

[54] PANTOGRAPH-TYPE JACK

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[22] Filed: June 28, 1973

[21] Appl. No.: 374,579

[52] U.S. Cl. 254/126
[51] Int. Cl. B66f 3/12
[58] Field of Search..... 254/122, 126

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[57]

ABSTRACT

A pantograph-type jack comprising a plurality of upper jack arm assemblies each of which includes a pair of opposite jack arms having inner toothed ends pivoted to a movable load support member and in engagement with each other. The jack has a plurality of lower jack arm assemblies, each of which includes a pair of opposite jack arms having the inner toothed ends pivoted to a stationary base member and in engagement with each other. Spaced movable support blocks are provided for pivotally supporting the outer ends of the jack arms of the upper and lower jack arm assemblies, with one of said support blocks having a center coarsely threaded bore threadedly engaging a first rod while the other support block has a center plain bore which supports a second rod. A sleeve having one end fixedly attached to the adjacent end of the first rod is provided with a finely threaded inner surface that is threadedly engaged by the second rod, which, in turn, is connected to a receiving member 14 for actuating the jack.

10 Claims, 5 Drawing Figures

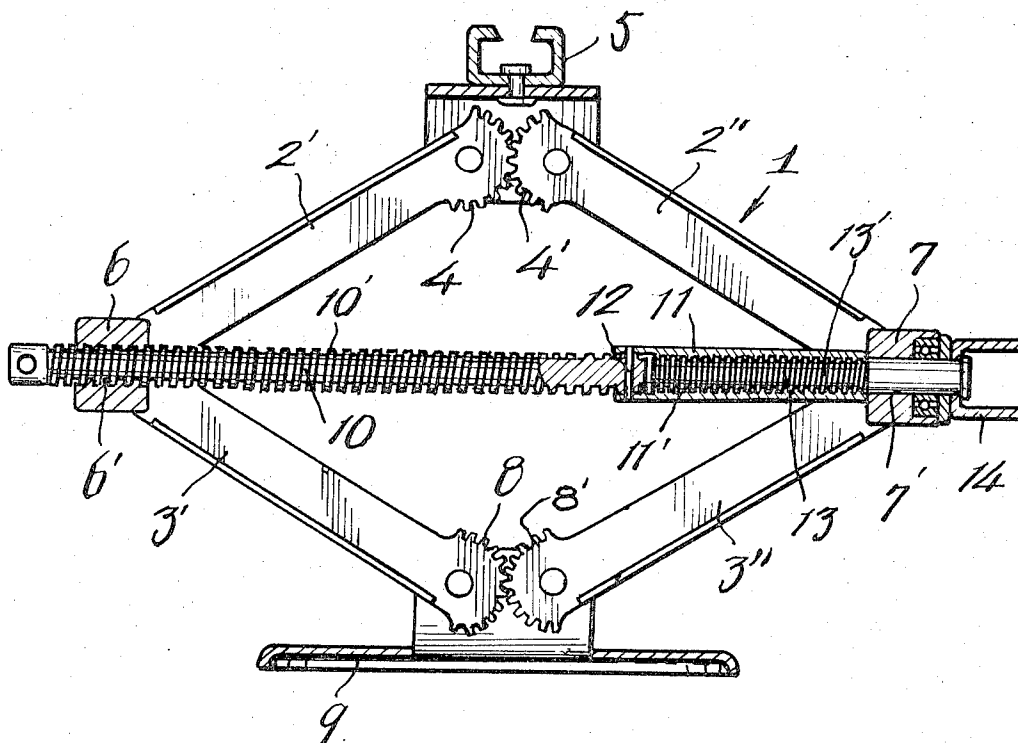


FIG. 1

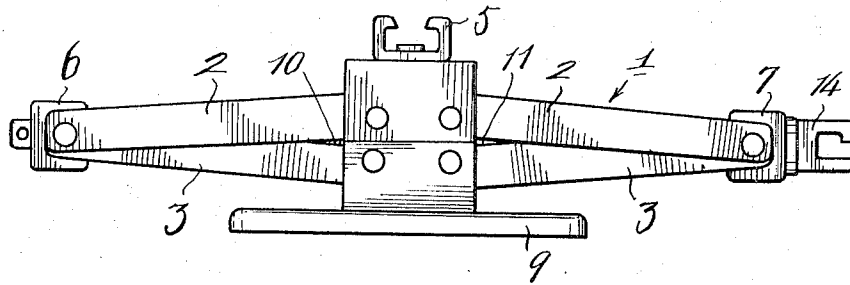


FIG. 2

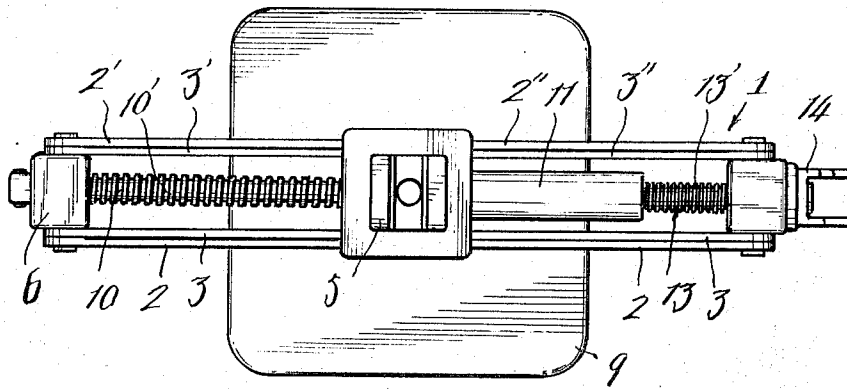


FIG. 3

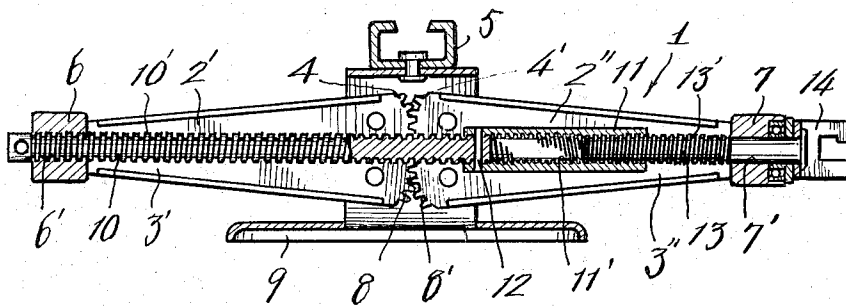


FIG. 4

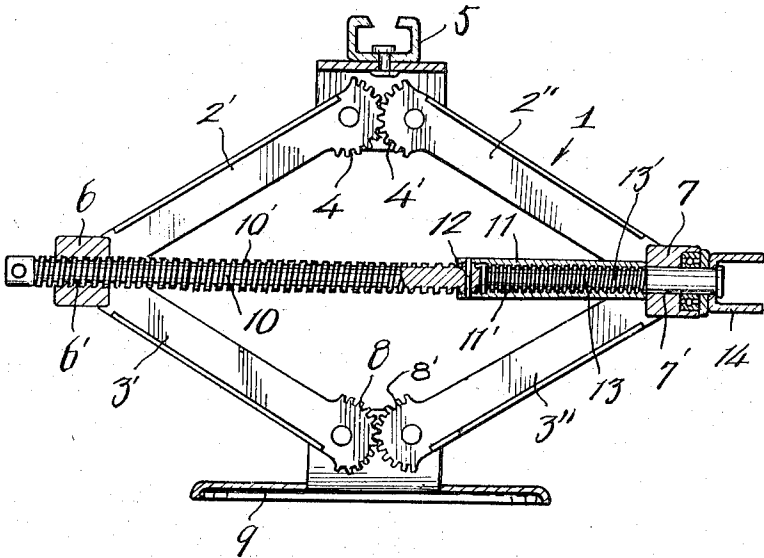
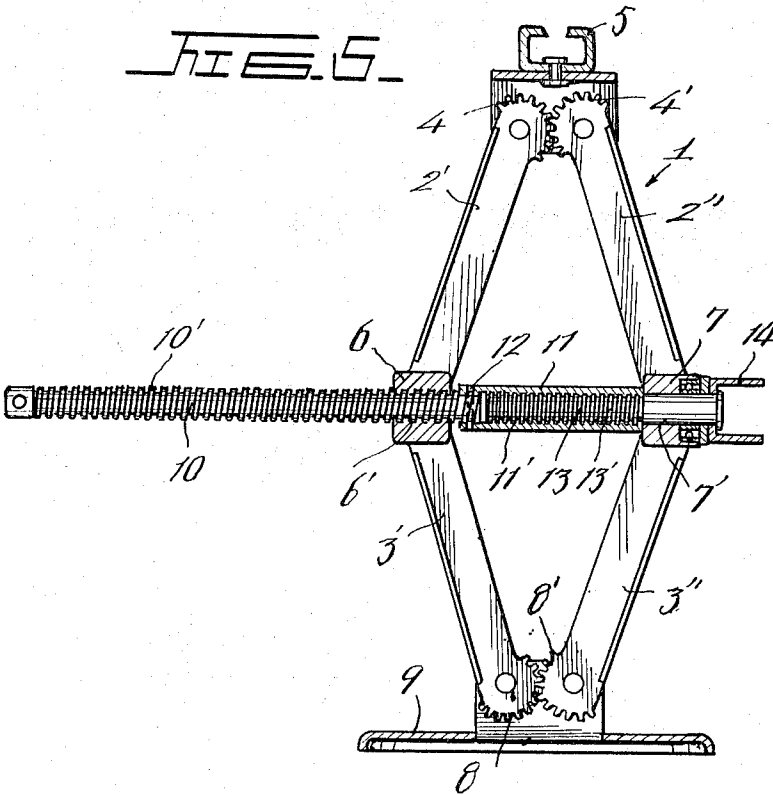


FIG. 5



PANTOGRAPH-TYPE JACK

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to a pantograph-type jack and, more particularly, to a pantograph-type jack comprising a plurality of pivoted upper jack arm assemblies and a plurality of pivoted lower jack arm assemblies.

2. Description of the Prior Art

Heretofore, a great variety of pantograph-type jacks have been proposed and employed and it is known that the pantograph-type jacks are characterized in that although such jacks are simple in construction, light in weight, small in volume and can be simply manufactured, they have a relatively great raising force. However, because of the construction of the prior art pantograph-type jacks, they not only require a relatively great amount of energy for any load to be raised in the initial stage of a particular load raising operation, but the parts of the jacks are easily subjected to damage in the manipulation of them which may lead to injury to the operator.

SUMMARY OF THE INVENTION

The present invention which will be described subsequently in greater detail, comprises a pantograph-type jack having a plurality of upper outer jack arm assemblies each of which includes a pair of opposite arms having inner toothed ends pivoted to a movable load support member and in engagement with each other; a plurality of lower inner jack arm assemblies each of which includes a pair of opposite arms having inner ends pivoted to a stationary base member and in engagement with each other; spaced movable support blocks for pivotally supporting the outer ends of the arms of the upper outer and lower inner jack arm assemblies, one of the support blocks having a center coarsely threaded bore while the other support block has a center plain bore; a first operation rod having a coarsely threaded outer surface in threaded engagement in the center coarsely threaded bore of the one support block; a sleeve having one end for fixedly receiving the adjacent end of the first operation rod while the other end thereof has a finely threaded inner surface; threadedly engaging a second operation rod.

It is therefore a principal object of the present invention to provide a novel and improved pantograph-type jack which can effectively eliminate the aforementioned disadvantages inherent in the prior art pantograph-type jacks.

Another object of the present invention is to provide a novel and improved pantograph-type jack which operates in two successive stages by the provision of threaded operation rods having different pitches.

Another object of the present invention is to provide a novel and improved pantograph-type jack which can be manipulated smoothly and safely.

Another object of the present invention is to provide a novel and improved pantograph-type jack which can provide a great raising force with a relatively small amount of energy.

Another object of the present invention is to provide a pantograph-type jack which is simple in construction and manipulation.

Another object of the present invention is to provide a novel and improved pantograph-type jack which can be manufactured inexpensively.

The above and other objects and attendant advantages of the present invention will be more readily apparent to those skilled in the art from a reading of the following detailed description in conjunction with the accompanying drawings which show a preferred embodiment of the invention for illustration purpose only, but not for limiting the scope of the invention in any way.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings show one preferred form of pantograph-type jack constructed in accordance with the present invention, and in which;

FIG. 1 is a side elevational view of a pantograph-type jack in its inoperative or lowered position;

FIG. 2 is a top plan view of the jack;

FIG. 3 is a vertically sectional view in side elevation of the jack in the position as shown in FIG. 1;

FIG. 4 is a vertically sectional view in side elevation of the jack showing the jack in a partially raised position; and

FIG. 5 is a vertically sectional view in side elevation of the jack showing the jack in its fully raised position.

DESCRIPTION OF THE PREFERRED EMBODIMENT

The pantograph-type jack of the present invention generally comprises a jack structure 1 having four jack arm assemblies including a first jack arm assembly consisting of two opposite arms 2 and 2'; a second jack arm assembly consisting of two opposite arms 2' and 2''; a third jack arm assembly consisting of two opposite arms 3 and 3'; and a fourth jack arm assembly consisting of two opposite arms 3' and 3''. As can best be seen in FIGS. 1, 2 and 3, all four jack arm assemblies are parallel to each other with the third jack arm assembly 3 and 3' being disposed below and inwardly of the first jack arm assembly 2 and 2', while, similarly, the fourth jack arm assembly 3' and 3'' is disposed below and inwardly of the second jack arm assembly 2' and 2''. Since the second jack arm assembly 2' and 2'' is identical to the first jack arm assembly 2 and 2' in both construction and arrangement, only the second jack arm assembly 2' and 2'' will be described in detail with the understanding that the description of the second jack arm assembly 2' and 2'' is equally applicable to the description of the first jack arm assembly 2 and 2'. Similarly, since the fourth jack arm assembly 3' and 3'' is also identical to the third jack arm assembly 3 and 3' in both construction and arrangement, only the fourth jack arm assembly 3' and 3'' will be described in detail, with the understanding that the description of the fourth jack arm assembly 3' and 3'' is equally applicable to the description of the third jack arm assembly 3 and 3'. The inner ends of the jack arms 2' and 2'' of the second jack arm assembly are formed with a toothed sectors 4 and 4', respectively, and the toothed sectors 4 and 4' have the same pitch and are always in engagement with each other to normally define a large angle (the arms 2' and 2'' define a maximum angle in the position shown in FIGS. 1 and 3).

The inner ends of arms 2' and 2'' are pivoted to a movable load support member 5 while the outer ends of the arms 2' and 2'' are pivoted to the outer sides of

movable support blocks 6 and 7, respectively. The support block 6 has a center coarsely threaded through bore 6' and the support block 7 has a center plain through bore 7' for a purpose to be described hereinafter. Similarly, the inner ends of the jack arms 3' and 3'' of the fourth jack arm assembly are formed with a toothed sector 8 and 8', respectively, and are always in engagement with each other to normally define a large angle which is substantially the same measure as that defined by the arms 2' and 2'' in the position of the jack as shown in FIGS. 1 and 2, but has the opposite direction to that of the angle by the arms 2' and 2''. The inner ends of the jack arms 3' and 3'' are pivoted to a stationary base member 9 while the outer ends of the arms 3' and 3'' are pivoted to the movable support blocks 6 and 7, respectively, by means of pins (not shown) which also pivotally support the outer ends of the arms 2' and 2'' of the second jack arm assembly to the support blocks 6 and 7. The opposite jack arms 2 and 2' of the first jack arm assembly are pivoted at their inner ends to the load support member 5 and at their outer ends to the support blocks 6 and 7, respectively, in the same manner as the arms 2' and 2'' of the second jack arm assembly. Similarly, the opposite arms 3 and 3' of the third jack arm assembly are pivoted at their inner ends to the load support member 5 and at their outer ends to the movable support blocks 6 and 7, respectively, in the same manner as the arms 3' and 3'' of the fourth jack arm assembly. A first operation rod 10 having a coarsely threaded outer surface 10' of the same pitch as that of the center threaded bore 6' in the support block 6, is threaded into the center threaded bore 6' to be guided by the support block 6 as the jack is moved upwardly and downwardly. The inner end of the threaded rod 10 is fitted into one end of a large diameter sleeve 11 having a center finely threaded internal bore 11'. A cross pin 12 extends through the adjacent ends of the rod 10 and sleeve 11 to connect the two parts together so that the rod 10 and sleeve 11 rotate together. A second operation rod 13 has the inner end portion provided with fine threads on the outer surface thereof and having the same pitch as the threaded bore 11' in the sleeve 11 while at the outer end portion of the rod 13 the outer surface of the rod 13 is plain.

The plain surface outer end portion of the rod 13 snugly fits and extends through the center plain bore 7' of the support block 7. Although the plain surface outer end portion of the second operation rod 13 is snugly fitted in the support block 7, the rod 13 is allowed to rotate relative to the support block 7. The extreme outer end of the second rod 13 extends beyond the outer end of the support block 7 and has an operation means receiving member 14 integrally secured thereto.

In use, the jack of the invention (it is assumed that the jack is in the position as shown in FIGS. 1 and 3) is positioned below a load to be raised thereby and any suitable conventional operation means (not shown) is received in the operation means receiving member 14. As the operation means is manipulated in the raising direction, the second operation rod 13 rotates relative to the sleeve 11 and support block 7 to inwardly advance into the threaded sleeve 11 until the rod 13 reaches a predetermined inner dead point within the sleeve 11 which stops its relative movement. Subsequently, the first coarsely threaded operation rod 10 initiates its rotation and in consequence, the first and

second operation rods 10 and 13 and the sleeve 11 now rotate as one unit. As the second finely threaded operation rod 13 advances into the threaded sleeve 11 as mentioned hereinabove, the right-hand upper and lower arms of the four jack arm assemblies (as seen in the various figures) are pivoted upwardly and downwardly, respectively, about their pivoted outer ends at the support block 7. This, in turn, pivots the left-hand upper and lower arms of the jack arm assemblies (as seen in the various figures) upwardly and downwardly, respectively, about their outer pivoted ends at the support block 6 as the toothed sectors of all the right-hand arms are in engagement with the corresponding parts of all the left-hand arms. As understood from FIGS. 4 and 5, as the jack is raised, the angle defined by the pair of arms of each jack arm assembly gradually reduces its value, but will not reduce to zero even when the jack is raised to its permitted highest position. The length of the sleeve 11 is so selected that even when the jack is raised to the highest permitted position, the fulcrums or the outer end pivoted points 6 and 7 of the arms do not lie in a vertical line passing through the center of gravity of an article on the load support member 5 to be raised by the jack of the invention. Rather they are located in positions spaced from each other on opposite sides of the vertical line. Therefore, in the initial stage of a particular raising operation, the jack of the present invention requires a relatively small amount of energy as compared to that required by the conventional pantograph-type jacks of a similar capacity. As mentioned hereinabove, the finely threaded second operation rod 13 is initially rotated so as to raise the jack at a relatively slow rate. The conventional pantograph-type jacks have a relatively rapid raising characteristic. Hence, in the jack of the present invention the raising operation can be more smoothly performed as compared with the conventional pantograph-type jacks, without the possibility of breakage or fracture. Furthermore, according to the present invention, the raising function of the jack is accomplished by two threaded operation rods having different pitches. The difference in pitches of the operation rods is selected in accordance with the invention's intended use. The raising operation can be performed in two successive stages. The initial stage being performed easily and slowly by the rotation of the finely threaded second operation rod, and the next or last stage being performed by the unison rotation of the first and second threaded operation rods and the threaded sleeve and therefore. Hence, the overall raising operation can be performed safely and smoothly. Finally, the jack of the present invention is simpler in construction and less expensive in the manufacture than prior art jacks. Thus, it is believed that the present invention will greatly contribute to the art.

It is to be understood that while the above has been indicated as a preferred embodiment, numerous variations or modifications therein may occur to those having skill in this art and what is intended to be covered herein is not only the illustrated form of the invention, but also any and all modified forms thereof as may come within the spirit of the invention or the scope of the present claims.

What is claimed is as follows:

1. A pantograph-type jack comprising a plurality of upper jack arm assemblies each of which comprises a pair of opposite jack arms having oppositely engaged

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inner toothed ends pivoted to a movable support member; a plurality of lower jack arm assemblies each of which includes a pair of opposite jack arms having the opposingly engaged inner toothed ends pivoted to a stationary base member; spaced movable support blocks for pivotally supporting the outer ends of said jack arms of said plurality of upper and lower jack arm assemblies, one of said supporting blocks having a center coarsely threaded bore, the other of said support blocks having a plain bore; a first operation rod having a coarsely threaded outer surface in threaded engagement in said one support block; a sleeve having one end portion for fixedly receiving an adjacent inner end of said first operation rod and an other end portion of said sleeve having a finely threaded inner surface; and a second operation rod having a finely threaded outer surface portion in threaded engagement with said inner threaded surface of the other end portion of the sleeve, said second operation rod further having a plain surface portion received in said plain bore of the other block.

2. The pantograph-type jack defined in claim 1 wherein said plurality of lower jack arm assemblies is disposed below and inwardly of said plurality of upper jack arm assemblies.

3. The pantograph-type jack defined in claim 1 wherein said inner ends of the pair of opposite jack arms in each of the upper and lower jack arm assemblies are in the form of a toothed sector.

4. The pantograph-type jack defined in claim 1 wherein the length of said sleeve is so selected that when said jack is in its permitted highest position, said support blocks are in positions spaced from each other on the opposite sides of a vertical line passing through the center of gravity of a load to be raised.

5. The pantograph-type jack defined in claim 1 wherein the inner one end portion of said second operation rod is threadedly received in said inner threaded surface of the other end portion of the sleeve to be guided therein.

6. The pantograph-type jack defined in claim 1 further comprising a pin, said pin fixedly securing the inner end of said first operation rod within said sleeve

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so that said rod and said sleeve rotate together.

7. The pantograph-type jack defined in claim 1, in which after said second operation rod has reached a predetermined inner dead end within said sleeve, said first and second operation rods and said sleeve can be rotated in unison.

8. The pantograph-type jack defined in claim 1 wherein the other end portion of said second operation rod has the plain outer surface and extends through said center plain bore in the support block, the extreme end of said other end portion of the second rod having an operation means receiving member secured thereto.

9. The pantograph-type jack defined in claim 1 wherein said plurality of upper outer jack arm assemblies comprises two parallel jack arm assemblies and said lower inner jack assemblies comprise two parallel jack arm assemblies.

10. A pantograph-type jack comprising upper opposing arm having adjacent ends pivotably mounted to a movable load support member, said adjacent ends having engaging tooth sections, the opposite ends of said arms being pivotably mounted to spaced support blocks having aligned bores one of which is a threaded bore, the other of which is a plain bore; lower opposing arms having adjacent ends pivotably mounted to a base member, said adjacent ends having engaging tooth sections, the opposite ends of said lower arms being pivotably attached to said spaced support blocks, respectively, a rod member having a coarsely threaded portion engaging said threaded bore, a connecting member carried at one end of said rod member and rotatable therewith, said connecting member having a finely threaded section, a second rod member having one end rotatably mounted in said plain bore and a finely threaded section thereon engaged with said connecting member; said second rod member rotating within said connecting member a predetermined amount without rotating said first rod member, said connecting member and said first rod member being rotatable with said second rod member after said second rod member is rotated beyond said predetermined amount.

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