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2  
3 A LIFT ASSEMBLY

4  
5 STATEMENT OF GOVERNMENT INTEREST

6 The invention described herein may be manufactured and  
7 used by and for the Government of the United States of  
8 America for Governmental purposes without the payment of any  
9 royalties thereon or therefore.

10  
11 BACKGROUND OF THE INVENTION

12 1. Field of the Invention

13 The invention relates to lifting devices and is  
14 directed more particularly to a "scissors" lift.

15 2. Description of the Prior Art

16 Scissors lifts are known in the art and generally  
17 include a number of scissors sections pivotally connected in  
18 a vertical array and expandable from a compressed condition  
19 and low level disposition to a relatively expanded condition  
20 and a higher level disposition. Each scissors section  
21 includes side-by-side pairs of crossed arms pivotally  
22 connected to each other at their centers and at their outer  
23 ends. They may be expanded and contracted in a bellows-like  
24 fashion.

25 Such lifts generally are constructed of rigid, heavy  
26 elements, otherwise the upper sections may fail to extend

1 when extension force is applied to the lower sections. In  
2 addition, lightly constructed scissors lifts tend to be  
3 unstable, in that one side, or one of the elevator  
4 structures, rises faster than the other, causing the  
5 apparatus to sway.

6 There is a need for a scissors lift, which is  
7 constructed of relatively light and inexpensive material, is  
8 of relatively low weight, yet is stable and reliable.

9  
10 SUMMARY OF THE INVENTION

11 An object of the invention is, therefore, to provide a  
12 scissors lift, which is constructed so as to provide stable  
13 and reliable operation.

14 A further object of the invention is to provide such a  
15 lift constructed of relatively light weight materials.

16 With the above and other objects in view, as will  
17 hereinafter appear, a feature of the present invention is  
18 the provision of a lift assembly having first and second  
19 elevator structures side-by-side. Each of the structures  
20 comprises a first scissors section mounted on a base bar, a  
21 second scissors section pivotally connected to the first  
22 scissors section, arms of the second scissors section being  
23 pivotally connected to each other by a lift shaft which  
24 extends between the first and second structures, at least  
25 one intermediate scissors section pivotally connected to the  
26 second scissors section, and an upper scissors section

1 pivotally connected to an uppermost of the intermediate  
2 scissors sections and supporting a top bar. First and  
3 second side plates upstand adjacent, respectively, the first  
4 and second structures, each of the side plates having  
5 therein an elongated slot, the lift shaft being disposed in  
6 the slots. A lower pulley is mounted proximate each of the  
7 base bars on a common drive shaft. A motor for rotating the  
8 drive shaft is provided. An upper pulley is mounted  
9 proximate an upper end of each of the side plates. A strand  
10 extends from each of the lower pulleys to each of the upper  
11 pulleys, respectively, and thence to the lift shaft. The  
12 motor is operable to rotate the drive shaft, and thereby the  
13 lower pulleys, to draw in the strand from the upper pulleys  
14 which support the strand to draw the lift shaft upwardly in  
15 the side plate slots, to draw the second scissors section,  
16 and thereby remaining scissors sections, upwardly, to raise  
17 the top bar.

18 The above and other features of the invention,  
19 including various novel details of construction and  
20 combinations of parts, will now be more particularly  
21 described with reference to the accompanying drawings and  
22 pointed out in the claims. It will be understood that the  
23 particular device embodying the invention is shown by way of  
24 illustration only and not as a limitation of the invention.  
25 The principles and features of this invention may be

1 employed in various and numerous embodiments without  
2 departing from the scope of the invention.

3  
4 BRIEF DESCRIPTION OF THE DRAWINGS

5 Reference is made to the accompanying drawings in which  
6 is shown an illustrative embodiment of the invention, from  
7 which its novel features and advantages will be apparent,  
8 wherein corresponding reference characters indicate  
9 corresponding parts throughout the several views of the  
10 drawings and wherein:

11 FIG. 1 is a side elevational view of one form of a lift  
12 assembly illustrative of an embodiment of the invention;

13 FIG. 2 is a front elevational view thereof;

14 FIG. 3 is similar to FIG. 1, but illustrates the  
15 assembly in a different operational position;

16 FIG. 4 is a diagrammatic view of a portion of the  
17 assembly, illustrating movement of such portions in  
18 operation of the assembly; and

19 FIG. 5 is a side elevational view of a representative  
20 arm of the assembly.

21  
22 DESCRIPTION OF THE PREFERRED EMBODIMENT

23 Referring to FIGS. 1 and 2, it will be seen that the  
24 illustrative scissors lift assembly 10 includes first and  
25 second elevator structures 12, 14 disposed side-by-side.

1           Each of the elevator structures 12, 14 includes a  
2           number of scissors sections disposed in a vertical array,  
3           including a first scissors section 16 mounted on a base bar  
4           18. The first scissors section 16 includes a first arm 20  
5           pivotally connected at a first end 22 to the base bar 18,  
6           and a second arm 24 pivotally connected to the first arm 20  
7           at the center 26 (FIG. 3) of the first and second arms 20,  
8           24. A first end 28 of the second arm 24 is movable along  
9           base bar 18, and for that purpose may be provided with a  
10          roller 30 (FIG. 4).

11          A second scissors section 40 includes a first arm 42  
12          (FIGS. 1 and 3) pivotally connected at a first end 44 to a  
13          second end 32 of the first section second arm 24. The  
14          pivotal connection is effected by a first rod 34, which  
15          extends between and interconnects the first and second  
16          structures 12, 14. The second scissors section 40 further  
17          includes a second arm 46 pivotally connected at a first end  
18          48 to a second end 36 of the first section first arm 20.  
19          The pivotal connection is effected by a second rod 38, which  
20          extends between and interconnects first and second  
21          structures 12, 14 (FIG. 2). The second section first and  
22          second arms 42, 46 are pivotally connected to each other by  
23          a lift shaft 50 which extends between and interconnects the  
24          first and second structures 12, 14 (FIG. 2).

25          At least one intermediate scissors section 60 (three  
26          shown in FIGS. 1-3; 60, 60a, 60b) includes a first arm 62

1 pivotally connected at a first end 64 to a second end 52 of  
2 the second section second arm 46 by a third rod 54 extending  
3 between and interconnecting the first and second structures  
4 12, 14. The intermediate sections 60 further include a  
5 second arm 66 pivotally connected at a first end 68 to a  
6 second end 56 of the second section first arm 42 by a fourth  
7 rod 58 extending between and interconnecting the first and  
8 second structures 12, 14. The intermediate section first  
9 and second arms 62, 66 are pivotally connected to each other  
10 at the center 70 (FIG. 3) of the intermediate section first  
11 and second arms 62, 66.

12 Any further intermediate sections, such as 60a and 60b  
13 are substantially the same in structure as the intermediate  
14 section 60 described immediately above. The number of  
15 intermediate sections is selected based upon the height of  
16 the lift desired. For purposes of description, the  
17 uppermost intermediate section 60b in FIGS. 1 and 4 is  
18 provided with the reference characters 66b and 62b for  
19 identification of arms supporting an upper scissors section  
20 80. It will be appreciated that the upper section 80 could  
21 just as well be supported by arms 62, 66.

22 The upper scissors section 80 includes a first arm 82  
23 pivotally connected at a first end 84 to a second end 72 of  
24 second arm 66b of an uppermost 60b of the intermediate  
25 scissors sections by a fifth rod 74 extending between and  
26 interconnecting first and second elevator structures 12, 14.

1 Similarly, the upper scissors section 80 includes a second  
2 arm 86 pivotally connected at a first end 88 to a second end  
3 76 of the uppermost intermediate scissors section first arm  
4 62b by a sixth rod 78 extending between and interconnecting  
5 first and second structures 12, 14 (FIG. 2). The upper  
6 section first and second arms 82, 86 are pivotally connected  
7 to each other at the centers of the upper section first and  
8 second arms 82, 86 by a locator pin 90 which extends  
9 outboard on both sides of the assembly 10. Alternatively, a  
10 discrete locator pin (not shown) may be provided in addition  
11 to a central connection pin 90.

12 A second end 92 of the upper section second arm 86 is  
13 pivotally connected to a top bar 94. A second end 96 of the  
14 upper section first arm 82 is provided with a pin 98 (FIGS.  
15 1 and 3) slidably disposed in an elongated slot 100 in the  
16 top bar 94.

17 First and second generally rectangular side plates 102,  
18 104 upstand alongside and, respectively, outbound of the  
19 first and second elevator structures 12, 14, described  
20 above. Each of the side plates 102, 104 defines an  
21 elongated slot 106 in which is disposed the lift shaft 50.

22 Lower pulleys 108 are mounted on or near the base bars  
23 18 and are each mounted on a drive shaft 110, which is  
24 driven by a turning means 112, such as a motor (FIG. 2). An  
25 upper pulley 114 is mounted on each side plate 102, 104  
26 proximate an upper end 116 of the side plate.

1           A strand 118 of metal wire, or other wire-like  
2 material, is wound about each lower pulley 108, which  
3 preferably is a spirally grooved pulley to ensure even  
4 winding of the strand 118. From the lower pulleys 108, the  
5 strands 118 extend upwardly, respectively, at least  
6 partially around upper pulleys 114 and downwardly alongside  
7 side plates 102, 104 and attach to lift shaft 50, which is  
8 movable in the slots 106.

9           The side plates 102, 104 may be inclined at an angle to  
10 the plane of the base bars 18. The upper end 116 of each  
11 side plate 102, 104 is provided with an open-ended slot 120  
12 (FIGS. 1 and 3) configured to receive the locator pin 90.  
13 The elongated slot 106 in each side plate 102, 104 defines  
14 an arc A of a circle having a radius R (FIG. 4).

15           When idle, the lift assembly 10 is in a disposition  
16 shown in FIGS. 1 and 2. The lift shaft 50 rests at a lower  
17 end 122 of elongated slot 106, preventing the first and  
18 second scissors sections 16, 40 from stacking too tightly.  
19 Similarly, the locator pin 90 rests in the open ended slot  
20 120, preventing the scissors sections 60, 60a, 60b, and 80,  
21 above the second section 40 from stacking tightly on the  
22 second section 40. With the lift shaft 50 coming to rest on  
23 lower end 122 of slot 106 and locator pin 90 resting in slot  
24 120, scissors sections 16, 40, 60, 60a, 60b and 80 are  
25 prevented from collapsing to a point where excessive power  
26 would be required to extend the assembly 10.

1           A pallet, or basket, or other load support, or load  
2           (not shown), is placed on the top bars 94. The motor 112 is  
3           started, to rotate the drive shaft 110 and, thereby, the  
4           lower pulleys 108. As the strand 118 of wire, or similar  
5           material, is wound onto the lower pulleys 108, the wire  
6           pulls lift shaft 50 upwardly.

7           As the lift shaft 50 moves upwardly in slot 106, the  
8           shaft 50 follows a path through points 50a - 50'; shown in  
9           FIG. 4, defining the arc A of a circle, and is stabilized by  
10          the rigid side plates 102, 104, each having the similarly  
11          configured slot 106 therein. As the locator shaft 50 moves  
12          upwardly the first section first arm 20 moves to the  
13          position labeled 20' in FIG. 4, and the first section second  
14          arm 24 moves along the base bar 18 and expands to the  
15          positions labeled 24' in FIG. 4. In similar fashion, arm 42  
16          moves to position 42' and arm 46 moves to the position  
17          labeled 46' in FIG. 4. In short order, typically 3-4  
18          seconds, the assembly has expanded to the configuration  
19          shown in FIG. 3. When the lift shaft 50 engages an upper  
20          end 124 of the curved slot 106, the movement of the scissors  
21          sections is complete. The linear movement of the first  
22          section second arm first end 28 and roller 30 to positions  
23          labeled 28' and 30', respectively, and the linear movement  
24          of the upper section first arm second end pin 98 within slot  
25          100 maintain a parallel relationship between the base bar 18  
26          and the top bar 94.

1 Referring to FIG. 5, it will be seen that a preferred  
2 configuration of the arm 20, as well as other arms 24, 42,  
3 46, 62, 66, 82 and 86, is tapered from a selected thickness  
4 at the center of the arm to a lesser thickness at either end  
5 thereof.

6 It will be understood that many additional changes in  
7 the details, materials, steps and arrangement of parts,  
8 which have been herein described and illustrated in order to  
9 explain the nature of the invention, may be made by those  
10 skilled in the art within the principles and scope of the  
11 invention,

As an  
12 example, assembly 10 may be constructed with a single  
13 elevator structure 12. Line L in FIG. 2 indicates a  
14 suitable point at which assembly 10 may be split into two  
15 portions, each having a single elevator structure 12. Shaft  
16 50 is shown with an end portion 50a having a larger diameter  
17 than the portion of shaft 50 passing through side plate 102  
18 and arms 42, 46, so as to prevent shaft 50 from disengaging  
19 from structure 12. Similar means would be used for rods 38,  
20 58 and 78 and drive shaft 110. It is to be noted that  
21 turning means 112 may be a hand crank and that assembly 10  
22 may also be operated by simply pulling on strand 112,  
23 without requiring the use of turning means 112 and drive  
24 shaft 110. It is also to be noted that the construction of  
25 assembly 10 does not require a payload to be placed above  
26 top bars 94. Rather, the construction of assembly 10 allows

1 for a payload to be suspended between structures 112,  
2 extending to shaft 50.

A LIFT ASSEMBLY

ABSTRACT OF THE DISCLOSURE

6 A lift assembly includes first and second elevator  
7 structures, each including a first scissors section, a  
8 second scissors section pivotally connected to the first  
9 scissors section and supporting a lift shaft which extends  
10 between the first and second structures, at least one  
11 intermediate scissors section pivotally connected to the  
12 second scissors section, and an upper scissors section  
13 pivotally connected to an uppermost of the intermediate  
14 scissors sections and supporting a top bar. First and  
15 second side plates upstand adjacent the first and second  
16 structures, each having therein an elongated slot, the lift  
17 shaft being disposed in the slots. A lower pulley is  
18 mounted proximate each of the base bars on a common drive  
19 shaft. An upper pulley is mounted proximate an upper end of  
20 each of the side plates. A strand extends from each of the  
21 lower pulleys to each of the upper pulleys, and thence to  
22 the lift shaft. A motor is operable to rotate the drive  
23 shaft and thereby the lower pulleys to draw in the strand to  
24 draw the lift shaft upwardly in the side plate slots, to  
25 draw the second scissors section, and thereby remaining  
26 scissors sections, upwardly, to raise the top bar.

1/3

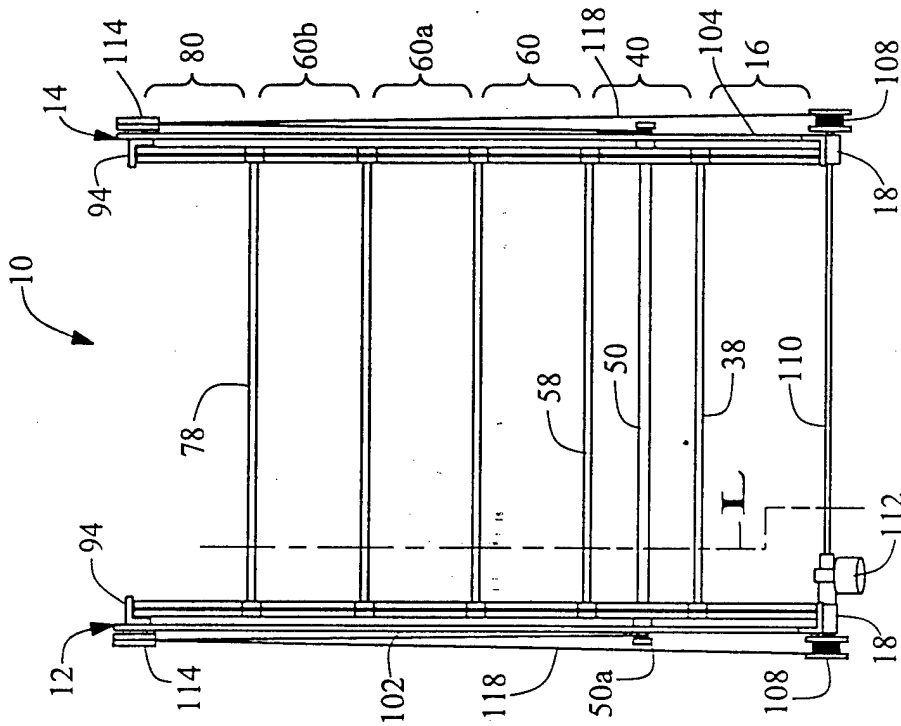


FIG. 2

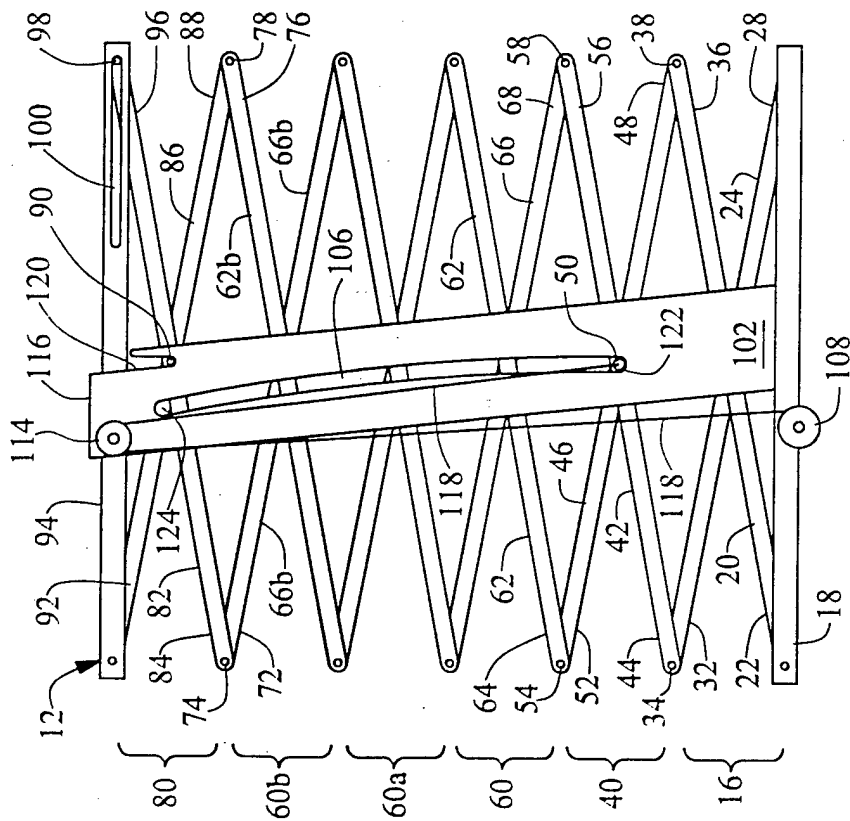


FIG. 1

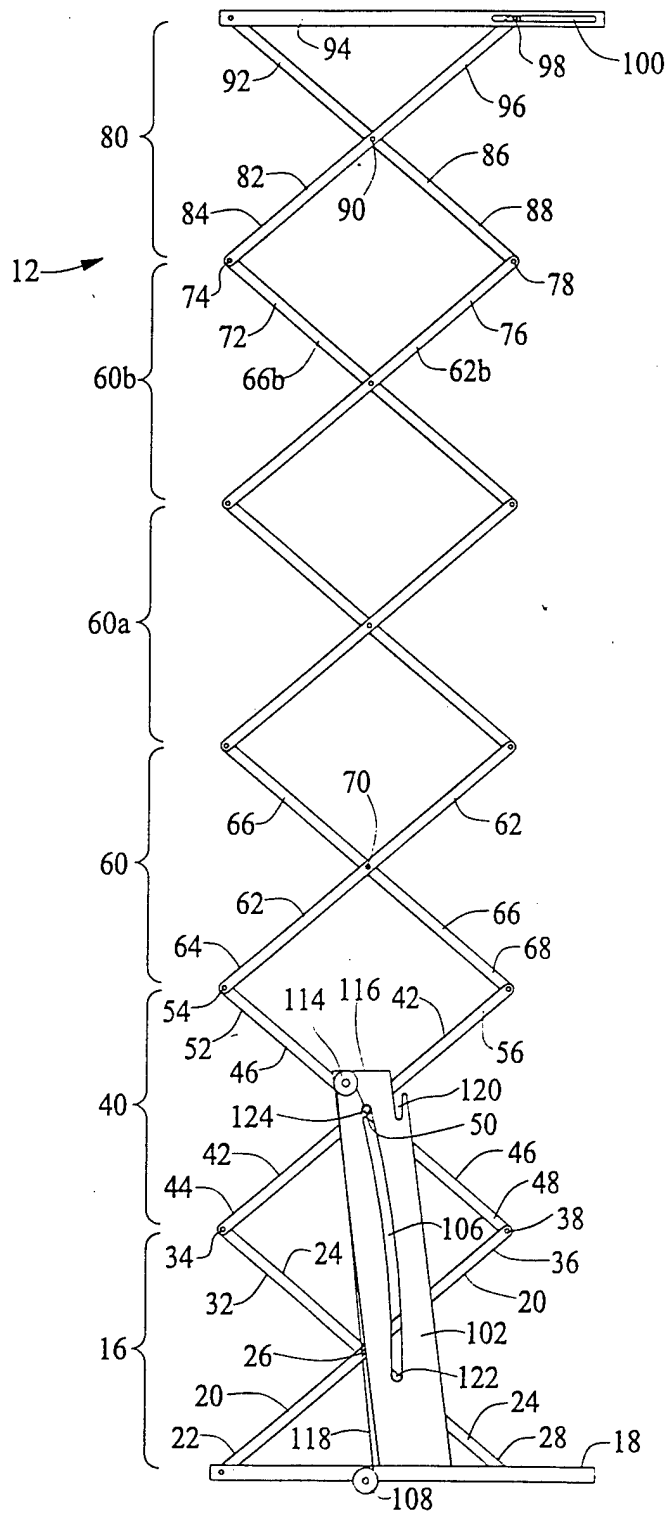


FIG. 3

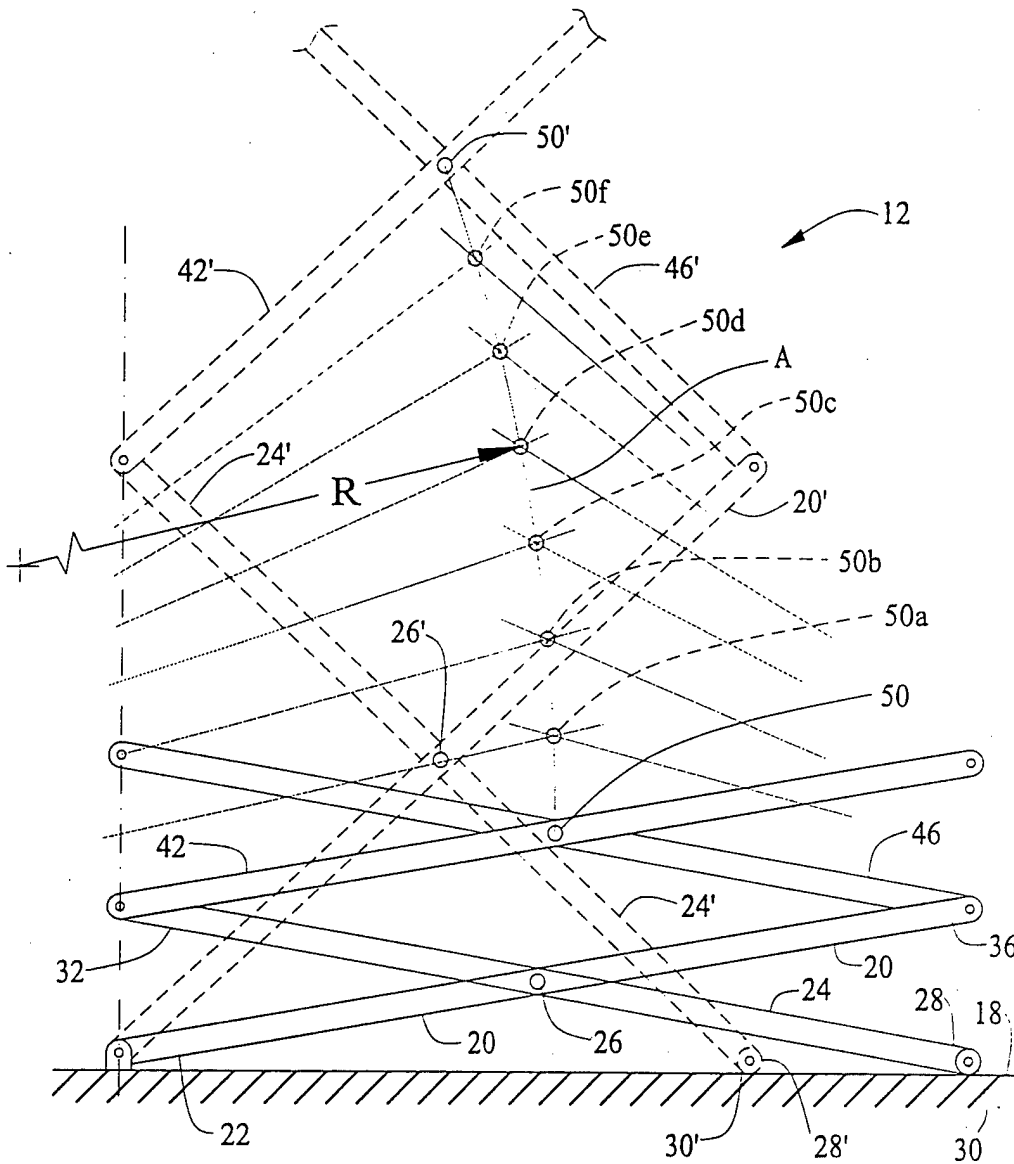


FIG. 4

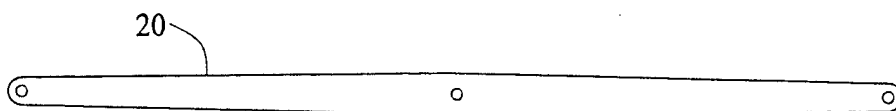


FIG. 5