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(54) Scissor Lifts

(57) A lift is disclosed comprising two leg members (3,4) interconnected by a common central pivot (9). Each leg member has a roller (6,8) at one end and a fixed pivot (5,7) at the other end. On one ofthe legs (3) is a pivotally mounted link (11) which on one end is a roller (12) which when the lift is in its lower travel range is in contact with the other scissor leg (4) and on the other end is mounted one end of a ram (10) by a pivot (15) and whose other end is connected to the other scissor leg (4) by a pivot (13). This arrangement improves the mechanical advantage of the ram force required to open the scissor legs in the initial lift movement.

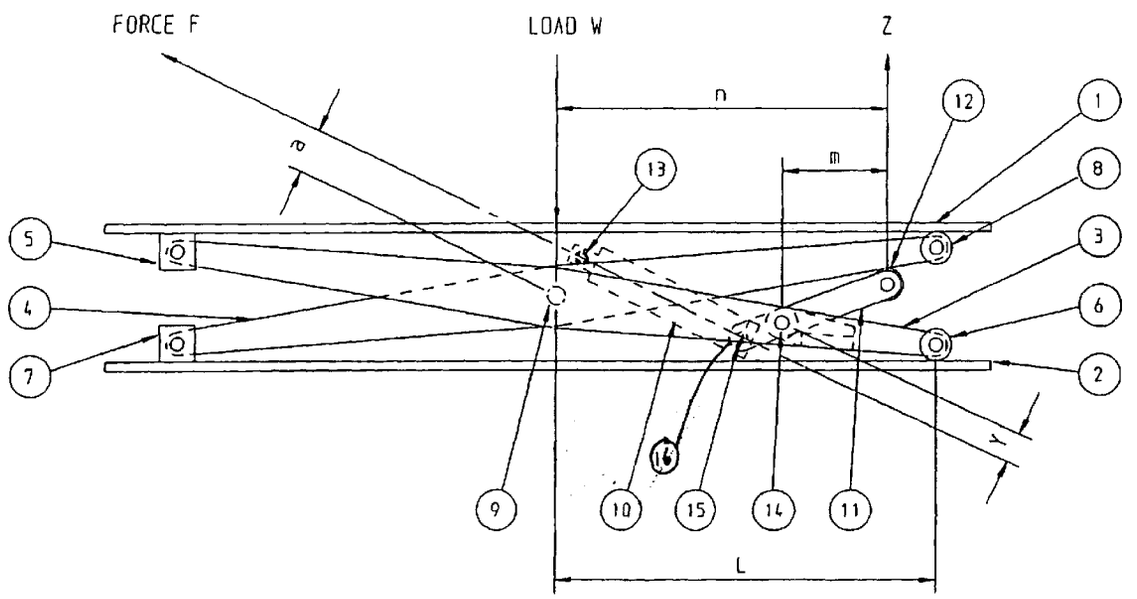

FIG 2.

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Description

[0001] This invention relates to scissor lifts.

[0002] A currently available scissor lift is shown in Figure 1 and comprises a load carrying platform 1 with bracing members and a base frame 2. Between the platform 1 and the base frame 2 is arranged a first leg unit 3 comprising two parallel spaced apart outer leg members each connected at one end to the load carrying platform 1 by means of a fixed pivot 5 and provided at the other end with a freely rotatable roller 6, and a second leg unit 4 comprising two parallel spaced apart inner leg members each connected at one end to the base frame 2 by a fixed pivot 7 and provided at the other end with a freely rotatable roller 8. The two legs 3 and 4 are interconnected by a common central pivot 9 and by at least one ram pivotally connected at one end to the first leg 3 and at the other end to the second leg 4 such that when the ram 10 is actuated the legs 3 and 4 rotate in the opposite directions about the central pivot 9 whereby the platform is raised and lowered.

[0003] The ram force F needed to spread apart the legs 3 and 4 so as to raise the platform 1 can be calculated from the equation:-

$$F = \frac{W.L}{a}$$

Where W is the total load to be lifted, including the weight of the load carrying platform 1 and the legs 3 and 4. L is the horizontal distance between the centre of the roller 6 and the central pivot 9 and a is the lever arm, i. e. the perpendicular distance between the axis of the ram 10 and a line which is parallel to the axis ofthe ram and intersects the axis of the central pivot 9 (i.e. the axis of rotation of the legs 3 and 4).

[0004] Clearly, at the lowest position the lever arm a is reduced and a large ram force F is needed to spread the scissor legs 3 and 4 apart.

[0005] The present invention arose in an attempt to provide an improved scissor lift in which the force F is reduced.

[0006] According to the present invention there is provided a scissor lift comprising a load carrying platform, a base frame, a first and second leg unit situated between the platform and the base frame, the leg units crossing each other at an axis and being pivotally interconnected at said axis, the first leg being connected at one end to the load carrying platform by first fixed pivot means and provided at the other end with first freely rotatable roller means; the second leg unit being connected at one end to the base frame by second fixed pivot means and provided at the other end with second freely rotatable roller means, a link means pivotally mounted to one of the leg units, and contacting either the other leg unit or the load carrying platform, by means of freely rotatable roller means, and ram means provided with first pivot means to act directly on said other leg unit, and second pivot means at said link means.

[0007] An embodiment of the present invention will now be described, by way of example only, with reference to the accompanying, in which:

Figure 1 shows schematically a side view of a previously proposed scissor lift;

Figure 2 shows schematically a side view of a scissor lift according to the present invention; and

Figure 3 schematically a side view of an alternative embodiment of a scissor lift according to the present invention.

[0008] Figure 2 shows a scissor lift comprising a load carrying platform 1 with bracing members and a base frame 2. Between the platform 1 and the base frame 2 is arranged a first leg unit 4 comprising two spaced apart parallel inner legs connected at one end to the base frame 2 by means of a fixed pivot 7 and at the other end by a freely rotatable roller 8 rotating on a central pivot and contacting the platform 1, and a second leg unit 3 comprising two parallel spaced apart outer leg members connected at one end to the platform 1 by means of a fixed pivot 5 and at the other end by a freely rotatable roller 6 rotating on a central pivot and contacting the base frame 2. The inner and outer legs 3,4 are connected to each other by a common pivot 9. At least one ram 10, preferably hydraulically actuated, is freely pivoted at one end to a transverse member 13 rigidly connecting the two inner leg members 4 and at its other end to a pivot 15 at the end of an arm member 11. The other end of arm member 11 comprises one or more freely rotatable roller 12 rotating on a central pivot and contacting the inner scissor legs 4. Arm member 11 rotates about a pivot 14 on a connecting member between the outer legs. The arrangement ofthe arm 11 and the pivots 14 and 15 causes the arm member 11 to rotate about the pivot 14 and assist the opening of the leg members 3,4 about the central pivot 9, reducing the force F required about the central pivot 9 to raise the platform. The ram pivot point 15 may be positioned anywhere between the pivot point 14 and the free end 16 of arm 11. The reaction of the ram force F acts about the pivot 14 such that the moments can be represented by the formula:-

$$Z = \frac{Fxy}{m}$$

Where F is the ram force needed to spread the legs 3,4 apart, y is the lever arm, i.e. the perpendicular distance between the axis of the ram 10 and a line parallel to the axis of the ram 10 which intersects the axis of the pivot 14, m is the horizontal distance between the centre of the roller 12 and the fulcrum pivot 14 of the arm member and Z is the resulting force applied to the scissor leg member 4. It can be shown that the force F required to

spread the legs apart is represented by the formula:-

$$F = \frac{W \times L}{a} - Z \times n$$

Where W is the weight of the load and platform, L is the horizontal distance between the centre of roller 8 and the central pivot 9, a is the lever arm, i.e. the perpendicular distance between the axis of the ram 10 and a line parallel to the axis of ram 10 which intersects the axis of central pivot 9 and n is the horizontal distance between the centre of the roller 12 and the central pivot 9. Force F is therefore reduced, compared to previously proposed scissor lift designs of similar specifications.

[0009] The arm 11 may be disposed in other arrangements which also reduce the ram force required. It may, for instance, contact the load platform 1 or base 2 directly (via roller means 12 for example), or may pivot on leg 4 and contact leg 3.

[0010] Figure 3 shows an alternative embodiment in which like components to that of Figure 2 have been accorded like numbers. The mechanism is virtually identical to that shown in Figure 2 apart from being inverted. The forces involved are therefore similar to those of the first embodiment but acting in the opposite direction (e. g. Force F has a downward component). The result is the same; the legs are caused to spread and the platform lifts.

[0011] It will be appreciated that the terms leg and leg unit used herein encompass units having two or more parallel leg members and spacing or connecting means between them. Parts which pivot at or contact the legs may of course pivot at or contact any part of the leg unit or leg assembly.

Claims

1. A scissor lift comprising a load carrying platform, a base frame, a first and second leg unit situated between the platform and the base frame, the leg units crossing each other at an axis and being pivotally interconnected at said axis, the first leg being connected at one end to the load carrying platform by first fixed pivot means and provided at the other end with first freely rotatable roller means; the second leg unit being connected at one end to the base frame by second fixed pivot means and provided at the other end with second freely rotatable roller means, a link means pivotally mounted to one of the leg units, and contacting, by means of freely rotatable roller means, either the other leg unit, the load carrying platform or the base frame; and ram means provided with first pivot means to act directly on said other leg unit, and with second pivot means at said link means.

2. A scissor lift as claimed in Claim 1, wherein the ram pivots at a point between the link pivot and the end of the link which is provided with the roller means.

3. A scissor lift as claimed in Claim 2, wherein the ram pivots at or towards one end of the link means.

4. A scissor lift as claimed in Claim 1, 2 or 3, wherein the link means is provided between the leg units or between cross-members.

5. A scissor lift as claimed in Claim 1, 2 or 3, wherein the link means is provided between one leg unit and the underside of the load carrying platform.

6. A scissor lift as claimed in Claim 1, 2 or 3, wherein the link mean is provided between one leg unit and the base frame.

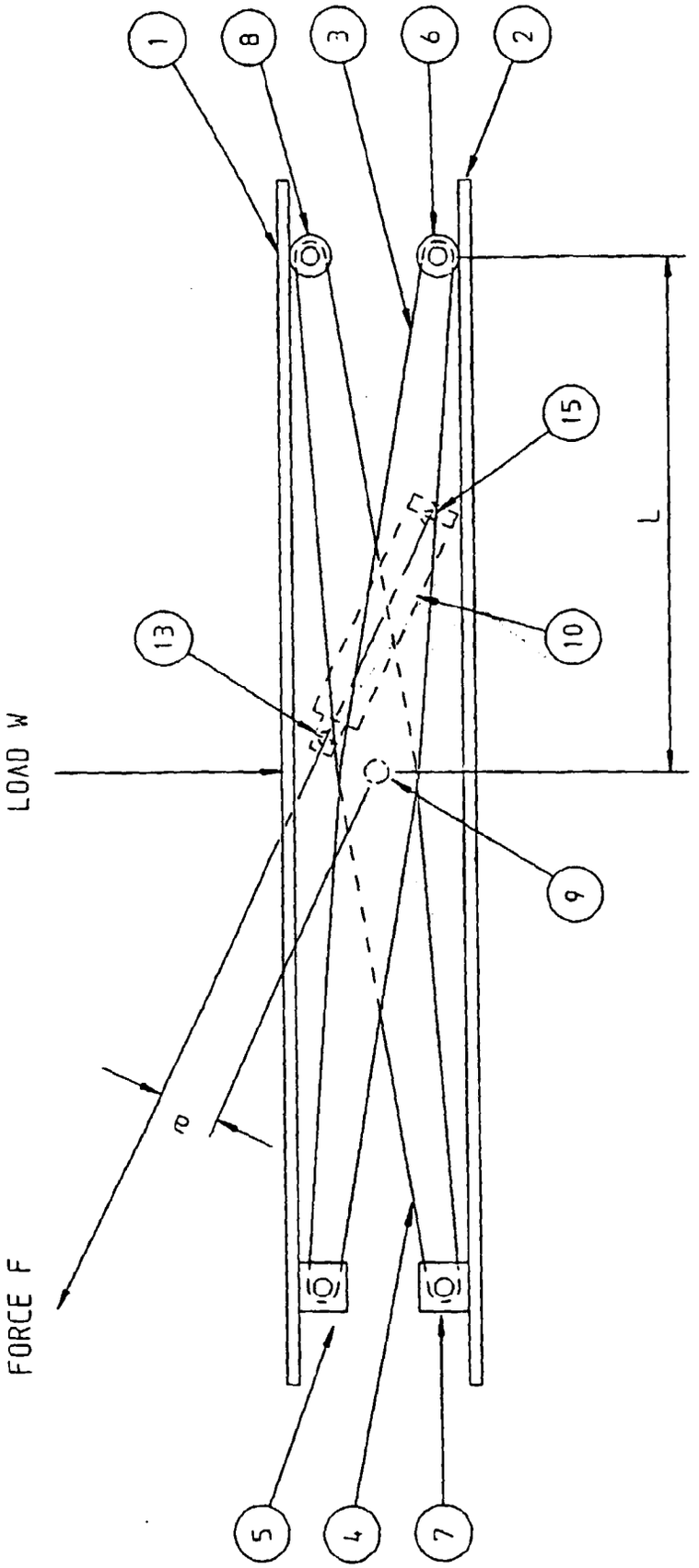

FIG 1.

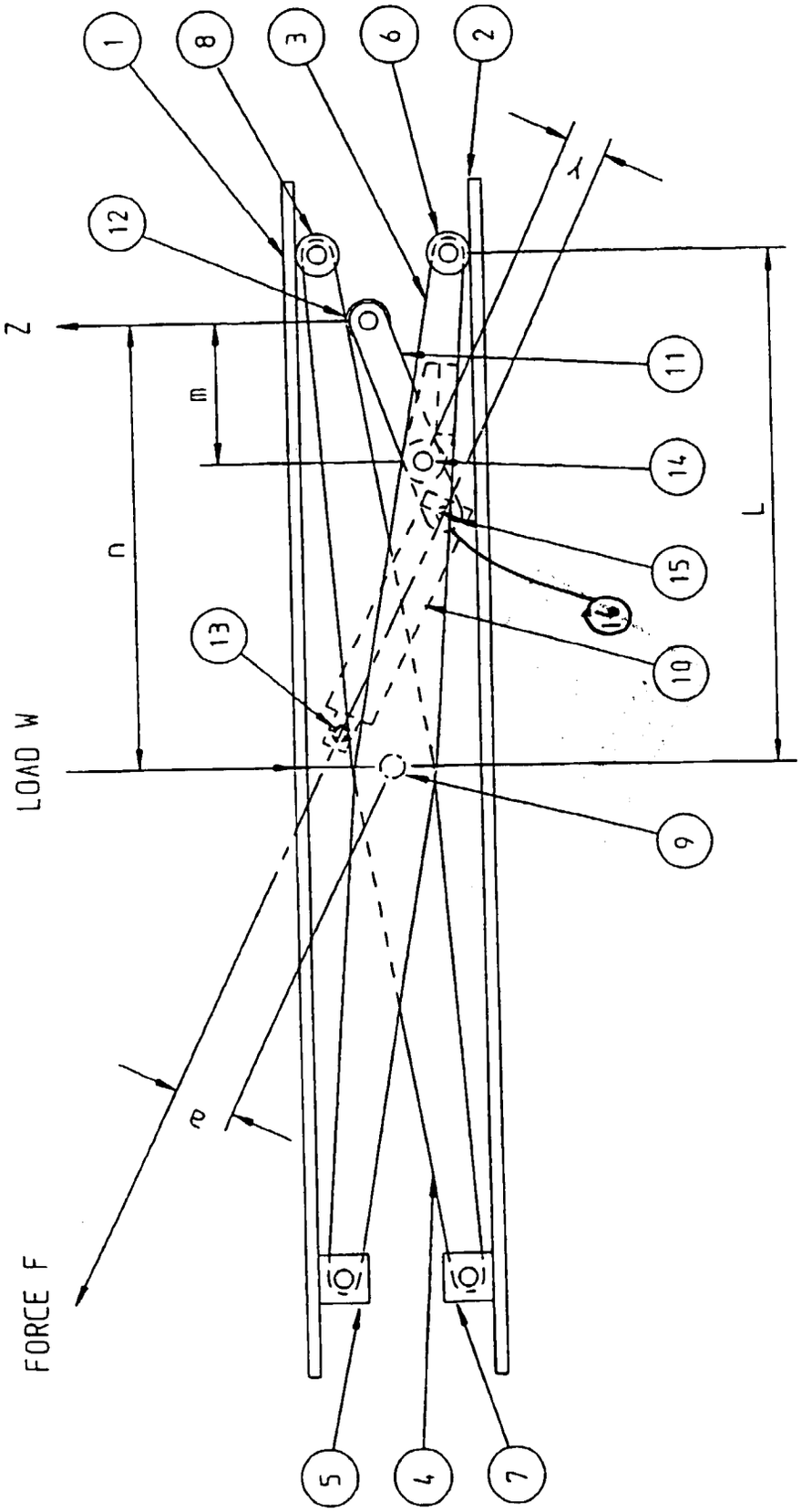

FIG 2.

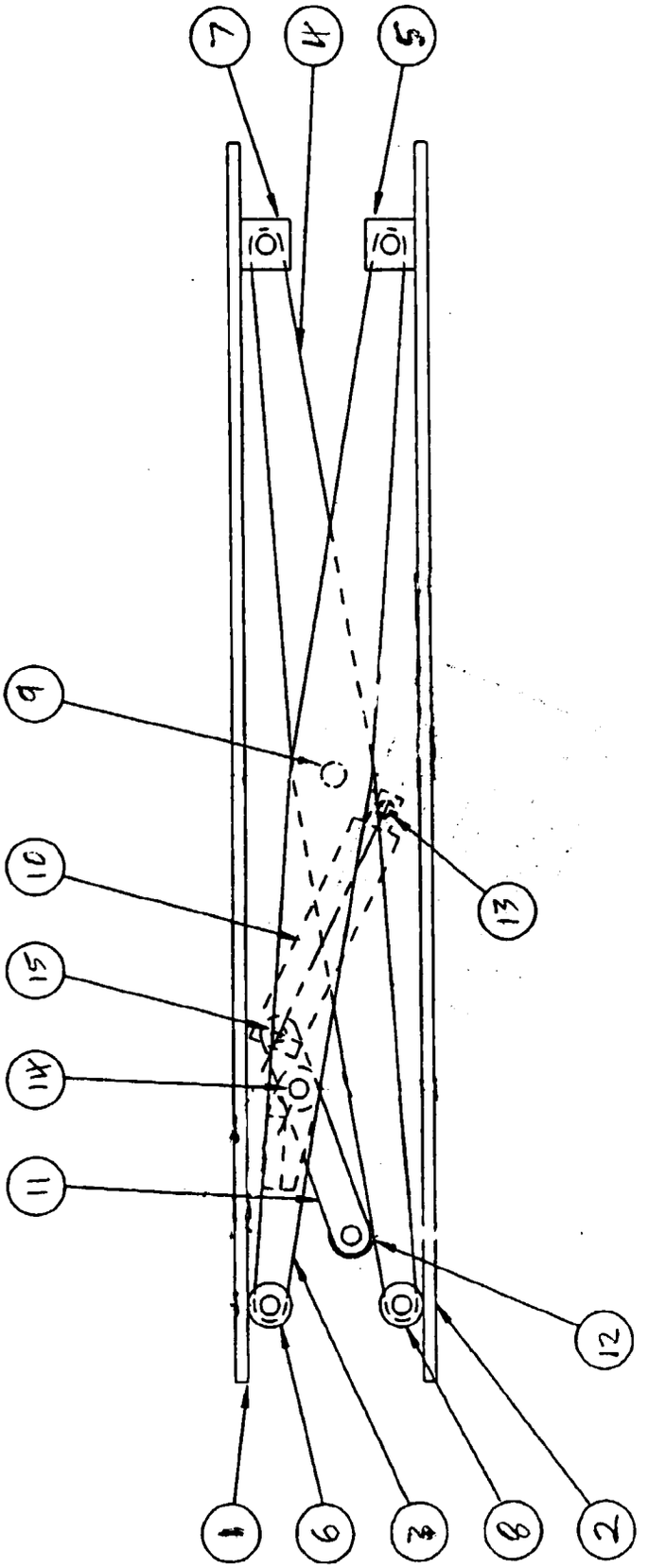

FIG3