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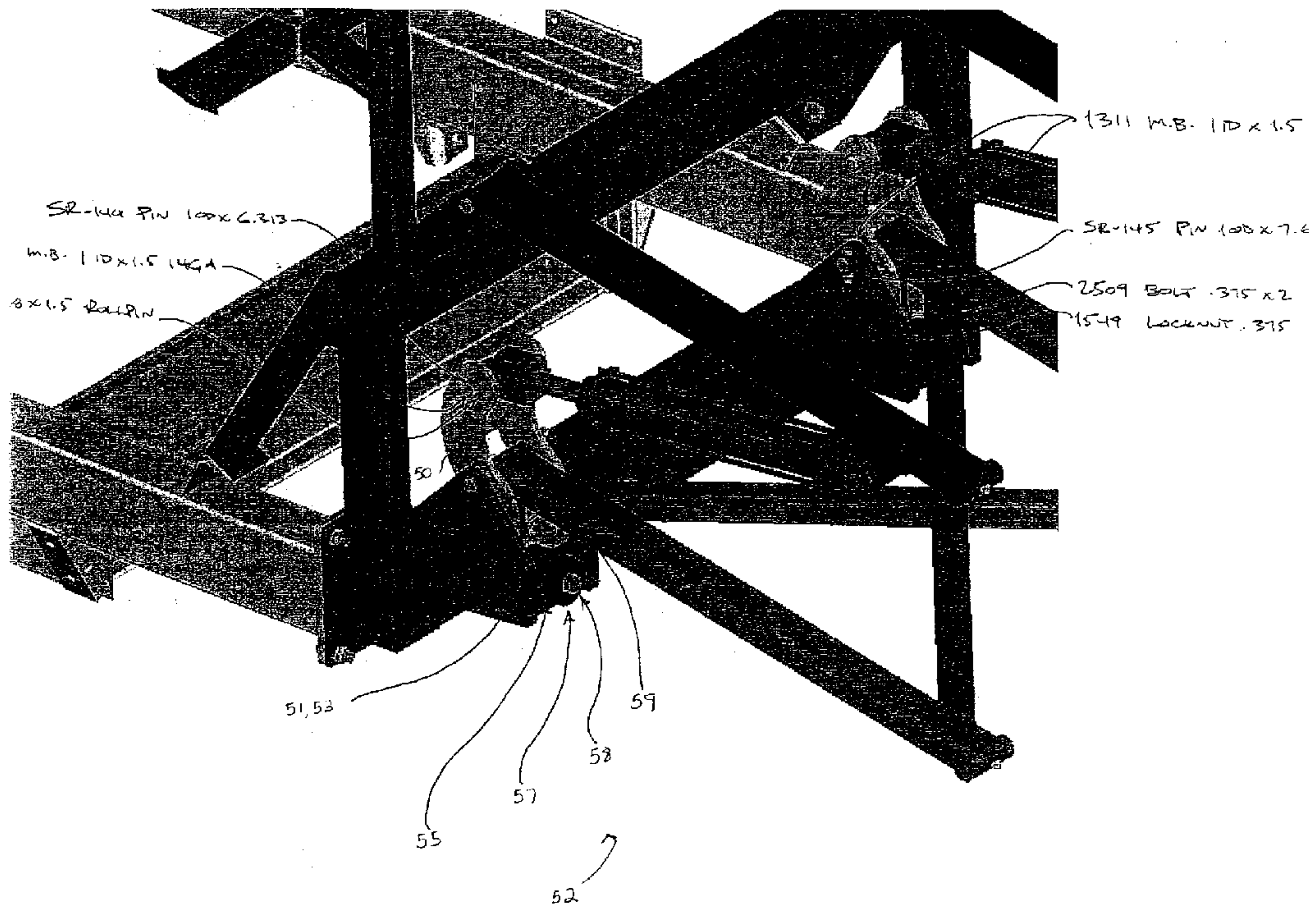
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(54) **SYSTEME DE SUSPENSION POUR VEHICULE DE SERVITUDE**

(54) **SUSPENSION SYSTEM FOR A WORK VEHICLE**



## **Suspension System for a Work Vehicle**

### **Field of the Invention**

This invention relates generally to a suspension system for work vehicles and in particular to a suspension system for an agricultural sprayer.

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### **Background**

Work vehicles, such as swathers, loaders and agricultural sprayers commonly utilize suspension means to minimize vertical forces in suspended equipment.

In particular, agricultural sprayers can include suspended booms extending outwardly from the implement. The booms support nozzles that distribute chemical, contained in a sprayer tank, on the field.

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In an effort to reduce work time and increase efficiency, sprayer booms are generally becoming longer to cover more land in a single pass. As the boom length increases, so does the impact of vertical forces on the boom. As the sprayer travels over the field, ground contours and irregularities induce vertical forces on the sprayer. This can result in variations of the chemical spray pattern on the field. There have been numerous attempts to resolve this problem. Such attempts are disclosed in US Patent 5,375,767 and US Patent 4,197,999.

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It is desirable to provide a suspension that is relatively inexpensive to manufacture and incorporate in a suspended boom sprayer. It is also desirable to provide a suspension that is easily incorporated into the boom lift linkage of the sprayer.

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### **Summary of the Invention**

Accordingly, an objective of the present invention is to provide a suspension means to absorb the shock loading induced on the sprayer cart by the booms during use. It is also an objective to provide a suspension means that is easily incorporated into the boom lift linkage of the sprayer. It is also an objective to

achieve the above in a cost effective manner.

The sprayer consists of a pair of boom lift mechanisms. Each boom lift mechanism consists of a parallel linkage system and a lift cylinder to allow the booms to be lifted upwardly and rearwardly of the sprayer frame. A suspension link rotates on a common pin with the lower parallel link on the boom lift and the lift cylinder pin connects to the top of the suspension link. A number of bushings are located between the suspension link and the rear sprayer frame to dampen the vertical forces experienced by the sprayer during use.

### 10 **Brief Description of the Figures**

Figure 1 shows a common suspended boom sprayer in field position;

Figure 2 is the sprayer of Figure 1 but in transport position;

Figure 3 is a rear view of the sprayer of Figure 2;

Figure 4 is a side view of the boom lift mechanism;

15 Figure 5 is a partial view of the boom lift mechanism;

Figure 6 is a view of the suspension link;

Figure 7 illustrates the effects of downward vertical forces;

Figure 8 illustrates the effects of upward vertical forces;

Figure 9 is a partial view of the suspension link mounted on the sprayer frame;

20 Figure 10 is an exploded view of the system.

### **Detailed Description**

This invention will be described in terms of a suspended boom sprayer, but could also be incorporated in conjunction with other implements such as swathers or loaders.

Figure 1 illustrates a common suspended boom sprayer in field position as known in the art. The sprayer includes a tank 10 supported by frame 12. The tank



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generally contains herbicide for distribution over a field. The sprayer can be self-propelled or pulled by a prime mover such as a tractor as illustrated in the Figures. The tank could also be skid or truck mounted. The sprayer also incorporates boom sections. In the preferred embodiment, the sprayer has a center boom section 14,  
5 left boom section 16 and right boom section 18. The left and right boom sections are pivotally connected to the boom frame 15 at brackets 20. The boom sections include spray nozzles (not shown) located at regular intervals along the boom sections. Chemical supply lines carry the chemical from the tank to the nozzles for distribution over the ground as the sprayer travels over a field.

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The sprayer may include optional windscreens 22 or other such drift control means. The sprayer is equipped to allow the boom sections to fold from field position to transport position as seen in Figure 2. In transport, the center section is lifted up and towards the rear sprayer frame 13 and the left and right boom  
15 sections fold about a generally vertical axis at brackets 20 inwardly.

The boom lift mechanism 30 consists of a pair of spaced apart parallel link systems 32 as seen in Figure 4. Each system includes a lower parallel link 34 pivotally connected to the rear sprayer frame 13 at pin 40 and to the rear of the  
20 boom frame 15 at pin 41. Each upper parallel link 36 is connected similarly at pins 42 and 43. The boom lift mechanism 30 is hydraulically operated via lift cylinders 38. The rod end 39 of each lift cylinder is pivotally connected to pin 44 on the rear sprayer frame. The cylinder end is connected to pin 45. Suspension link 50 pivots about pins 40 and 44. All pin connections are secured accordingly  
25 by common bolt and lock nut assemblies.

The suspension link is illustrated in Figure 6. The link consists of two link plates 60 and 61, mounting plate 62 for mounting to the rear sprayer frame, flat spacer

63 and bushings 64.

When the lift cylinders are extended, the parallel link system pivots about the pins to lift the boom frame and boom sections. Left and right boom sections then pivot  
5 about brackets 20 to fold inwardly toward the cart frame.

Also provided on the sprayer is a suspension assembly 52 to minimize vertical movement of the boom sections. First and second bushings 51 and 53 are inserted between each suspension link 50 and the sprayer frame 13. The bushings are  
10 preferably polyurethane (or some other resilient means) and approximately 1" thick. Alternatively, a single 2" bushing could be used. A third bushing 55, preferably polyurethane and 1/2" thick, is located to the outside of the suspension assembly 52. The bushings 51, 53 and 55 are secured by the presence of a washer 57, bolt 58 and lock nut 59. First and second suspensions are located between the  
15 cart frame and each suspension link.

As the sprayer travels over the field, vertical movements of the sprayer cart are translated into the suspended boom assembly. Downward vertical boom movement causes the lift cylinder to push on the suspension link towards the front  
20 of the cart. The suspension link then pivots about the common pin 40 with the lower parallel link and compresses bushings 51 and 53. Upward vertical boom movement causes the lift cylinder to pull on the suspension links towards the back of the cart. The suspension link pivots about pin 40 with the lower parallel links and compresses bushing 55.

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Numerous alternative embodiments will be apparent to persons skilled in the art without departing from the spirit and scope of the invention as defined in the claims attached.



**CLAIMS:**

1. A suspension system for a work vehicle substantially as described.
2. A suspension system for an agricultural sprayer substantially as described.
- 5 3. A suspension system having a link in conjunction with a parallel linkage/lift cylinder assembly to provide a sprayer cart suspension substantially as described.
- 10 4. A suspension system as in claim 1, 2 or 3 having a pivoting suspension link about a common point with parallel link in "rocking motion" whether link is straight and pivots in rocking motion, i.e. ends move in opposite directions or link is "L" shaped and ends move in same direction.
- 15 5. A suspension system as in any of claims 1-4 including the use of polyurethane or some other "resilient means" to provide suspension/dampening in both upward and downward motion of booms, (whether resilient bushings are bolted together with a common bolt or bolted on either side of the cart frame with separate bolts for both upwards and downwards movements).

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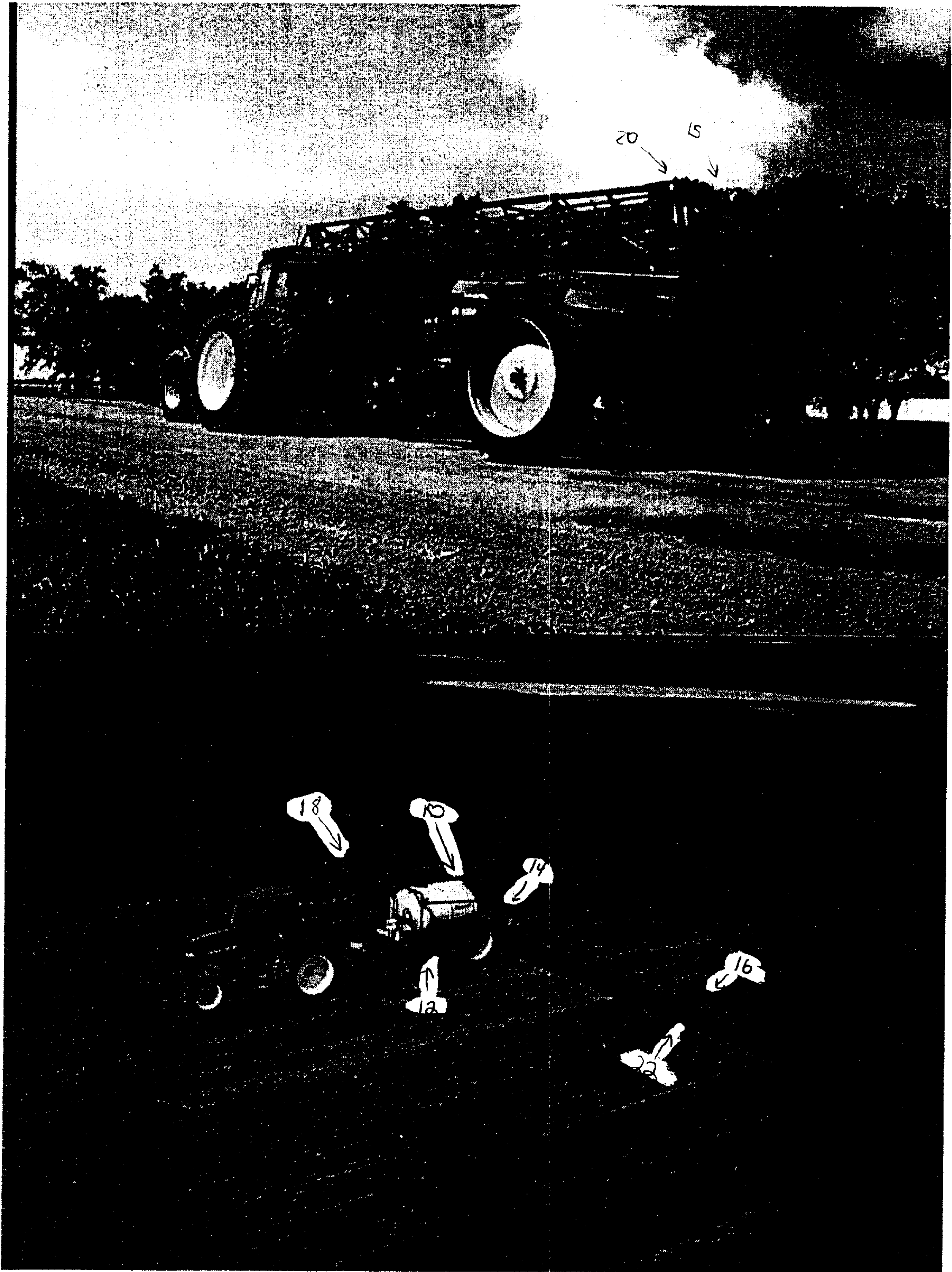


Figure 2

Figure 1



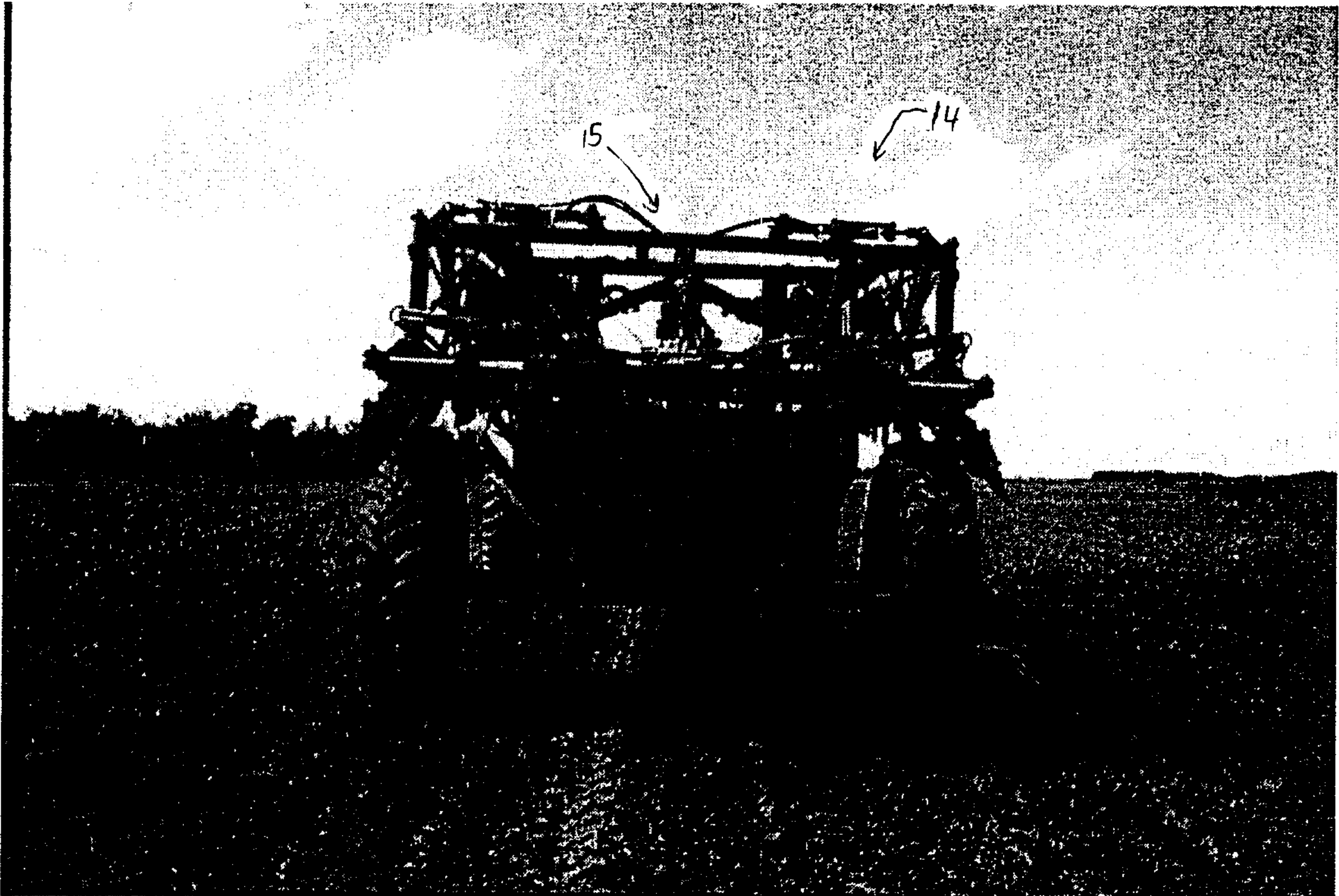


Figure 3



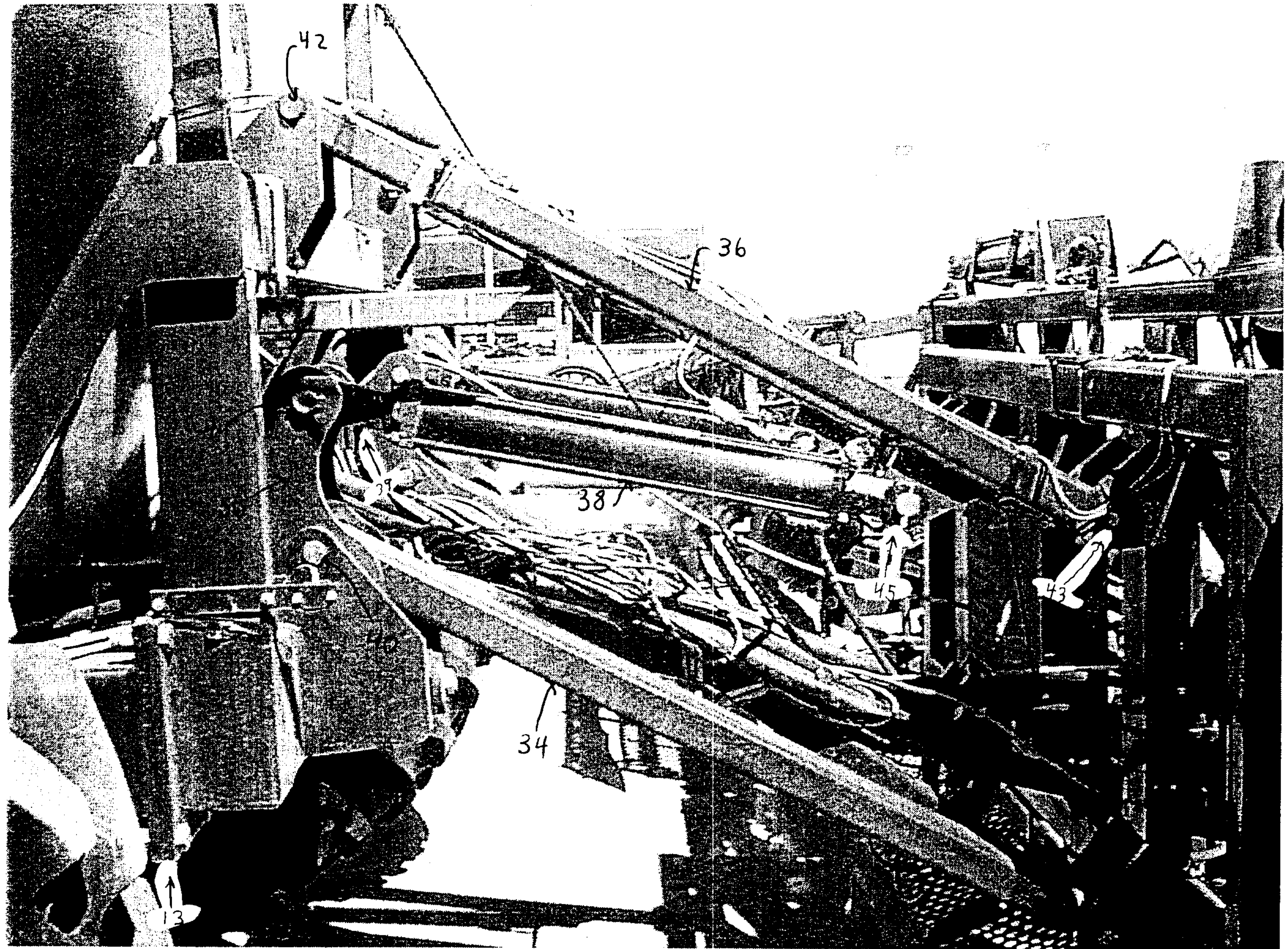


Figure 4



1311 M.B. 1D x 1.5

SR-145 PIN 100 x 7.6

2509 BOLT .375 x 2

1549 LOCKWUT .375

SR-144 PIN 100 x 6.313

M.B. 1D x 1.5 149A

8 x 1.5 RAU PIN

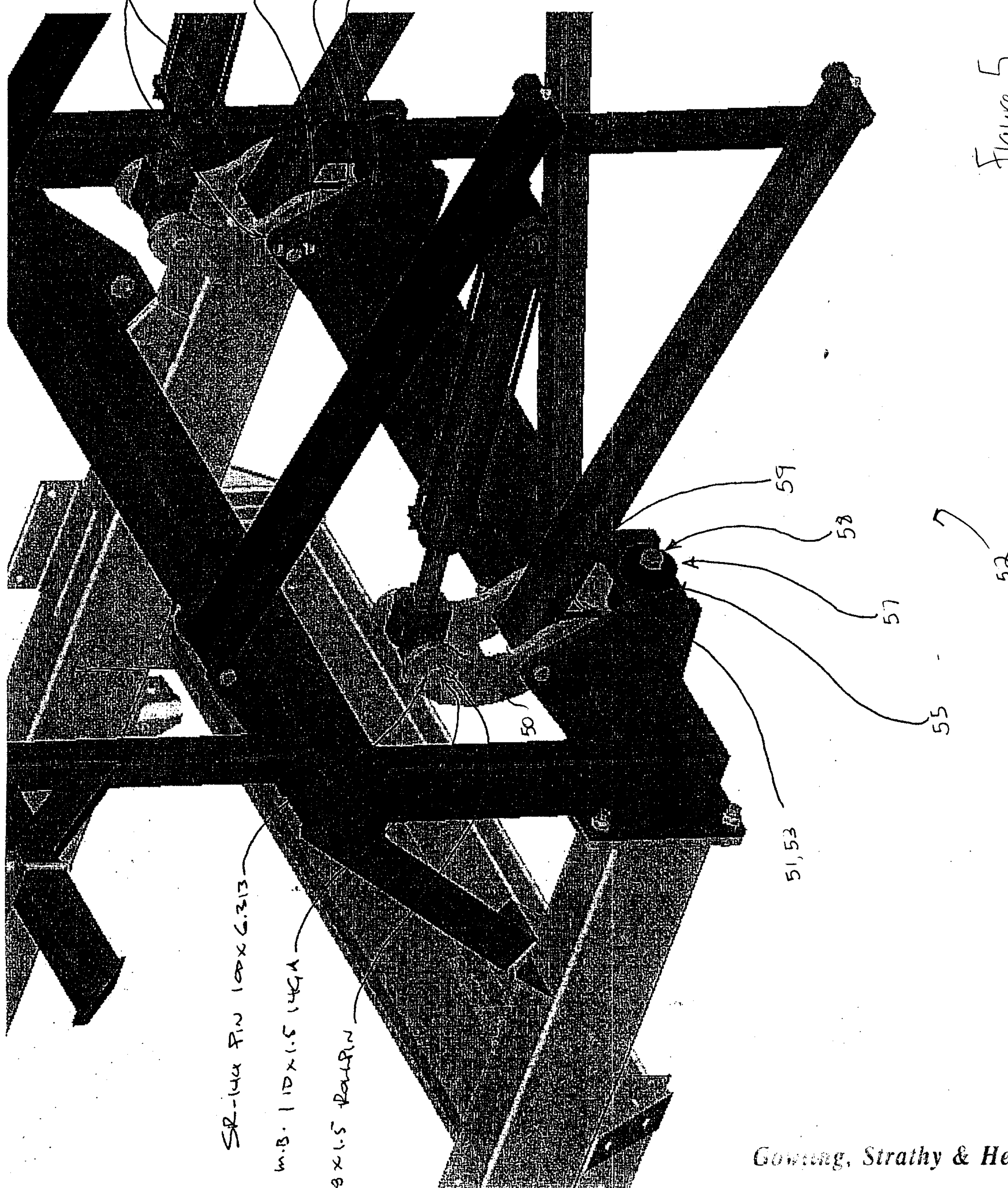


Figure 5



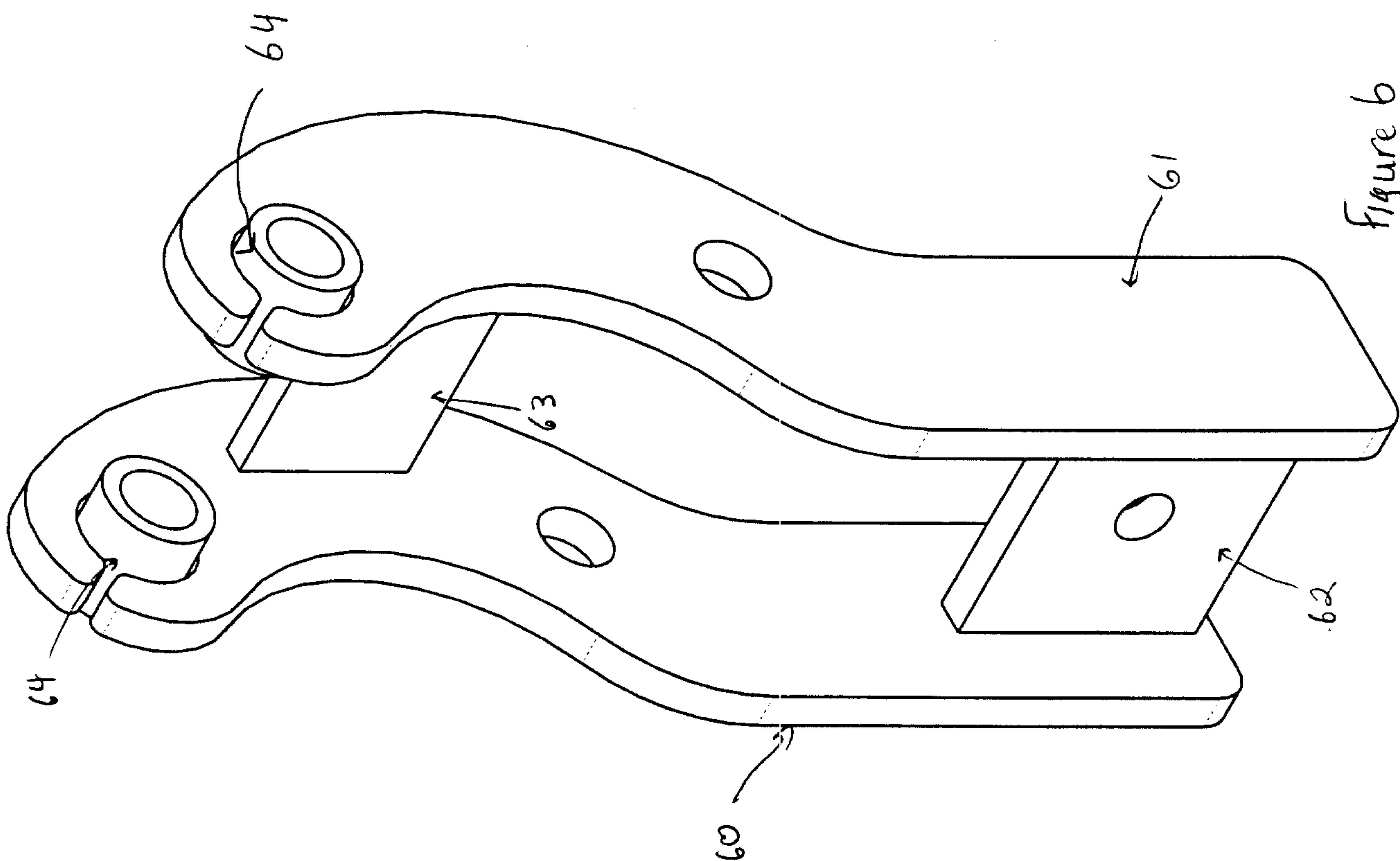


Figure 6

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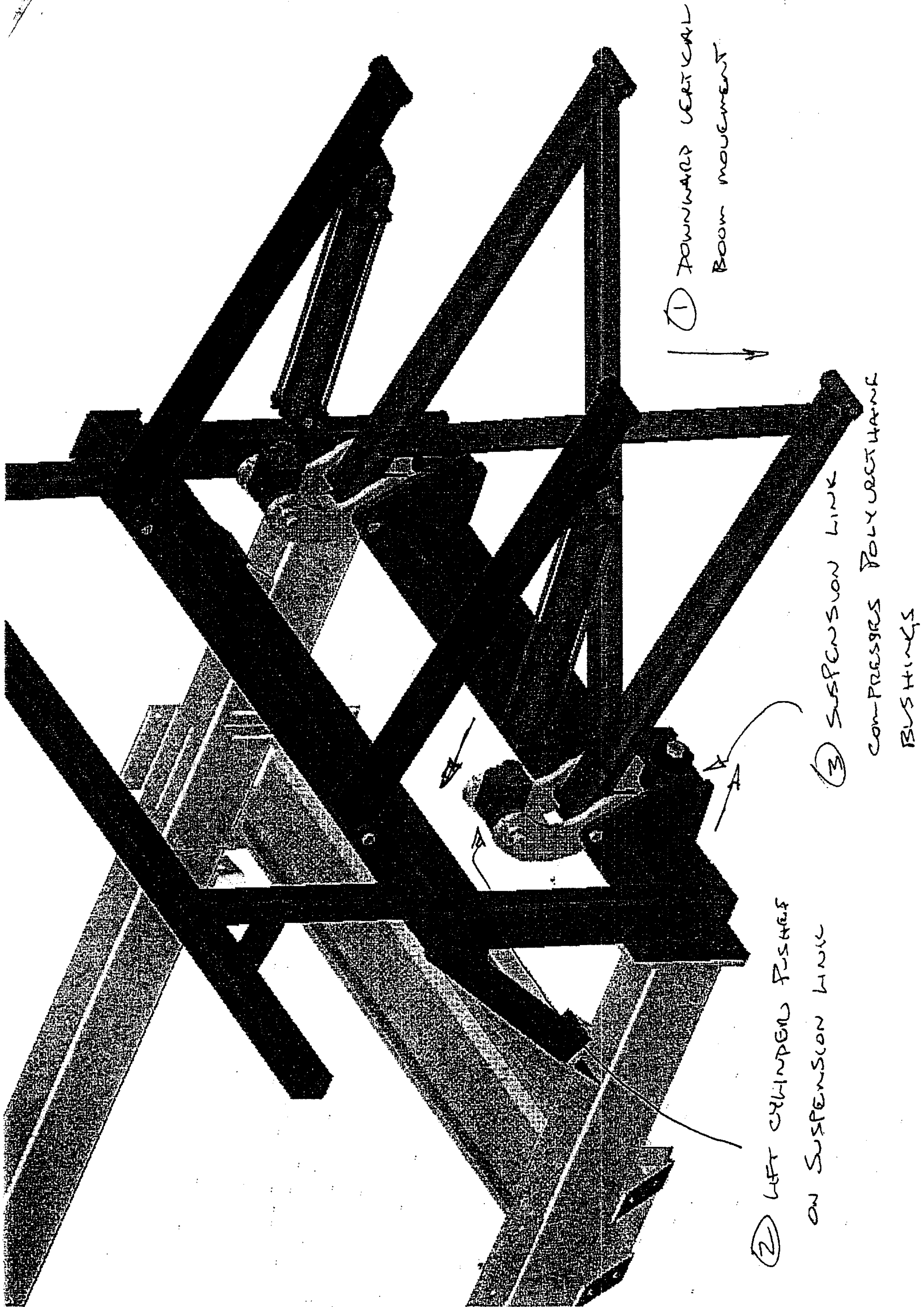
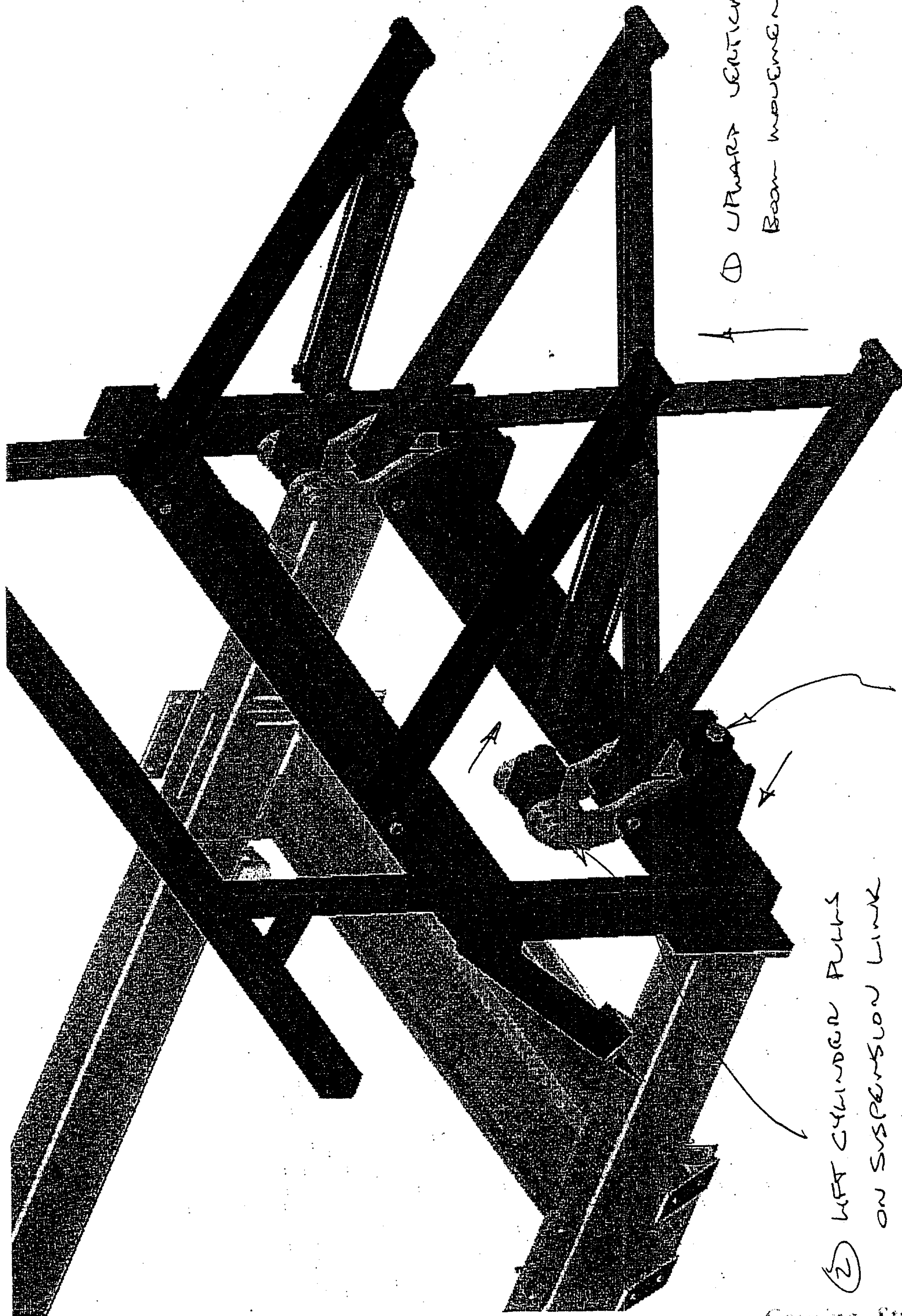


Figure 7

SUSPENDED BOOM  
CART SUSPENSION OPERATION





① UPWARD VERTICAL  
BEAM MOVEMENT

③ SUSPENSION LINK PULLS  
BOLT AND WASHER PLATE  
WHICH COMPRESSES POLY BUSHING

② LEFT CYLINDER PULLS  
ON SUSPENSION LINK

SUSPENDED BEAM  
CANT SUSPENSION OPERATION!

Figure 8



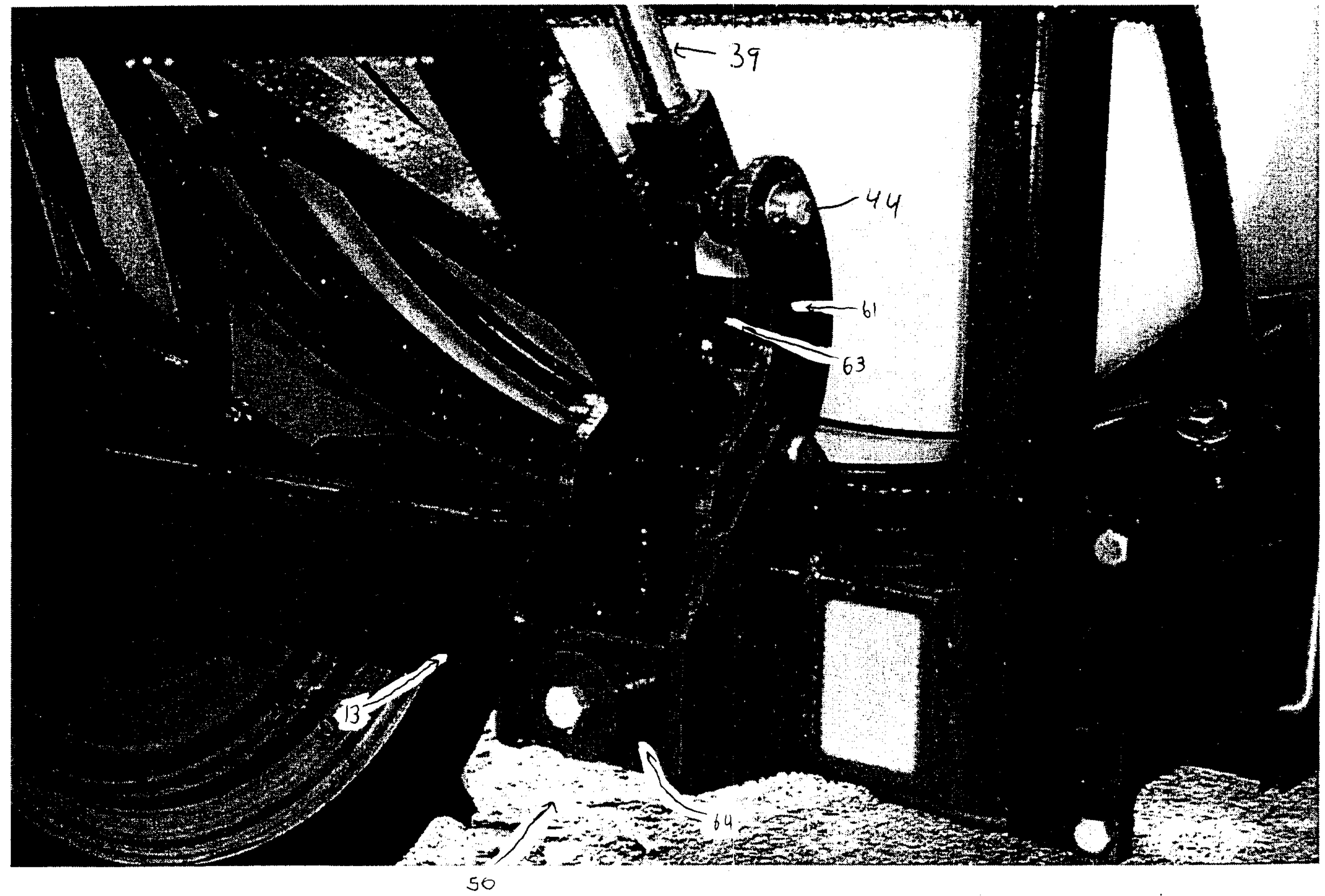


Figure 9



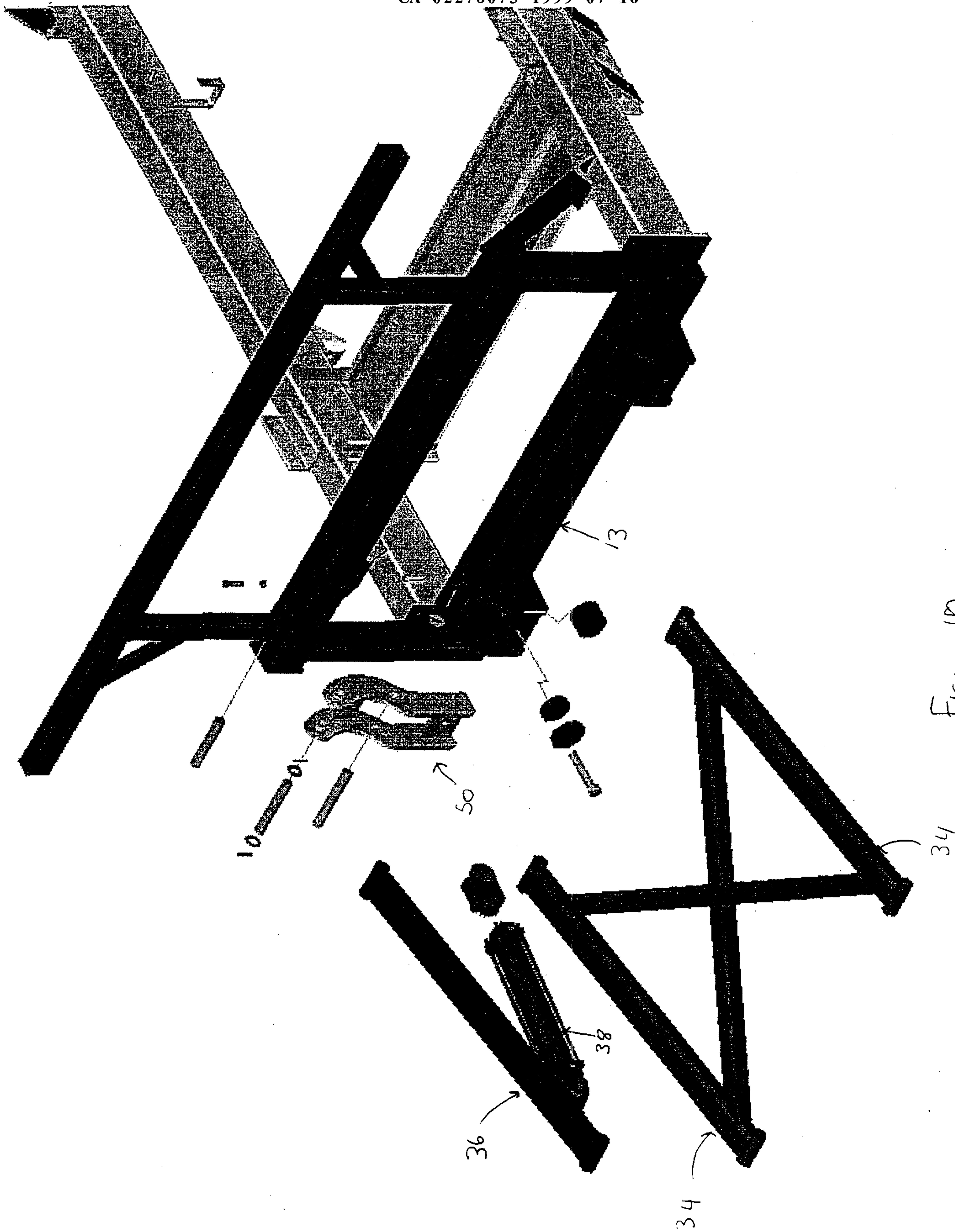


Figure 10

