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(54) IMPROVEMENTS IN OR RELATING TO LOAD TRANSMITTING ASSEMBLIES

(71) We, PAUL ANDERSON INDUSTRIER AB, a Swedish Company of Box 704, S-721 20 Vasteras, Sweden, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of pivotably bearing a first member on a second member by means of an axle, and where the first member is intended to transmit forces between the second member and a third member; the invention relates also to a load transmitting assembly.

It is known to lift or lower heavy loads by utilizing so-called climbing jacks, i.e. jacks movable by steps upwards or downwards along an associated climb rod. The jack, alternatively, may be arranged fixed, and the rod be lifted or lowered by the jack. Jacks of this kind usually comprise an upper yoke and a lower yoke removable from, and approachable to, each other, respectively, by means of hydraulic cylinders provided between the yokes, but also by using screws or other means. By positioning the yokes about a rod or climb rod, and providing them with locking members to temporarily lock the yokes to the rod, such an arrangement can be caused to climb along the rod by alternatingly locking the upper yoke and the lower yoke to the rod. The yoke being locked temporarily to the rod receives in this position the entire load, which thereby is transmitted to the climb rod. The locking members to be utilized for this locking, consequently, must meet high requirements, and they usually are designed either as clamping jaws disposed on said yokes and acting symmetrically on the rod, or as latches mounted pivotally in the yokes and cooperating with shoulders on the climb rod. By arranging the latches in pairs directly in front of each other, a balancing of arising horizontal forces is obtained.

Locking members in the form of clamping jaws cannot be applied to the large-size jacks since recently demanded for handling loads exceeding one hundred tons, nor can the latches supported on an axle at present in use be utilized in connection with jacks of said size, because the entire load to be carried by the jack then must be transmitted from the yokes via the latches and their axles to the climb rod. This would require such an extension of the bearing for the axle, in order to prevent the load per surface unit in the bearing from exceeding a predetermined permissible upper limit, and such a dimension of the axle, that the entire arrangement would assume dimensions which are entirely unrealistic.

According to one aspect of the present invention, there is provided a method of pivotably bearing a first member on a second member by means of an axle, said first member being able to transmit forces between said second member and a third member, said first member being pivotable between an operative and an inoperative position, said method comprising the steps of: providing complementary surfaces on said first member and second member with minimal clearance therebetween when said first member is in an operative position with respect to said third member; and pivotably mounting said first member on said second member by an axle bearing which permits displacement of said first member with respect to said second member upon load engagement in the operative position of said first member such that a load transmitting engagement occurs between said complementary surfaces.

According to another aspect of the present invention, there is provided a load transmitting assembly including a first member pivotably mounted on an axle carried by a second member, said first member being pivotable between an operative and an inoperative position, said first member in the operative position being arranged to transmit forces between said first member and a third

member; wherein said first member has a surface portion which, when in said operative position, has minimal clearance from a complementary surface portion of said second member, said assembly including means for mounting said first member on said second member through said axle such that upon load engagement with said first member in said operative position, said first member is displaceable through a distance to effect load transmitting engagement between said complementary surface portions.

When applying the invention to climbing jacks with latches, the latches are mounted so that there is only a small clearance between a rear cylindrical surface of the latches and a complementary surface of the corresponding yoke, and so that the latches upon load engagement with the climb rod are so displaced as to establish load transmitting engagement also between said surfaces.

One way of achieving this is to design the axle so weak such that, upon loading of the latch, the axle resiliently yields through a distance sufficient to bring about said load transmitting engagement. The latch, alternatively, may be provided with a through bore for the axle, which bore has a greater diameter than the axle, and/or the axle be supported in oversized bores in associated holders.

In order to obtain, in spite thereof, a satisfactory guilding of the latches, an elastic bushing may be provided about the axle in said bores. When the latch is being subjected to load, the elastic bushing is compressed until load transmitting contact is established between the surface of the latch and the complementary surface in the yoke. The axle, therefore, need take up only the force required for the compressing of the elastic bushing. In order to facilitate the rotation of the latch, said bushing preferably is enclosed by a sleeve of anti-friction metal.

The invention will now be described by way of example with reference to the figures of the accompanying drawings, in which:—

Figure 1 is a side elevation of a climbing jack, and Figure 1A is a view in oblique perspective of the form of the upper and lower yoke of the jack,

Figure 2 shows in oblique perspective partly in section a latch of the type used in the jack shown in Figure 1; and

Figure 3 is a sectional view of an alternative bearing of the latch.

Referring to Figure 1, a climbing jack comprises an upper yoke shown generally at 2, that surround a climb rod 3 on three sides, i.e. the yokes 1 and 2 are substantially U-shaped (Fig. 1A). Said yokes 1 and 2 have ends 1_1, 1_2; 2_1, 2_2 and said yokes can be displaced from, and approached to, each other, respectively, by means of hydraulic cylinders 4 and 5, respectively. In order to render possible climbing upwards and downwards, respectively, along the climb rod 3, each yoke 1, 2 is provided with two opposed latches or first members $6I_A$, $6I_B$; $6II_A$, $6II_B$ co-operating with corresponding shoulders S_1, S_2, S_3 for example on the climb rod or third member 3. As the said first members 61_A, $6I_B$; $6II_A$, $6II_B$ are arranged in opposed pairs, on second members or yoke ends 1_1, 1_2; 2_1, 2_2 no horizontal net forces act upon the climbing jack. Each latch is pivotable about an associated yieldable axle 7 by associated means (not shown).

In order to prevent said axle 7 from being exposed to the forces to be transmitted between the yokes 1, 2 and the climb rod 3, via said latches the axle 7 is provided in a bore in its associated latch which bore has a slightly greater diameter than the axle 7. The latch further is so disposed in the associated yoke that there is a clearance between the rear cylindrical surface of the latch and a complementary surface of the yoke. Said clearance is smaller than the difference in diameter between said axle 7 and associated bore. This implies that the latch when being subjected to load is displaced slightly relative to the axle 7 in the longitudinal direction of the latch until the rear cylindrical surface of each latch $6I_A$, $6I_B$, $6II_A$, $6II_B$ respectively engages its complementary surface $C1_1$, $C1_2$, $C2_1$, $C2_2$ of the yokes 1_1, 1_2, 2_1, 2_2. The entire load carried by the climbing jack thereby is transmitted directly to the climb rod 3 via the material of the latch, without affecting the axle 7 and its bearing.

As is more clearly apparent from Fig. 2, an elastic cylindrical bushing 8 is placed about the axle 7 in said bore in the latch 6 to provide a good guide in spite of the oversized bore. In order to facilitate rotation of the latch 6, said bushing 8 which, for example, may consist of a suitable rubber material, is disposed between an outer sleeve 9 and an inner sleeve 10 of anti-friction material which is harder than the rubber material. The only force to be taken up by the axle 7 in connection with the transmission of forces between the associated yoke 1, 2 and the climb rod 3 via the latch 6, thus, is the force required for compressing the elastic bushing 8 to a degree sufficient to establish load transmitting engagement between the cylindric rear surface of the latch 6 and the corresponding surface of the yoke. The axle 7, therefore, can be relatively weak even in devices intended for very heavy loads, as it can yield, resiliently, through a distance sufficiently to establish load transferring contact between the complementary surfaces of the latch and the yoke.

In Figure 3 another embodiment of the

bearing of the latch 6 is shown, in which the latch 6 is provided with fixed axle journals 11 and 12, respectively. In order to achieve the same effect as in connection with the latch according to Figure 2, said axle journals are arranged in bores in an associated holder, which bores have a greater diameter than said journals. The holders can be formed in the yokes or be composed of separate external members. Also in this case preferably an annular bushing of the same kind as described with reference to Figure 2 is placed about each axle journal. Further, the embodiments according to Figures 2 or 3 can also be combined.

In order to reduce among other things the risks of fatigue phenomena in the material of the elastic bushings, the bushings preferably can be divided into several rings spaced relative to each other. This permits the material upon its compression to expand slightly in lateral direction.

The same effect as above can be obtained also by designing the axle 7 with relatively small dimensions and in such a manner, that it resiliently can yield through a distance sufficient to establish the load transferring contact between the latch and the seat in the yoke. The axle must be mounted so as to have a certain free resilient length, in order to avoid excessive shearing forces. This can be achieved for instance by positioning the axle in a bore in the latch, which bore is wider at its ends and having, for instance, conical form.

The invention can also be varied in other respects within the scope of the appendant claims. The elastic bushings, for example, can be omitted, so that between the axle and the associated bearing bore a clearance is formed which is greater than the distance between the rear surface of the latch and the corresponding surface in the associated yoke. The invention, besides in connection with jacks moving along a climb rod arranged at a desired angle, can be applied also, for example, in connection with stationary jacks displacing a rod in one direction or the other.

WHAT WE CLAIM IS:—

1. A method of pivotably bearing a first member on a second member by means of an axle, said first member being able to transmit forces between said second member and a third member, said first member being pivotable between an operative and an inoperative position, said method comprising the steps of: providing complementary surfaces on said first member and second member with minimal clearance therebetween when said first member is in an operative position with respect to said third member; and pivotably mounting said first member on said second member by an axle bearing which permits displacement of said first member with respect to said second member upon load engagement in the operative position of said first member such that a load transmitting engagement occurs between said complementary surfaces.

2. The method according to claim 1, wherein the step of pivotably mounting said first member on said second member comprises resiliently mounting said axle so that upon loading of said first member relative to said second member, said axle yields a distance sufficient to establish said load transmitting engagement between said complementary surfaces.

3. The method according to claim 1 or claim 2, wherein said step of pivotably mounting said first member with respect to said second member comprises the step of providing said second member with a through bore for the axle, said bore having a diameter exceeding that of the axle.

4. The method according to claim 1, wherein said step of pivotably mounting said first member on said second member comprises the step of providing bushings on opposite sides of said first member, providing an axle on said first member which extends to each side thereof and receivable within respective bores of said bushings with the diameter of said bores exceeding that of said axle.

5. The method according to claim 3 or claim 4, wherein said step of pivotably mounting said first member on said second member further comprises providing an elastic bushing between said bore and said axle.

6. The method of pivotably bearing a first member on a second member by means of an axle, the method being substantially as herein described with reference to the figures of the accompanying drawings.

7. A load transmitting assembly including a first member pivotably mounted on an axle carried by a second member, said first member being pivotable between an operative and an inoperative position, said first member in the operative position being arranged to transmit forces between said first member and a third member; wherein said first member has a surface portion which, when in said operative position, has minimal clearance from a complementary surface portion of said second member, said assembly including means for mounting said first member on said second member through said axle such that upon load engagement with said first member in said operative position, said first member is displaceable through a distance to effect load transmitting engagement between said complementary surface portions.

8. The load transmitting assembly as claimed in claim 7, wherein said axle is

resiliently mounted with respect to said second member such that upon loading of said second member said axle yields a distance sufficient to establish load transmitting engagement between said surfaces of said first and second members.

9. The load transmitting assembly as claimed in claim 7 or claim 8, wherein said second member is provided with a bore, said first member carries said axle with said axle positioned within said bore, and wherein said bore has a diameter in excess of that of said axle.

10. The load transmitting assembly as claimed in claim 7, wherein said axle extends from each side of said first member, and wherein associated holders are provided to each side of said first member, said holders comprising portions of second member and including with bores receiving said axle, said bores having a diameter in excess of that of said axle.

11. The load transmitting assembly as claimed in claim 10, wherein said second member comprises two opposed axle journals which project from said member and define the pivot axis for said axle.

12. The load transmitting assembly as claimed in any one of claims 9 to 11, wherein said bore carries an elastic bushing extending about said axle.

13. The load transmitting assembly as claimed in claim 12, wherein said elastic bushing comprises a sleeve of elastic material, and said sleeve is enclosed between two sleeves of material harder than said elastic material and having good slide bearing properties and bearing on said axle and said bore respectively.

14. The load transmitting assembly as claimed in claim 12 or claim 13, wherein said bushing comprises several spaced bushing rings.

15. A load transmitting assembly substantially as herein described, and as shown in, Figures 1 and 2, as modified by Figure 3 of the accompanying drawings.

For the Applicants:
F. J. CLEVELAND & COMPANY,
Chartered Patent Agents,
40/43 Chancery Lane,
London WC2.

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2 SHEETS *This drawing is a reproduction of the Original on a reduced scale*
Sheet 1

Fig. 1

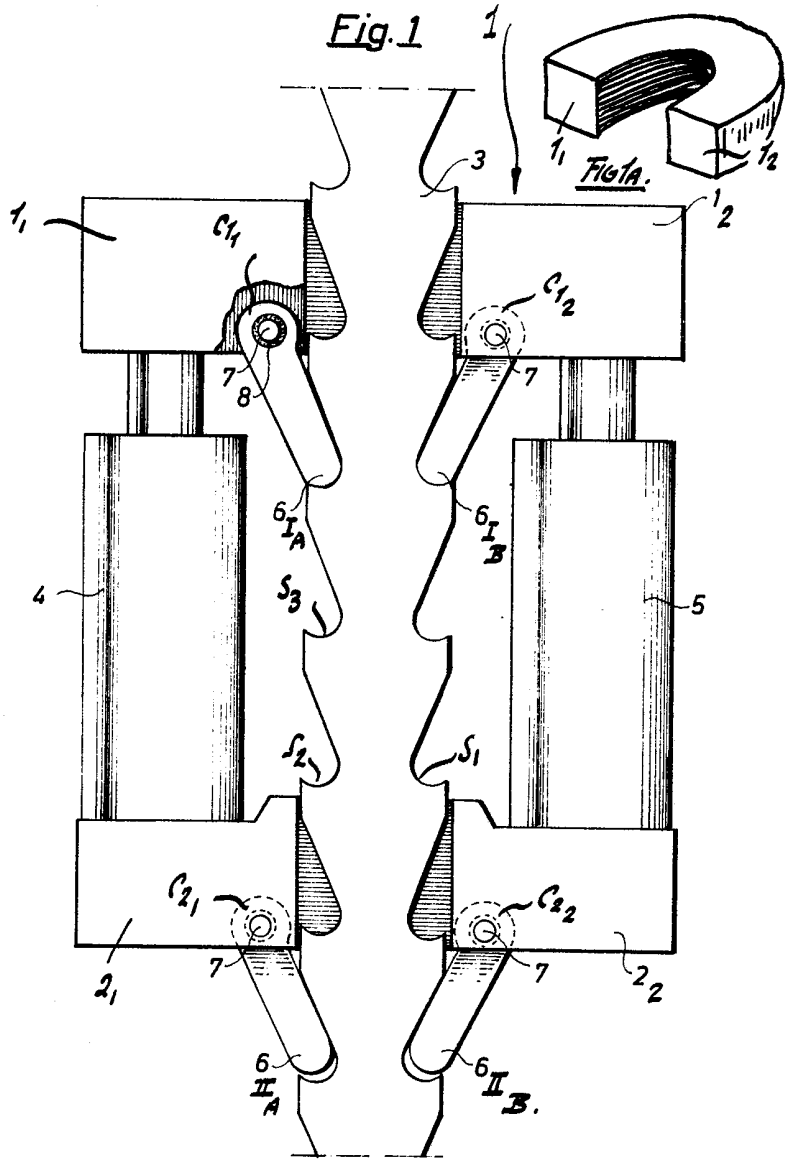

Fig. 2

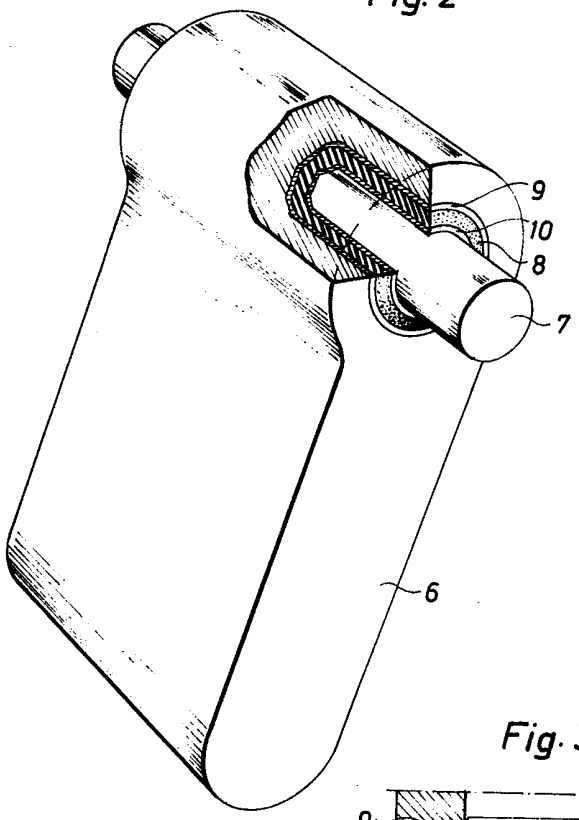

Fig. 3