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Herbicidal spray boom

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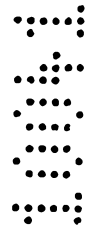
(71) Applicant(s)
Angcon Pty Ltd

(72) Inventor(s)
Leon Andretzke

(74) Agent/Attorney
**A.P.T. PATENT AND TRADE MARK ATTORNEYS,GPO Box 772,ADELAIDE SA
5001**

ABSTRACT

A spray boom adapted for spraying herbicide or other agricultural chemicals. The spray boom is mounted by a spring release breakaway system to a transport vehicle. The boom has at its outer end a rotatable resilient member extending beyond the end of the spray boom. In operation the resilient rotatable member can contact an obstruction so that as the spring release breakaway system operates the rotatable resilient member can roll partially around the obstruction. The boom may also contain means for constraining drift of the spray material.



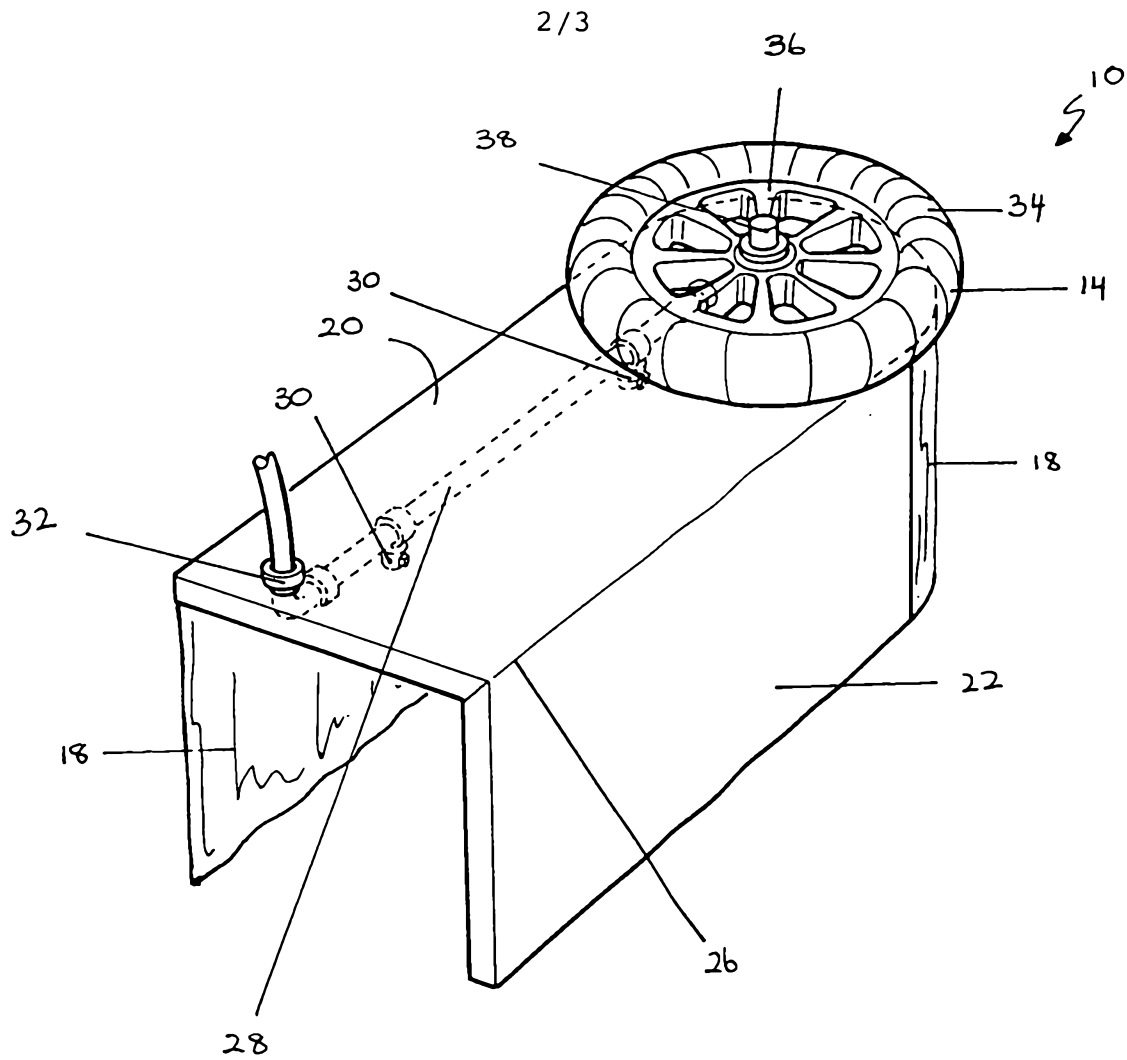
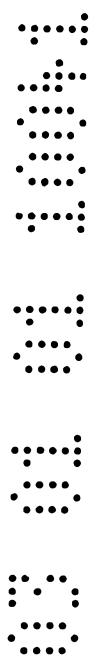


FIGURE 2



AUSTRALIA

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COMPLETE SPECIFICATION

FOR A STANDARD PATENT
ORIGINAL

TO BE COMPLETED BY APPLICANT

Name of Applicant: Angcon Pty Ltd

Actual Inventor: Leon Andretzke

Address for Service: A.P.T. Patent and Trade Mark Attorneys
GPO Box 772, Adelaide, SA 5001

Invention Title: HERBICIDAL SPRAY BOOM

Details of Associated Provisional Application No PQ4941 dated 4 January 2000

The following statement is a full description of this invention, including the best method of performing it known to us:-

This invention relates to a spray boom for spraying herbicide and other agricultural chemicals under plants trees and vines, and in particular to a spray boom which will pass around an obstruction such as a tree or vine and cause minimal damage to the obstruction.

5 BACKGROUND OF THE INVENTION

Herbicides and other agricultural chemicals such as pesticides and fertilisers are often applied using sprays that are distributed using one or more spray nozzles connected to a liquid herbicide spray tank. On a commercial scale in particular, the tank and nozzles are fitted to a vehicle such as a tractor such that the nozzles spray downwardly onto the
10 ground as the vehicle travels over the ground.

The spray nozzles can be located on spray booms or other arrangements that extend outwardly from the vehicle and there is typically more than one spray nozzle on each boom. Known booms can be a single boom that extends laterally to the direction of travel of the vehicle and is towed or otherwise suspended across the rear of the vehicle.
15 Alternatively, and relatively from the point of view of the present invention, separate booms may extend outwardly from either side of the vehicle.

In either form of the known spray booms, the vehicle is driven between rows of trees or vines in an orchard to spray herbicide or the like under the trees or vines. To ameliorate problems with spray drifting and coming into contact with leaves of the trees or vines it
20 has been proposed in the prior art to use spray bells or similar devices to shroud the spray nozzles and present only a downward opening to thereby prevent drift of the spray. An example of such arrangements can be found in US 2,928,610 to Fenimore and US 4,199,896 to Lehman.

A problem with these boom arrangements is that the booms can be snagged on
25 obstructions such as trunks and vines. To obviate this problem it is known to connect the boom to the vehicle using a breakaway mechanism which allows the boom to swing rearwardly upon contact with an obstruction and then to swing back into position after the obstruction is passed.

A problem with this arrangement is that once the boom contacts the obstruction its
30 forward movement is effectively halted until it swings past the obstruction. This results in a trailing of the herbicide around the obstruction, with a high concentration of spray on the approach side of the obstruction and minimal concentration on the leeward side. In an attempt to overcome this problem it has been proposed to use circular rotatable shrouds that are said to reduce the problem of contact with obstructions such as trunks
35 or trellis by rotating when they contact the obstruction. However the diameter of the

shroud limits the number of spray nozzles and hence the area that can be covered. Thus the larger the number of spray nozzles or the larger the area then the larger the diameter of the shroud which obviously becomes impractical.

OBJECT OF THE INVENTION

- 5 It is an object of this invention to provide a spray boom to obviate or minimise at least one of the aforementioned problems, or at least provide the public with a useful choice.

SUMMARY OF THE INVENTION

For the purpose of this specification the word "comprising" means "including but not limited to", and the word "comprise" has a corresponding meaning.

- 10 Reference in this specification to a document is not to be taken as an admission that the disclosure therein constitutes common general knowledge in Australia.

The invention may be said to reside, not necessarily in the broadest or only form, in a spray boom adapted for spraying herbicide or other agricultural chemicals, the spray boom mounted by a spring release breakaway system to a transport vehicle and having
 15 at its outer end a rotatable resilient member extending beyond the end of the spray boom so that in operation the rotatable resilient member can contact an obstruction and as the spring release breakaway system operates the rotatable resilient member can roll partially around the obstruction.

- In use the vehicle may be driven between or alongside rows of trees vines or other
 20 plants with the spray boom spraying herbicide downwardly onto the ground. When the boom contacts an obstruction the resilient rotatable member can absorb some of the impact of the boom before the breakaway mechanism acts to allow the boom to swing as the vehicle moves past the obstruction. At the same time the resilient rotatable member can roll around the obstruction and therefore minimise 'catching' of the boom
 25 on the obstruction. In this way the speed of the boom will be more constant and the boom can more quickly return to its normal position.

- Preferably, the rotatable resilient member is capable of absorbing at least part of the impact when the boom contacts the obstruction. The resilient rotatable member may be a wheel that is rotatable about a vertical axis located at the end of the boom. Preferably
 30 the wheel includes a resilient periphery which contacts the object and absorbs part of the impact. The resilient rotatable member preferably rotates independently of the frame and skirt.

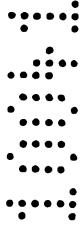
Preferably the boom also contains means for constraining drift of the spray material. The means for constraining drift of the spray material may be a frame having a

Figures 1 to 5 show a spray boom of the present invention. The boom (10) is adapted for spraying herbicide or other agricultural chemicals and is mounted by a spring release breakaway system to a transport vehicle (12). The boom has at its outer end a rotatable resilient member (14) extending beyond the end of the spray boom. In operation, the rotatable resilient member can contact an obstruction such as a tree trunk and as the spring release breakaway system operates the rotatable resilient member can roll partially around the obstruction. The boom also contains means for constraining the spray material in the form of a frame (16) carrying a skirt (18) which extends along the sides of boom and around the ends thereof.

10 The frame (16) has a generally horizontal top plate (20) and a downwardly extending leading face plate (22). In plan view the top plate (20) is generally rectilinear except for a semi-circular or rounded outer end. The diameter of the semi-circular end is less than the diameter of the rotatable resilient member, as discussed later.

A flexible skirt (18) extends along a trailing side (24) of the boom and around each end thereof. Any suitable material that is flexible and resistant to agricultural chemicals can be used for the skirt, and for example a plastics sheet material having a woven central middle layer with a PVC coating on both sides is suitable. Alternatively sheet rubber or other elastomeric sheet material could be used. Preferably the weight of the skirt is such that it is not readily blown by wind or the like so that in usual conditions of operation the skirt hangs downwardly from the frame to thereby contain the spray. The skirt is connected to the top plate (20) by way of a vertical flange (21) that extends downwardly from the top plate. The skirt is attached to the flange using any suitable means, including rivets, press studs or the like.

The top (20) and leading face (22) plates of the frame are formed from stainless steel sheet and are therefore relatively resilient. In an alternative that is not illustrated, the flexible skirt (18) can extend downwardly from the leading and trailing edges and the ends of the top plate (20), however when the flexible skirt is used at the leading edge it is easily deflected upwardly by small weeds or plants and when it is so deflected it provides a sloped surface which directs droplets of herbicide or condensate away from the base of the weed or plant. In contrast the relatively resilient leading face plate (22) extends about 180mm downwardly from the leading edge (26) of the top section and, due to the resilient nature of the material, it functions to push over larger weeds as the boom travels over them. This has the effect of laying the larger weeds more or less horizontally and leads to them being more fully covered with spray as the boom travels over them.



In a further alternative that is not illustrated the skirt could be a relatively rigid material, although it will be appreciated that this embodiment may not be particularly suited to use on variable terrain.

As best seen in Figures 2 to 5, the frame carries a spray pipe (28) and a plurality of spray nozzles (30). The pipe is attached to the underside of top plate (20) using suitable brackets. Two nozzles are shown but the number may vary depending upon the length of the boom, the type of spray nozzles used and the coverage required. The nozzles are positioned to spray downwardly in a circular spray pattern. The pipe is made from stainless steel or other suitable corrosion resistant material such as plastic and is in fluid connection with a tank for containing the herbicide or other agricultural fluid. The tank can be towed by the vehicle or supported on the vehicle itself. An inlet (32) to the pipe passes through the top plate (20) and includes a coupling for connection to hosing running from the tank, as is known in the art. Electronically and/or mechanically controlled valves can be used to regulate flow of fluid through the pipe and sprayers.

At the end of the boom there is provided a rotatable resilient member (14). In the example shown this is a tyre (34) mounted on a wheel (36) or rim rotatable about a vertical axle (38) fixed adjacent the outer end of the boom. The axle is fixed to the top surface of the frame using any suitable means. A washer is placed between the frame and the wheel and the at the top of the wheel and the wheel is fixed vertically with respect to the axle using split pins or nuts, or an other suitable means.

The tyre extends beyond the end of the boom and preferably the end of the boom is also part circular of lesser diameter than the outer periphery of the tyre so that it is always ensured that the tyre will contact any obstruction, such as the trunk of a tree or vine.

The tyre on the wheel may not be inflated, or may be inflated to a desired pressure.

However it is preferred that the resilience of the tyre be such that it will deflect to absorb the impact of the boom on the trunk, and then roll around the trunk of the tree or vine.

While a tyre has been described as the preferred member to be mounted on the end of the boom, it is to be realised that the rotatable member may be other than a tyre, as long as it will have the capacity to absorb the impact on the trunk and then roll around the trunk. Similarly, the wheel need not be located on top of the boom but could be located at any vertical position at the end of the beam provided it extends beyond the end of the boom.

The spring release break away mechanism (40) can be any of the break away mechanisms known in the art and examples can be found in US 4,768,715 to Sali, US

5,012,608 to Brown and AU 651271 to Redway. Briefly, the breakaway mechanism depicted in Figure 1 includes a horizontal connecting arm (42) which is hingedly connected to a vertical post (44) which is in turn connected to the side of the vehicle using a suitable frame. The hinged connection between the connecting arm (42) and the post (44) allow the connecting arm to rotate upwardly in a vertical plane so that the spray boom can be raised out of the way for ease of transport. In addition the connecting arm is rotatable rearwardly so that when the connected spray boom contacts an obstruction such as a tree the boom and connecting arm can swing rearwardly in a horizontal plane. The rearward rotation works against the bias of a compression spring (46) and thence when the obstruction is removed the connecting arm and hence spray boom swings back to the original position. The connecting arm contains a connecting plate (48) on the free end and the spray boom is connected thereto via a right angle bracket (50) which is fixed to the top of the frame. The right angle bracket can be fixed to the connecting plate and to the top of the frame using any suitable connection means, including bolts and/or welding.

The boom is supported at one end by attachment to the breakaway mechanism, but there is no vertical support at the outer end.

The vehicle (12) may be any suitable vehicle such as a tractor or All Terrain Vehicle. In the illustrated embodiment one boom is mounted on each side of the vehicle so as to extend sidewardly at the front of the vehicle. Alternatively the booms could be mounted at the rear or towards the middle of the vehicle.

It will be appreciated that this disclosure is not intended to limit the invention to preferred embodiment or details thereof. A person skilled in the art would readily be able to conceive other embodiments of the invention and as such these other embodiments would all fall within the spirit of the invention disclosed herein.

THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS

1. A spray boom adapted for spraying herbicide or other agricultural chemicals, the spray boom mounted by a spring release breakaway system to a transport vehicle and having at its outer end a rotatable resilient member extending beyond the end of the spray boom so that in operation the rotatable resilient member can contact an
5 obstruction and as the spring release break away system operates the rotatable resilient member can roll partially around the obstruction.

2. A spray boom as in claim 1 wherein the rotatable resilient member is capable absorbing at least part of the impact when the boom contacts the obstruction.

10 3. A spray boom as in claim 2 wherein the rotatable resilient member is a wheel that is rotatable about a vertical axis located adjacent the end of the boom.

4. A spray boom as in any one of claims 1 to 3 wherein the boom contains means for constraining drift of the spray material.

15 5. A spray boom as in claim 4 wherein the means for constraining drift of the spray material is a frame and skirting which encase the top and sides of the boom to prevent the spray material exiting in those directions.

6. A spray boom as in claim 5 wherein the frame has a relatively rigid horizontal upper surface with a rigid leading face depending downwardly from a leading edge of the upper surface, and a flexible peripheral skirt depending downwardly from other
20 edges of the upper surface.

7. A spray boom as in claim 6 wherein separate spray booms are fitted on each side of the vehicle.

8. A spray boom as in claim 7 wherein a plurality of spray nozzles are linearly arranged on each boom.

25 9. A vehicle including a spray boom of any one of the preceding claims.

10. A spray boom substantially as hereinbefore described with reference to the accompanying figures.

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Dated this 3rd day of January 2001

ANGCON PTY LTD
By their Patent Attorneys
A. P. T. Patent and Trade Mark Attorneys

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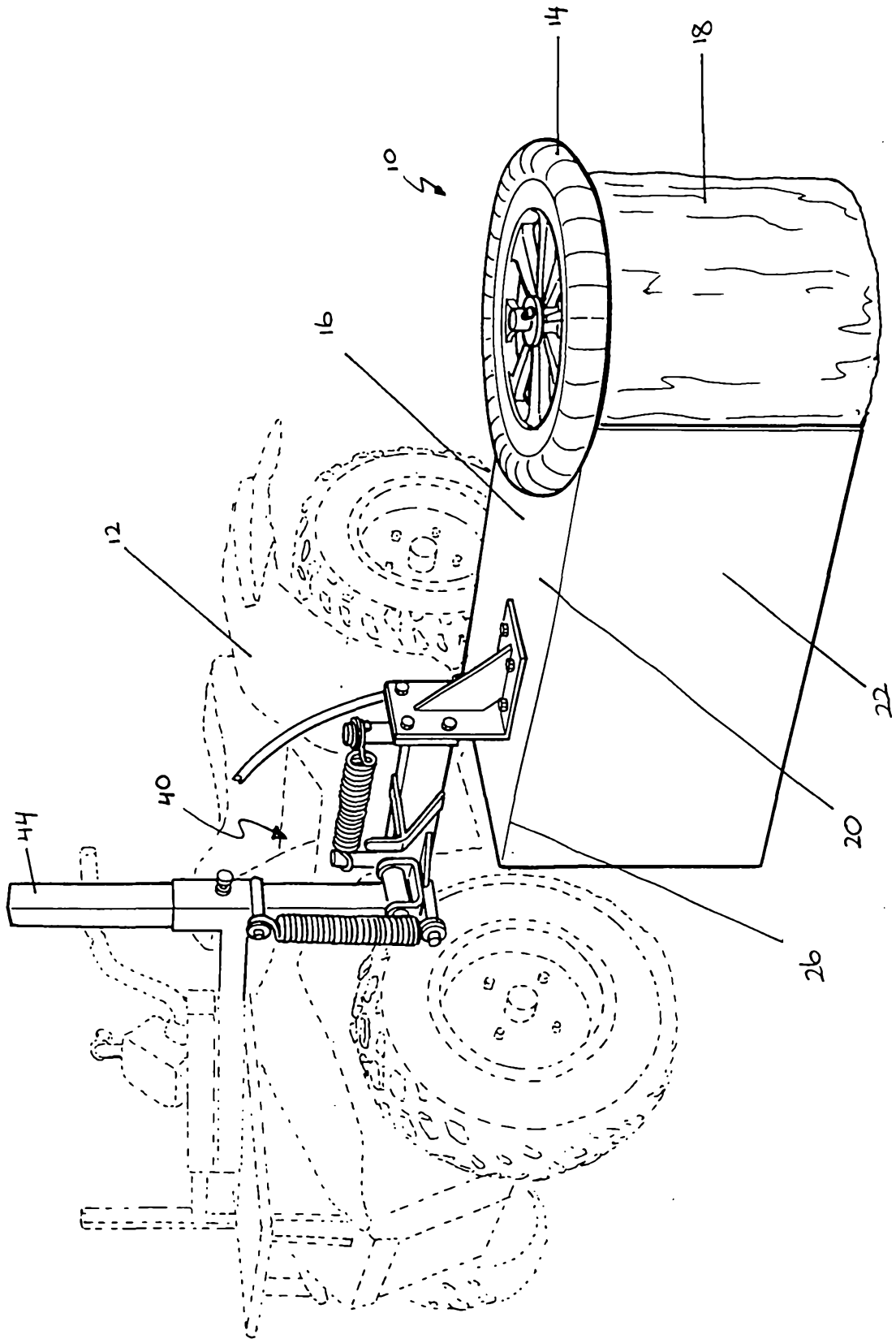


FIGURE 1

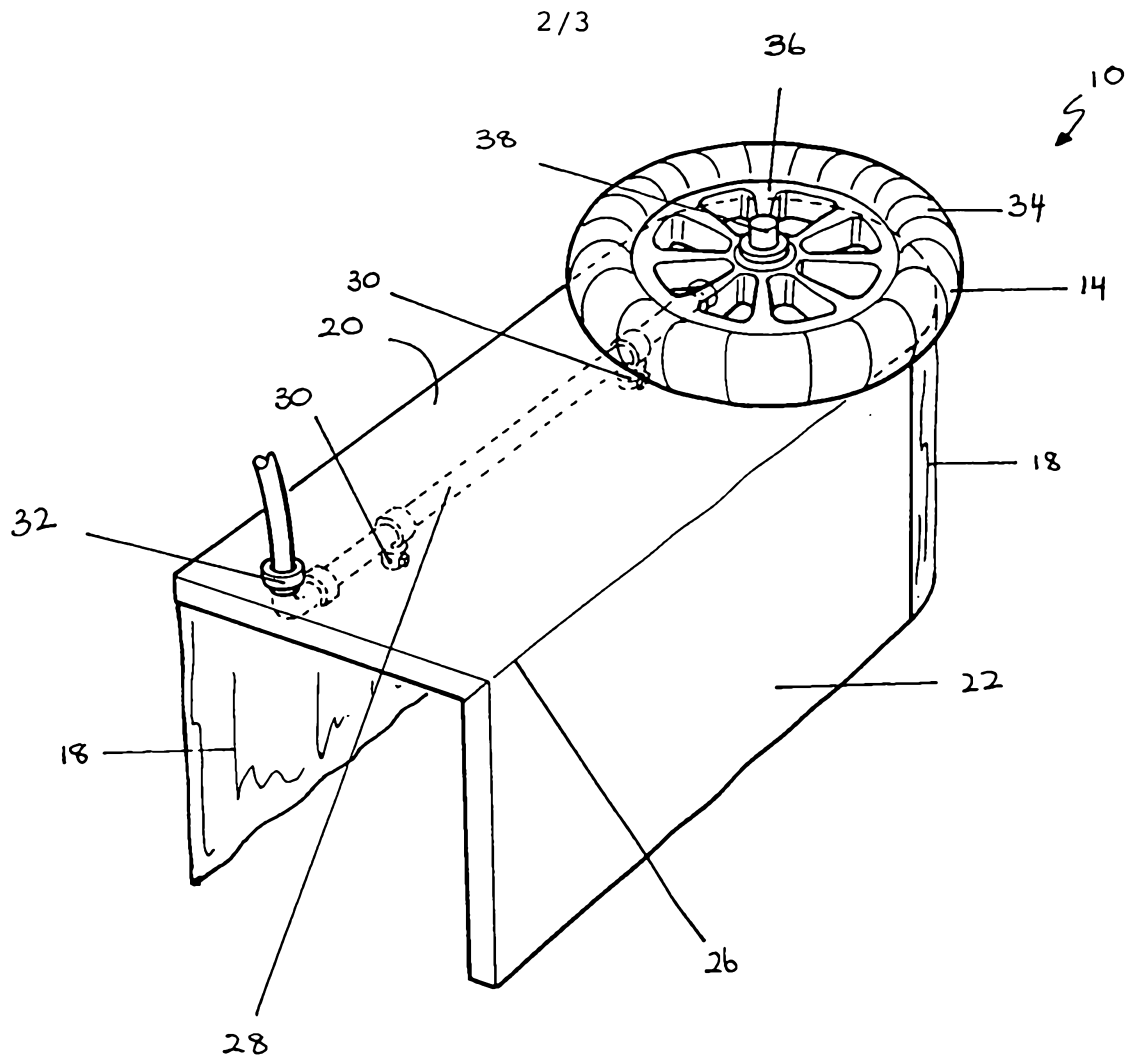
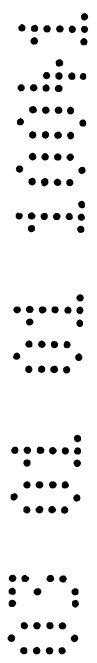


FIGURE 2



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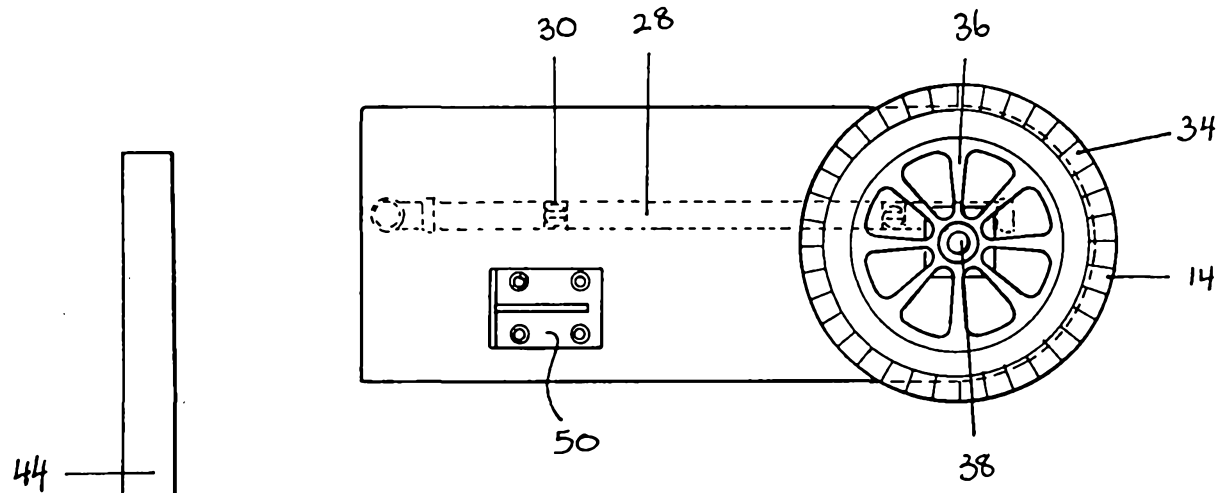


FIGURE 3

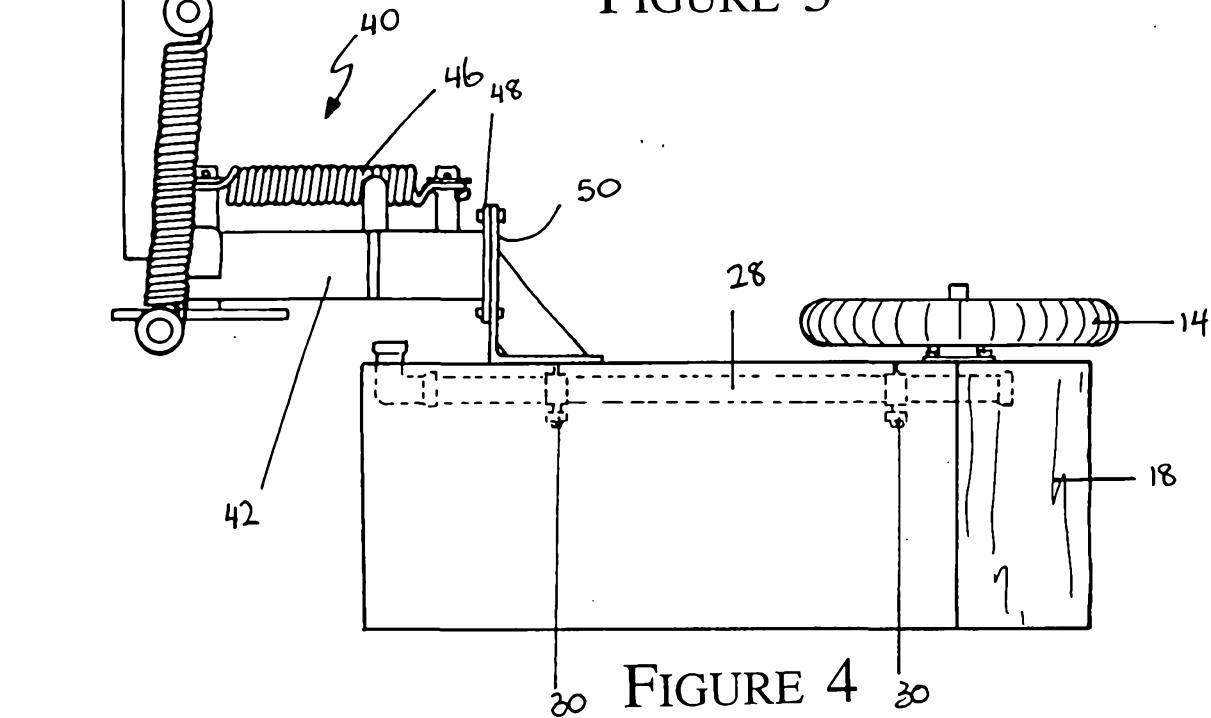


FIGURE 4

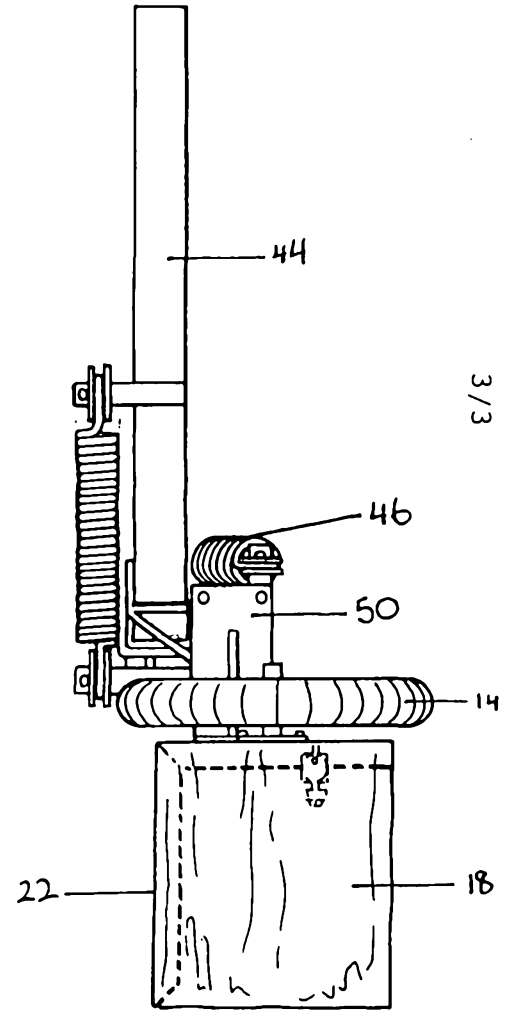


FIGURE 5