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ENGINE AUXILIARY EQUIPMENT HANDLING JACK ASSEMBLY

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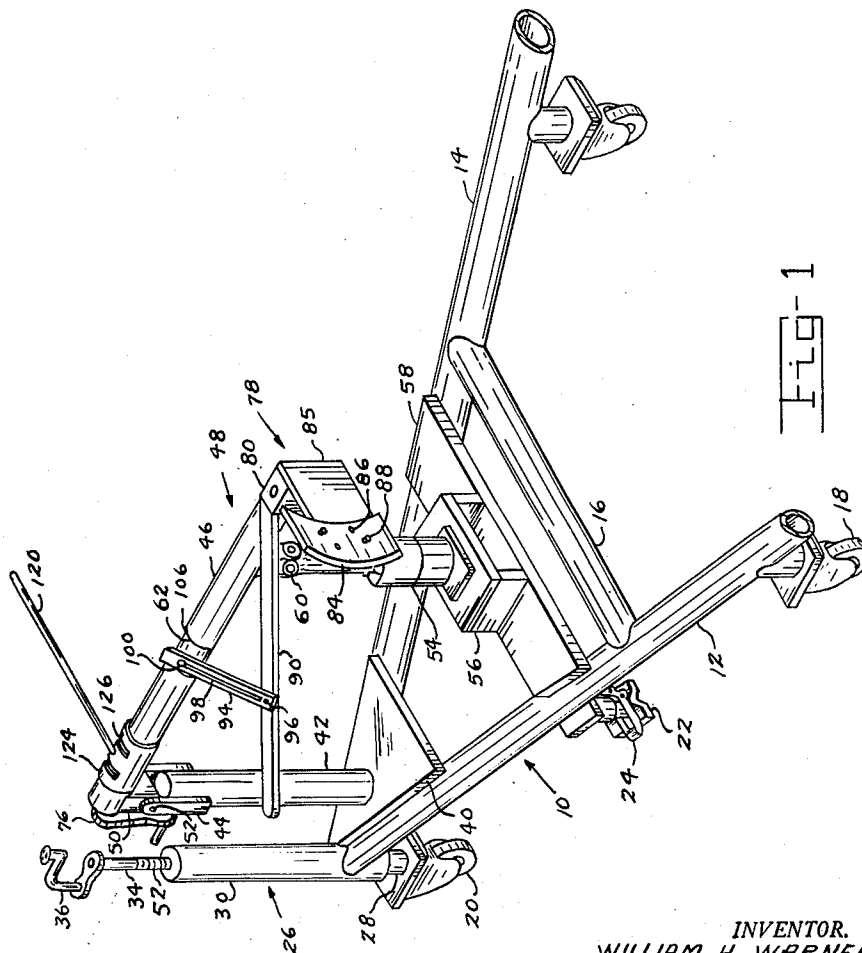
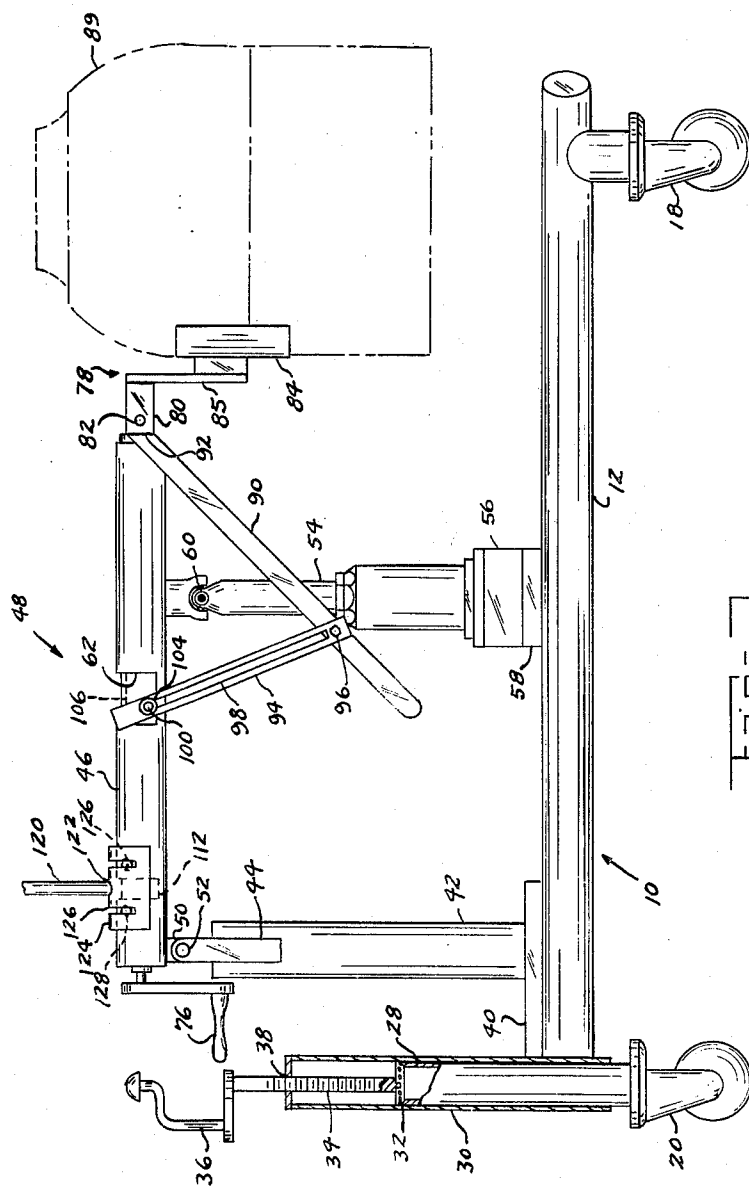


FIG-1

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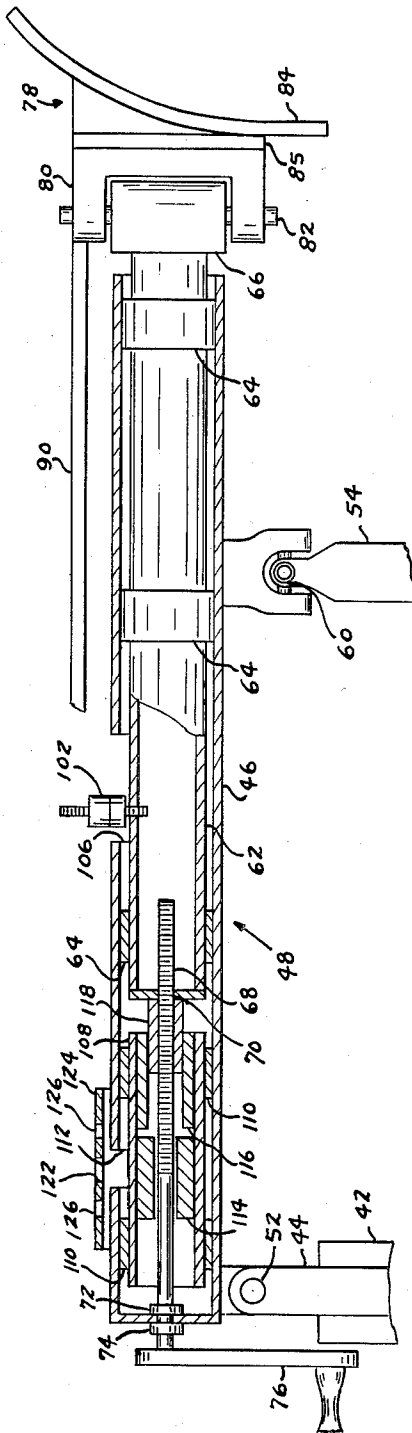
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5-10

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ENGINE AUXILIARY EQUIPMENT HANDLING JACK ASSEMBLY

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3 Claims. (Cl. 214—1)

(Granted under Title 35, U. S. Code (1952), sec. 266)

The invention described herein may be manufactured and used by or for the United States Government for governmental purposes without payment to me of any royalty thereon.

This invention relates to apparatus for use in handling aircraft engine auxiliary equipment, and more particularly, to a jack apparatus of the type employed for handling such equipment during installation or mounting thereof on engine nacelles.

At present, heavy engine auxiliary equipment, such as turbosuperchargers frequently weighing several hundred pounds, require manhandling with the assistance of chain hoists and crew chief stands or hydraulic jacks during installation or mounting on engine nacelles of modern large aircraft. Such operation is usually time consuming, fatiguing, requiring the participation of several men, and considerably delaying maintenance or servicing of aircraft, an operation of extreme importance, especially, in military airbases.

The main purpose of the present invention is to provide a novel jack assembly for handling engine component parts or accessories, such as a turbosupercharger, so as to enable one man to handle and install a turbosupercharger in an engine nacelle in a relatively short time.

It is further the purpose of the present invention to provide a jack apparatus in the form of a workstand arranged to support, raise or lower, turn from a vertical to a horizontal position, and move fore and aft an engine component part, such as a turbosupercharger, during installations thereof in an engine nacelle.

The jack apparatus constructed in accordance with the present invention is also characterized by its simple construction of material readily available, by being very easy to operate, and by easily being dismantled for purposes of shipping.

The jack apparatus of the present invention is, further, particularly useful for installing turbosuperchargers in engine nacelles of the type requiring a vertical installation characteristic of certain military aircraft.

According to the present invention the jack apparatus for handling engine auxiliary equipment during installation thereof consists of a mobile base frame provided with tilting means for raising one end thereof, and upon which frame, a work supporting extensible strut is adjustably mounted for raising or lowering and for holding the work in various level positions. Also, the extensible strut is provided with means for longitudinal adjustment thereof and with means for turning the work from a vertical to a horizontal position.

These and other features of the present invention are described in detail below in connection with the accompanying drawings wherein like numerals designate like parts throughout the several views, and in which,

Figure 1 is a perspective view of the engine auxiliary equipment handling jack apparatus embodying the present invention;

Figure 2 is a side elevation, partly in section, of the

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jack apparatus of Figure 1 but with the work adapter positioned in a vertical position; and

Figure 3 is a fragmentary detail in section of the extensible strut of the device of Figure 1.

Referring now in detail to the drawings, the embodiment of the jack assembly of the present invention arranged for handling turbosuperchargers or other such engine equipment during installation thereof in engine nacelles illustrated in the drawings comprises a base frame 10 formed of lengths of tubing 12 and 14 arranged in a horizontally extending triangular or V-shape, and of a cross bracing 16 welded thereto. The base frame 10 may be movably supported on a pair of front caster wheels 18 and a rear caster wheel 20, which are attached in a suitable manner at the ends of the tubing sections 12 and 14 so that the jack assembly may be shifted bodily in any direction over the floor or any other supporting surface. The frame 10 may also be provided with the usual floor engaging shoe 22, which may be raised or lowered to engage the floor by a foot operated pedal 24 as shown in Figure 1.

Attached to the closely located ends of the tubing sections 12 and 14 at the rear end of the frame 10, as by welding, is a pedestal jack 26 formed of an inner cylindrical part 28 slidably inserted in an outer tubular part 30, which outer tubular part 30 is welded to the tubing sections 12 and 14. The inner cylindrical part 28 is supported on the rear caster wheel 20 suitably connected thereto, and is provided, at its upper end, with a ball bearing 32 press fitted therein. An externally threaded jack screw 34 provided with a handle 36 and threadedly engaging the outer tubular part 30 as at 38 is fitted at its lower end into the bearing 32, whereby rotation of the jack screw 34 by the handle 36 raises and lowers the outer tubular part 30 and therefore the rear end of the frame 10, thereby tilting the base frame 10 for a purpose as hereinafter described.

A horizontally extending plate 40 welded to the frame tubing sections 12 and 14 fixedly supports an upstanding strut 42 provided with ears 44 at its upper end. The upstanding strut 42 in turn pivotally supports a tubular casing 46 of a linear adjustment extensible strut 48 extending substantially longitudinally of the frame 10. The casing 46 is pivotally supported on the upstanding strut 42 by an ear 50 extending between the ears 44 of the upstanding strut 42, and which ear 50 is pivotally connected to the ears 44 by a pivot pin 52, whereby the extensible strut 48 may be raised or lowered in a vertical plane.

Extremely limited pivotal movement of the extensible strut 48 about the pivot pin 52 in the vertical plane may be obtained by an upstanding hydraulic jack 54 fixedly supported on a platform 56 welded to a plate 58 extending transversely of the frame 10, and which plate 58 is welded to the frame tubing sections 12 and 14. The hydraulic jack 54 is connected to the tubular casing 46 by a universal joint 60 as shown in Figures 1-3.

Supported for reciprocable and rotary movements in the tubular casing 46 of the extensible strut 48, an inner cylindrical member 62 is provided with bushings 64 on the outer surface thereof and with an ear 66 at its front end. Longitudinal or linear adjustment of the inner strut member 62 may be obtained by an externally threaded jack screw 68 extending through the tubular casing 46 and threadedly engaging the inner strut member 62 as at 70. The jack screw 68 is rotatably supported in the tubular casing 46 by an inner bushing 72 attached to the casing 46 at the end side thereof and by an outer bushing 74 attached to the jack screw 68. Rotation of the jack screw 68 by a handle 76 will cause longitudinal movement of the inner strut member 62 so as to extend or retract in the tubular casing 46 as the case may be.

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The inner strut member 62 of the extensible strut 48 is further arranged to pivotally support at its front end a work supporting adapter 78 having a pair of ears 80 between which extends the ear 66 at the front end of the inner strut member 62. A pivot pin 82 extending through the ears 66 and 80 provides pivotal movement of the work supporting adapter 78 in a horizontal plane. The adapter 78 is also provided with a curved plate 84 attached, as by welding, to a flat plate 85 extending substantially at right angles to the ears 80. The curved plate 84 may be formed with apertures 86 through which extend bolts 88 for attaching thereto a turbosupercharger, as shown at 89, or any other object arranged to be handled by the jack apparatus.

The work supporting adapter 78 is further provided with a torque arm 90 welded thereto as at 92, and which torque lever 90 extending at an angle therefrom is pivotally connected to a torque lever 94 by a pivot pin 96. The torque lever 94 is provided with a longitudinally extending slot 98 through which extends a pin 100 having an upper threaded portion, which pin 100 is threadedly connected to the inner strut cylindrical member 62. A spacer 102 and a nut 104 retain the pin 100 in the slot 98 of the torque lever 94.

In order for the pin 100 to extend above the tubular casing 46 so as to engage the slot 98 of the torque lever 94, the casing 46 is formed with a cutaway portion 106 as best shown in Figure 2. The cutaway portion 106 extending for about 172° on the circumference of the tubular casing 46, as shown in Figure 2, permits rotation of the inner tubular member 62 between the limits defined by the size of the cutaway portion 106, so that the work supporting adapter 78 may be rotated from a horizontal position as shown in Figure 1 to a vertical position as shown in Figure 2. This function of the jack apparatus permits turning of the work piece supported thereon, especially, necessary for a vertical installation of the turbosuperchargers. By this arrangement, the torque means 90, 94 not only takes up the torque force during rotation of the inner tubular member 62 and, therefore, of the work supporting adapter 78 but, also, controls the pivoting of the work supporting adapter 78 on the pin 82 at the front end of the inner tubular member 62.

Rotary adjustment of the inner strut member 62 may be obtained by an inner tubular part 108 provided with a pair of bushings 110 on the outer surface thereof, which bushings 110 rotatably support the inner tubular strut part 108 in the casing 46 at the rear end thereof and adjacent a second cutaway portion 112 on the casing 46 as best shown in Figure 2. The inner strut part 108 is further provided with an inner bushing 114 press fitted therein and with a female spline fitting 116 engaged by a tubular male spline fitting 118 rigidly connected to and extending rearwardly of the inner cylindrical short member 62. The jack screw 68 is arranged to extend through the inner tubular part 108 and the male spline fitting 118, to engage the inner strut member 62, previously described above, as shown in Figure 3.

The inner tubular strut part 108 is rotatably operated by a handle rod 120 attached thereto and extending through an opening 122 in a semitubular casing sleeve 124 slidably mounted on the tubular casing 46. The sleeve 124 is further formed with a pair of slots 126 through which extend a pair of bolts 128 screwed on the casing 46, as shown in Figure 2, which bolts 128 are arranged to retain the sleeve 124 for slidable movement on the casing 46.

As shown in Figure 2, the second cutaway portion 112 extending for about 162° on the circumference of the tubular casing 46 and on the opposite side of that of the first cutaway portion 106 permits the handle rod 120 to travel from a horizontal position, as shown in Figure 1, to a vertical position, as shown in Figure 2, thereby rotating the inner tubular strut part 108 that causes

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rotation of the inner strut member 62 and, therefore, rotary adjustment of the work supporting adapter 78 from a horizontal position to a vertical position and vice versa as desired.

As it can be seen from the above description of the apparatus of the present invention, the work supporting adapter 78 may be rotated in a horizontal plane about the pivot 82 by the arm 90, or from a horizontal position to a vertical position by handle 120, or may be extended or retracted by the jack screw 68 operated by the handle 76, and may also be raised or lowered by the hydraulic jack 54. In addition, the adapter 78 may be adjusted so as to carry a work piece in a level plane and at any elevated position in the vertical plane by adjustment of the hydraulic jack 54 and the pedestal jack 26. For example, if the work adapter 78 is raised from the position shown in Figure 1 by operation of the hydraulic jack 54, then by raising the base frame 10 at the rear end thereof through the pedestal jack 26, the adapter 78 may be adjusted to carry the work piece in a level plane at that elevated position. Also the adapter 78 may be raised or lowered by operation of the pedestal jack 26 only or with the hydraulic jack 54 as it may be desired.

The present invention has been described in detail above for purposes of illustration only and is not intended to be limited by this description or otherwise except as defined in the appended claims.

I claim:

1. A jack stand for installing engine accessories in engine nacelles comprising a mobile base frame, a pedestal jack adjustably supporting said frame at an end thereof, an upstanding stationary strut on said frame, a tubular casing pivotally mounted at an end thereof on said upstanding strut, an upstanding jack on said frame pivotally connected to said tubular casing for adjustable supporting the same, a reciprocable member in said casing, a work supporter pivotally connected to said reciprocable member at a front end thereof, torque levers adjustably connecting said reciprocable member to said work supporter, a linear adjustment screw for said reciprocable member, a rotary adjustment member in said casing, said rotary adjustment member connected to said reciprocable member for transmitting rotary motion thereto, and handle means for manually operating said rotary adjustment member.

2. An installation jack assembly comprising a mobile base frame, jack means adjustably supporting said frame at an end thereof, upright stationary strut means on said frame pivotally supporting a casing extending longitudinally of said frame, jack means on said frame pivotally supporting said casing for vertical adjustment thereof to different levels, a reciprocable member in said casing for linear movement therein, linear adjustment means for said reciprocable member, work supporting means pivotally connected to said reciprocable member, torque means adjustably connecting said work supporting means to said reciprocable member for supporting said work supporting means in various level positions when said casing is raised or lowered by said jack means, rotary adjustment means in said casing operatively connected to said reciprocable member for rotary movement thereof, and actuating means for operating said rotary adjustment means, whereby said work supporting means may be raised, lowered to different level positions by said jack means, rotatably adjusted by said actuating means, and moved fore and aft by said linear adjustment means.

3. An installation jack assembly comprising a mobile base frame of triangular form, a pedestal jack connected to and adjustably supporting said frame at the rear end thereof, a caster wheel at each end of said frame, an upstanding stationary strut on said frame pivotally supporting a tubular casing extending longitudinally of said base frame, an upstanding jack on said base frame pivotally connected to said tubular casing for adjustment of

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said casing to different elevations in a vertical plane, a linearly and rotatably adjustable member in said casing, working supporting means connected to the front end of said adjustable member for pivotal movement thereon, adjustable torque lever means connected to said adjustable member and said work supporting means for supporting said work supporting means in various level positions when said work supporting means is disposed at different elevations, a linear adjustment screw for said adjustable member for operation thereof, a rotatable tubular member in said casing operatively connected to

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said adjustable member for transmitting rotary motion thereto, and manual means for operating said rotary tubular member.

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