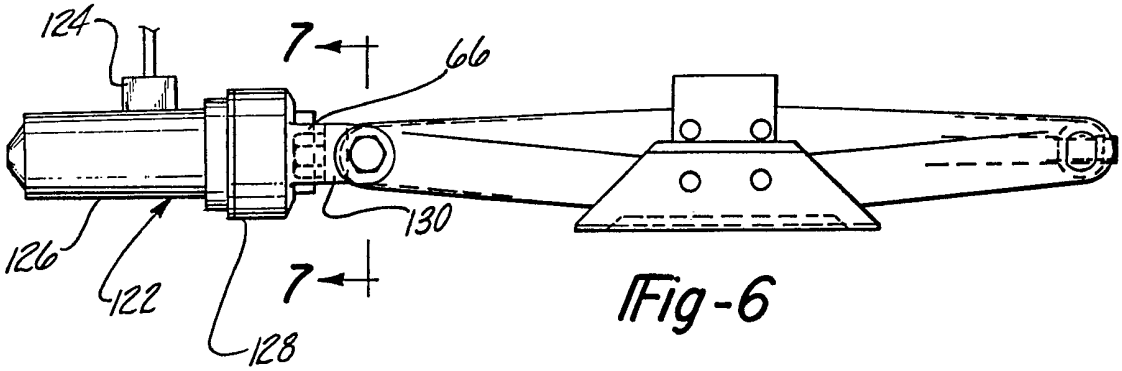

Fig-6

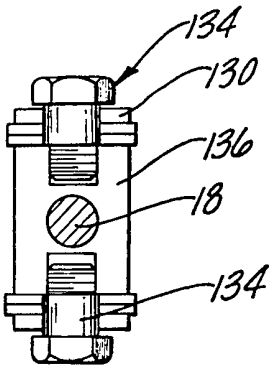

Fig-7

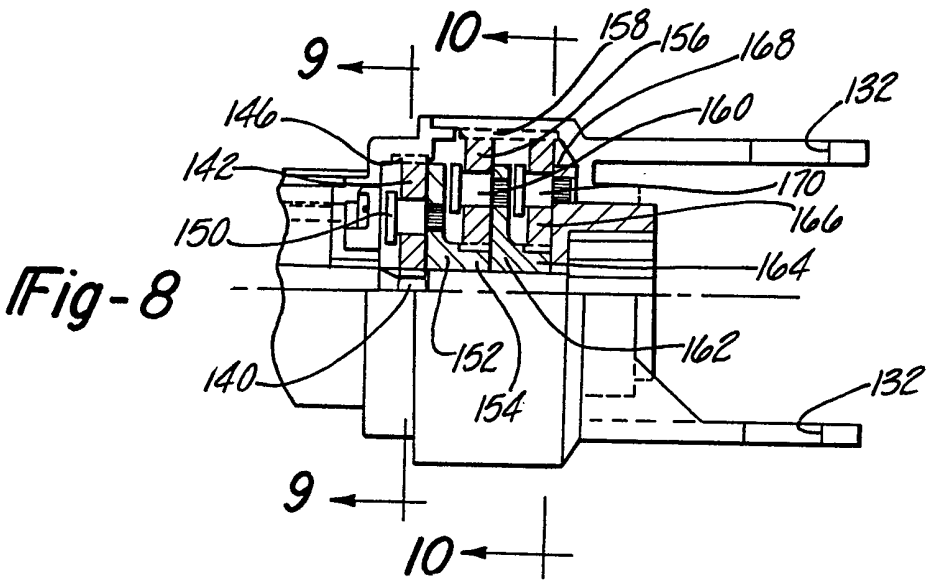

Fig-8

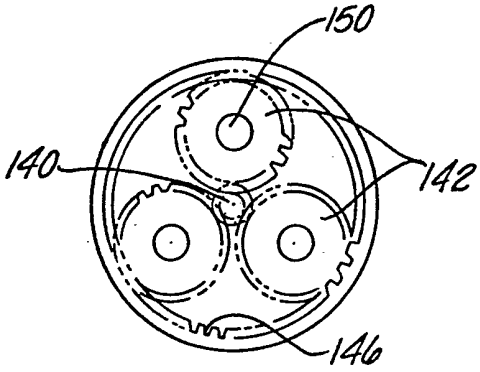

Fig-9

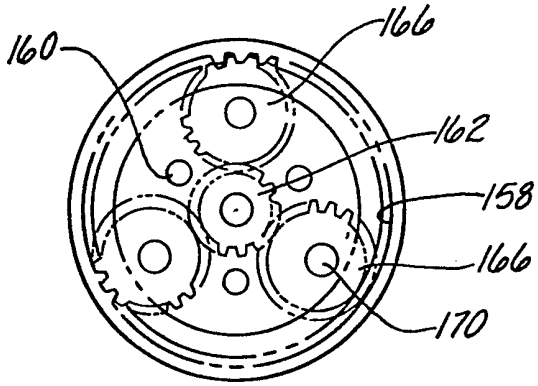

Fig-10

SPECIFICATION

A drive device for a jack

The present invention relates generally to a drive device for actuating a motor vehicle jack of the screw operated type.

Many different types of mechanisms for raising a motor vehicle from the ground are known, although many of them are too large and heavy to be considered practical as a portable jack. For example, the well known hydraulic trolley jack, in which a working fluid is delivered into a cylinder under pressure to act upon a piston which lifts a load platform, is usually constructed of heavy metal parts to enable it to withstand the pressures exerted when a motor car is being lifted by the jack, and to make is sufficiently robust and rugged for constant use in a garage or repair workshop. Moreover, the pressure fluid used in such jacks substantially increases the weight of the jacks, and the complexity of constructing the fluid passageways in the jack substantially increases the expense of producing such a jack. Although such jacks are often provided with castors so that they can be easily manoeuvred into position under a motor vehicle, their weight and bulk prohibit the use of such jacks as portable emergency jacks which can be conveniently and compactly transported in the motor vehicle for ready use in emergency situations.

One previously known portable jack, sometimes called a bumper jack is often provided as an original equipment accessory of a motor vehicle. Such a jack employs a ratcheting pawl mechanism in which the pawl engages a series of detents along a vertical member in response to manual actuation of a lever which is slidable into and removable from the ratchet assembly, whilst the vertical support rod is slidably, removably inserted in a base plate. While such a device can be readily dismantled and can, therefore, be conveniently transported in a storage compartment of the motor vehicle, the bumper of the motor vehicle must be specially manufactured in order to support the weight of the motor vehicle and to engage the lift tongue of the jack. In the event that the bumper has been damaged, or the connection between the bumper and the vehicle does not provide sufficient support for the lifting of the vehicle, the jack cannot be used to engage other structural members of the motor vehicle such as a framing member. Moreover, such bumper jacks require substantial physical effort to be exerted in order to operate the jack, and thus are not well adapted for use by infirm or handicapped persons. A similar structure is used to fit into a socket or other fitting on the car body shell, known as a so-called "jacking point", but often suffers the disadvantage that the shell corrodes on the underside and crumples when an attempt is made to lift from the jacking point.

Another previously known type of jack is termed a scissors or a parallelogram jack and can be used to lift the frame or other supporting structure of a motor vehicle off the ground by engaging under any selected point. Such a mechanism generally comprises a lazy tongue mechanism which is expanded and contracted in response to the rotation of an elongate screw threaded member. Typically, an end of the elongate screw threaded member includes a hexagonal head substantially the same size as the head of a wheel nut so that a wheel nut spanner can be used to raise the jack. Such a structure still requires a substantial effort to be exerted in order to raise and lower the jack. Moreover, the wheel nut spanner, unless formed as a crank handle, must be repeatedly engaged over removed from the head of the elongate, screw threaded member since the swing arc of the spanner is often limited by the ground surface and/or portions of the motor vehicle.

One previously known device intended to overcome the problem of repeatedly applying and turning the wheel spanner used to operate the jack comprises a jack having an elongated base upon which a motor housing is secured rotatably to drive the screw member. Such previously known motorised jack mechanisms are physically larger and substantially heavier than manually operated jack mechanisms, and are not well adapted for use as a portable jack which is intended to be conveniently stored and transported for use in emergency situations. Such jacks substantially decrease the available storage space in the storage compartment of the motor vehicle. Moreover, previously known motorised jacks have required circuits which enable the direction of rotation of the motor shaft to be reversed, thus increasing the cost and complexity of the motorised jack.

According to one aspect of the present invention, there is provided a drive device for use with a jack for raising a motor vehicle from the ground, the jack having a rotatable member for actuation thereof, comprising a housing, a tubular socket adapted slidably to receive an end of the said rotatable member of the jack; means for rotatably mounting the socket in the housing so that at least one end of the socket is exposed exteriorly of the housing, an electric motor for rotatably driving the socket, and electrical conductor means for electrically connecting the electric motor to an electrical power supply of the vehicle.

The drive device of the present invention thus overcomes the disadvantages discussed above by providing a lightweight jack drive device which can be manually positioned and removably engaged with the rotatable actuating member of a jack, such as a scissors type jack. The jack drive device includes a housing adapted to rotatably support a tubular socket which can be driven by a motor contained within the housing, and may include elongate handle means for manoeuvring and positioning the jack drive device with respect to the rotatable member of the jack.

The drive device also preferably includes manually engageable switch means, which may be mounted on a handle portion of the housing, for activating and deactivating the motor within the housing. The motor may be an electric motor operable from the electrical system of the motor vehi-

cle so as to eliminate the need for storing a power source within the housing and contribute to the lightweight, portability of the jack drive device itself. Consequently, electrical conductor means for connecting the power supply of the vehicle to the motor preferably include an electrical plug adapted to be received within the cigar lighter socket in the dashboard of the motor vehicle.

In a preferred embodiment of the present invention, the tubular socket is secured within a coaxial sleeve having a radius substantially larger than the tubular socket. The periphery of the sleeve comprises a portion of the transmission means for driving the tubular socket by the motor, and is engaged by a smaller gear or other driving mechanism to provide a mechanical advantage to rotation of the tubular socket.

Thus the present invention provides a jack drive device which can be utilised in combination with a conventional jack to produce a portable and conveniently stored lifting device which can be compactly transported in the storage compartment of the motor vehicle. Moreover, the jack drive itself is easily manipulated and positioned, and enables the jack to be raised or lowered without substantial physical exertion by the user. In addition, the torque applied to the tubular socket is substantially greater than the torque which must be delivered by the motor at its output shaft in previously known motorised lifting jacks having a direct connection between the motor and the rotatable member of the jack. In addition, the jack drive device can be driven by the electrical power source of the motor vehicle and thus eliminates the need for an internal power source which would increase the size and weight of the jack drive device housing. In addition, such a drive device eliminates the need for access to a standard electrical outlet which may not be available in an emergency situation on the highway.

The present invention also comprehends a combination comprising a scissors jack having a rotatable member forming means for raising and lowering the jack, and a portable jack drive device comprising, a housing having a central housing portion, coupling means for engaging and rotatably driving the said rotatable member of the jack, the said coupling means being located within the said central housing portion and comprising a tubular socket having at least one end exposed exteriorly of the housing and adapted to receive the said rotatable member of the jack, and means for selectively actuating the coupling means.

Embodiments of the present invention will now be more particularly described, by way of example, with reference to the accompanying drawings, in which:

Figure 1 is a perspective view of a jack drive device formed as an embodiment of the invention, being used in combination with a jack;

Figure 2 is a plan view from above of the jack drive device shown in Figure 1;

Figure 3 is a side elevational view of the jack drive device shown in Figures 1 and 2;

Figure 4 is a perspective view of a second embodiment of a jack drive device, and a jack;

Figure 5 is a perspective view of a further embodiment of a jack drive device and jack combination;

Figure 6 is a side elevational view of the combined jack drive device shown in Figure 5;

Figure 7 is a sectional view taken substantially along line 7-7 of Figure 6;

Figure 8 is a partial sectional view of a portion of the housing of the jack drive device shown in Figures 5 and 6;

Figure 9 is a sectional view taken substantially along the line 9-9 of Figure 8; and

Figure 10 is a sectional view taken substantially along line 10-10 of Figure 8.

Referring first to Figure 1, a jack drive device 10 according to the present invention is shown being applied to a scissors jack 12. The drive device 10 is shown being held by a person 14 about to engage it onto the extending end 16 of an elongate screw threaded rod member 18 in a manner which will be described in detail hereinafter. In the jack, it can be seen that the rod member 18 is rotatably secured in a support block 20 and a nut block 22 entrained on cross bars between spaced, expansible scissors mechanisms 24 forming the sides of the jack. Thus the rod member extends across an expansible section of each scissor section 24. The ends of the top links of each scissors mechanism are secured to a load platform 26 whereas the ends of the bottom members of the scissors mechanism 24 are secured to a base platform 28. The load platform 26 and the base platform 28 can be conveniently provided by one piece plates formed with parallel side flanges to which the scissors mechanisms 24 are pivotally secured.

The jack 12 illustrated in Figure 1 is particularly advantageous for its simplicity of construction and the fact that in its fully retracted position it is very compact for convenient storage. However, it will be understood that other jacks can also be used in combination with the jack drive device of the present invention; it is only necessary that the jack includes a rotatable member which actuates the raising and lowering of the load platform of the jack in order for use of the jack drive device of the present invention to be within the scope of the present invention.

Referring again to Figure 1, it will be understood that rotation of the rod member 18 causes the nut block 22 to ride along the rod member 18 in one direction, for instance, toward the mounting block 20, causing a load platform 26 to be raised above the base platform 28. Conversely, rotation of rod member 18 in the opposite direction causes the nut block 22 to traverse along the rod member 18 in the opposite direction, for instance, toward the end 16 of the rod member 18. Having thus described the important features of the jack 12, the particularly advantageous means of the present invention for actuating the jack can now be described in detail.

As best shown in Figures 2 and 3, the jack drive device 10 comprises a housing 30 having a central casing portion 32 and a pair of elongate handle

portions 34 and 36 extending outwardly from the opposite sides of the central casing portion 32. The elongate portions 34 and 36 form handles which, as shown in Figure 1, can be grasped by the person for manipulating and positioning the drive device with respect to the jack 12 as well as activating the drive device 10. In addition, as shown in Figure 2, at least one of the handle portions 34 and 36 is provided with a switch 38 having manual actuators such as the start button 40 and the stop button 42 protruding from the housing 30 so that they are readily accessible for use by the person. The switch 38 closes an electrical circuit between the power cord 50 and an electric motor 44.

The casing portion 32 of the housing 30 rotatably supports an annular sleeve 60 which is axially retained in position within the housing by tapered bearing rings 62 and 64 secured to opposite sides of the housing 30. The sleeve 60 is coaxially secured to a tubular socket 66. The inner peripheral wall of the tubular socket 66 is shaped to conform with the shape of the end 16 of the rotatable rod member 18 in the jack 12 so that the end 16 can be slidably received in the end of the tubular socket 66. The annular bearing rings 62 and 64 define an enlarged aperture on each side of the housing 30 through which the axial ends of the tubular socket 66 are exposed exteriorly of the housing 30. Thus, both ends of the tubular socket are readily engageable with the end 16 of the rotatable member 18.

In addition, as shown diagrammatically in Figure 3 at 70, a transmission connects the electric motor 44 to the sleeve 60. Preferably, as best shown in Figure 2, the sleeve 60 includes a peripheral, gear-toothed ring 72 adapted to engate with a smaller diameter pinion gear (not shown) secured to the rotating shaft of an electric motor. Such gearing provides a reduction in the speed of rotation of the tubular sleeve 60 while at the same time enhancing the torque being applied to the tubular socket 66 and available for use in rotating the rotatable rod member 18. Although various other speed reducing and torque enhancement transmission devices can also be used within the scope of the present invention, the preferred embodiment of the present invention constitutes a simple, lightweight and inexpensive structure for the jack drive device of the present invention.

Referring again to Figure 1, the power cord 50 which extends from the switch 38 has a plug 80 at its other end. The plug 80 includes electrical contact elements 82 and 84 electrically insulated from each other by the cylindrical body of plug 80 which provide electrical contact with electrical contact elements (not shown) in a conventional cigar lighter socket 86 in the dashboard 88 of a motor vehicle.

In the preferred embodiment, as will be understood, both ends of the tubular socket 66 are exposed exteriorly of the housing 30 so that the drive mechanism is simplified. For example, a uni-directional electric motor can be controlled by the on switch 40 and the off switch 42. Nevertheless, it will be appreciated that the rotatable rod member 18 can be rotated both clockwise and counterclockwise by merely reversing the position of the jack drive device 10 as shown in Figure 1. Although it is not necessary to use a reversible motor when both ends of the tubular socket are exposed through the housing 30, it is to be understood that such motors may also be used with the jack drive device of the present invention if desired. Nevertheless, it can be seen that the switching mechanism required for such a motor is more complex than the switch 38 provided in the preferred embodiment of the present invention.

Referring now to Figure 4, a modification of the jack drive device of the present invention is shown generally indicated by a reference numeral 100. The jack drive device 100 includes an elongate housing 110 having an enlarged casing portion 112 at one end of the housing. The casing portion 112 rotatably supports a tubular socket 114 by an arrangement substantially similar to the means for rotating the tubular socket 66 in the embodiment shown in Figures 1-3, and similar motor driving means is contained in the housing for rotatably driving the sleeve 114. However, a switch 116 is located at the opposite end of the housing 110. In addition, the housing 110 is substantially longer than the maxinum height of the load platform 26 on the jack 12 so that the housing 110 forms a handle which can easily be grasped while the person operating the device stands erect with his foot pressed on the base platform 28. Moreover, the base 28 includes laterally expanded end portions 29 adapted to receive a person's foot for pressing the base against the ground. Thus, the device 100 can easily be grasped and positioned so that the tubular socket receives the end 16 of the rotatable member 18 of the scissors jack while the jack is maintained in position by the pressure of the foot of the person who is operating the jack.

Referring now to Figures 5-10, a further modified jack drive device 120 according to the present invention is secured to a scissors jack 12. The drive device 120 includes a cylindrical housing 122 encasing both a motor and a transmission for rotatably driving a socket adapted to receive the end of the rotatable member 18. A switch 124 electrically connects the motor within the housing to the power cord 50 leading to a power source such as a cigarette lighter socket in the motor vehicle.

As best shown in Figure 6, the housing 122 comprises a motor encasing portion 126 and a transmission enclosing portion 128. The tubular socket 66 extends outwardly from, or is exposed exteriorly of, the transmission housing portion 128 so as to be able to receive the end of the rotatable member therein. In addition, a pair of arms 130 extend outwardly from the end of the housing portion 128 adjacent the tubular socket 66. As best shown in Figure 8, the arms 130 include registering apertures or slots 132 adapted to receive an enlarged diameter stem portion of a locking bolt 134 fastened to the nut block 136 of the jack (see Figure 7). The arms 130 can be formed on a bracket 138 as shown in Figure 5, or can be integrally constructed with the housing 122 as shown in Figure

8. Thus, it will be understood that when the tubular socket is slid over the end of the rotatable member 18 and the locking bolts 134 have been received in the slots 132, the drive device 120 is stably maintained in position for operating the jack.

Referring now to Figures 8-10, the transmission means of the device 120 is shown comprising a plurality of gears which provide speed reduction as well as mechanical advantage to the rotation of the tubular socket 66. As best shown in Figures 8 and 9, a pinion gear 140 directly driven by a motor shaft is engaged with a plurality of axially aligned driven gears 142. Driven gears 142 are in turn engaged with a peripheral gear rack 146 formed on the inner periphery of the housing 122. A pivot pin 150 is slidably inserted through the centre of each gear 142 and is secured to a radially extending flange of annular gear 152. An axially elongated sleeve portion 154 of the gear 152 includes external gear teeth adapted to engage a plurality of driven gears 156. The driven gears 156 are in turn engaged with the gear rack 158 on the inner periphery of the housing 122. A pivot pin 160 is slidably received through a central aperture in each driven gear 156 and is secured to a radially extending flange in an annular gear 162. An axially extending portion 164 on the annular gear 162 includes peripheral gear teeth adapted to engage a plurality of driven gears 166. The driven gears 166 are in turn engaged with the peripheral, axially extending gear rack 158. A pivot pin 170 slidably received through the bore in each driven gear 166 is secured to the radially extending flange of the sleeve 168 peripherally secured to or integrally formed with the socket 66. Since the structural relationship between the gears 152, 156 and gear rack 158 is substantially the same as the structural arrangements between gears 162, 166 and gear rack 158, only the structural relationship of the latter gears are shown in Figure 10 for the sake of clarity and brevity.

Nevertheless, it will be understood that as the pinion gear 140 rotates, the driven gears 142 are forced to travel around the ring 146, whereby pivot pins 150 rotate in a circle about the centreline of the housing 122. Such rotation of the pins causes like rotation of the annular gear 152 which in turn causes the driven gear 156 to rotate and travel along the gear rack 158. Similarly, the pivot pins 160 are driven in a circle about the centreline of the housing and cause a like rotation in the annular gear 162. Rotation of the gear 162 causes rotation of the driven gears 166 along the gear rack 158. This in turn causes rotation of the sleeve 168 so that the tubular socket 66 is rotated at a reduced speed as compared to the motor shaft and with sufficient torque to operate the jack and lift a vehicle above ground.

Thus, the present invention provides a lightweight, portable jack drive device for use with a jack having a rotatable, jack actuating member, as well as simple, compact combination of tools which is easily stored, transported, and operated. Moreover, while the rotary drive means of the drive device can provide a mechanical advantage to the socket, the housing is easily restrained against rotation either by manually gripping the elongate handles of the housing, which are radially spaced a substantial distance from the axis of rotation of the socket, or by mechanical inter-connection of the drive device to the jack. Furthermore, when both of the ends of the tubular socket are exposed, either can be positioned readily to receive the end of the rotatable actuating member on the jack to permit raising or lowering of the load support as desired. Moreover, the drive device is conveniently powered by the existing electrical power supply system of the motor vehicle to be lifted without modification thereto.

CLAIMS

1. A drive device for use with a jack for raising a motor vehicle from the ground, the jack having a rotatable member for actuation thereof, comprising a housing, a tubular socket adapted slidably to receive an end of the said rotatable member of the jack; means for rotatably mounting the socket in the housing so that at least one end of the socket is exposed exteriorly of the housing, an electric motor for rotatably driving the socket, and electrical conductor means for electrically connecting the electric motor to an electrical power supply of the vehicle.

2. A drive device as claimed in Claim 1 for use with a vehicle which has a conventional, vehicle mounted, cigar lighter, in which the electrical conductor means includes a plug adapted to be received in an electrical socket of the cigar lighter.

3. A drive device as claimed in Claim 1 or Claim 2, in which the housing includes at least one elongate housing portion constituting a handle of the device.

4. A drive device as claimed in any preceding Claim, in which the housing includes a central housing portion adapted to receive the said tubular socket, and a pair of elongate housing portions extending outwardly from opposite sides of the said tubular socket.

5. A drive device as claimed in any preceding Claim, in which the said tubular socket extends across the housing so that both axial ends of the tubular socket are exposed at opposite sides of the housing, so that the direction in which the rotatable member is turned is determined by which axial end of the tubular socket is engaged by the rotatable member.

6. A drive device as claimed in any preceding Claim, in which there are further provided means for manually, selectively actuating the said electric motor mounted in the housing.

7. A drive device as claimed in Claim 3, and any of Claims 4 to 6 when dependent thereon, in which the said housing includes a first end portion adapted to receive the said socket.

8. A drive device as claimed in Claim 7, in which the end opposite the said first end portion includes means for manually selectively actuating the electric motor.

9. A drive device as claimed in Claim 1 or Claim

2, and further comprising means for positioning the said housing on a jack and resisting rotation of the housing when the socket is turned with respect thereto by the said electric motor.

10. A drive device as claimed in Claim 9, in which the said means for resisting rotation comprises at least one handle secured to the housing and extending generally radially outwardly of the said tubular socket.

11. A drive device as claimed in Claim 9, in which the said means for resisting rotation comprises means for engaging the housing non-rotatably with respect to a jack.

12. A combination comprising a scissors jack having a rotatable member forming means for raising and lowering the jack, and a portable jack drive device comprising, a housing having a central housing portion, coupling means for engaging and rotatably driving the said rotatable member of the jack, the said coupling means being located within the said central housing portion and comprising a tubular socket having at least one end exposed exteriorly of the housing and adapted to receive the said rotatable member of the jack, and means for selectively actuating the coupling means.

13. A combination as claimed in Claim 12, in which the said coupling means includes an annular sleeve coaxially secured to said tubular socket, and means for rotatably driving the said sleeve.

14. A combination as claimed in Claim 13, in which the said means for rotatably driving the sleeve comprise an electric motor mounted in the housing, and transmission means coupling the electric motor to the sleeve.

15. A combination as claimed in Claim 14, in which the outer periphery of the sleeve includes a ring of gear teeth and the said transmission means include a gear adapted to engage the said ring of gear teeth.

16. A combination as claimed in Claim 12, in which the said means for selectively actuating the coupling means comprises means for manually activating and deactivating the said coupling means, mounted on the exterior of the said housing.

17. A combination as claimed in Claim 16, in which the manual activating means is secured on a handle portion of the said housing.

18. A combination as claimed in any of Claims 12 to 17, in which both axial ends of the said tubular socket are exposed at the exterior of the housing such that the direction of rotation of the rotatable member can be selected by determining which axial end of the socket is positioned to receive the said rotatable member of the jack.

19. A combination as claimed in any of Claims 12 to 18, in which the jack includes a base having a flat extended portion which can be engaged by the foot of a user whereby to press the base against the ground.

20. A drive device for a jack, substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

21. A combination of a jack and a drive device as claimed in any of Claims 1 to 11 and 20, and substantially as hereinbefore described with reference to, and as shown in, the accompanying drawings.

Printed in the UK for HMSO, D8818935, 4/85, 7102.
Published by The Patent Office, 25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.