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Moore et al.

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[54] **FULL COVERAGE RECIRCULATING SPRAYER**

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[73] Assignee: **Sprayrite Manufacturing Co.**, West Helena, Ark.

[21] Appl. No.: **165,132**

[22] Filed: **Jul. 1, 1980**

Related U.S. Patent Documents

Reissue of:

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Filed: **Feb. 2, 1978**

[51] **Int. Cl.**[3] **B05B 1/28**

[52] **U.S. Cl.** **239/121**; 239/148; 239/175; 47/1.7

[58] **Field of Search** 239/120, 121, 124, 148, 239/145, 146, 159, 170, 172, 175; 4.7/1.5, 1.7; 111/1; 261/106, 98

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[57] **ABSTRACT**

A recirculating sprayer adapted for mounting on a vehicle is improved for use at increased travel speed and for operation in higher wind conditions by angling the solid spray streams forwardly or rearwardly from a direction transverse to the travel direction. The sprays are employed in criss-cross, opposite pairs, with the spray stream patterns of adjacent pairs of spray nozzles abutting or overlapping one another for full coverage of all upstanding weeds or crops in an area traversed by the sprayer. A series of collector mats or panels may be arranged transverse to the travel direction, with sprays trained thereon for contacting each weed twice in its upstanding position once by each spray of a pair; the weeds may also be contacted once more as they are bent forward to pass beneath the panels and a reservoir thereunder. The collector may also be arranged in panels parallel to the travel direction, for increased ease in negotiating sloping terrain. Spray liquid is collected from the collector panel(s) into reservoirs therebelow and is recirculated for reuse.

31 Claims, 11 Drawing Figures

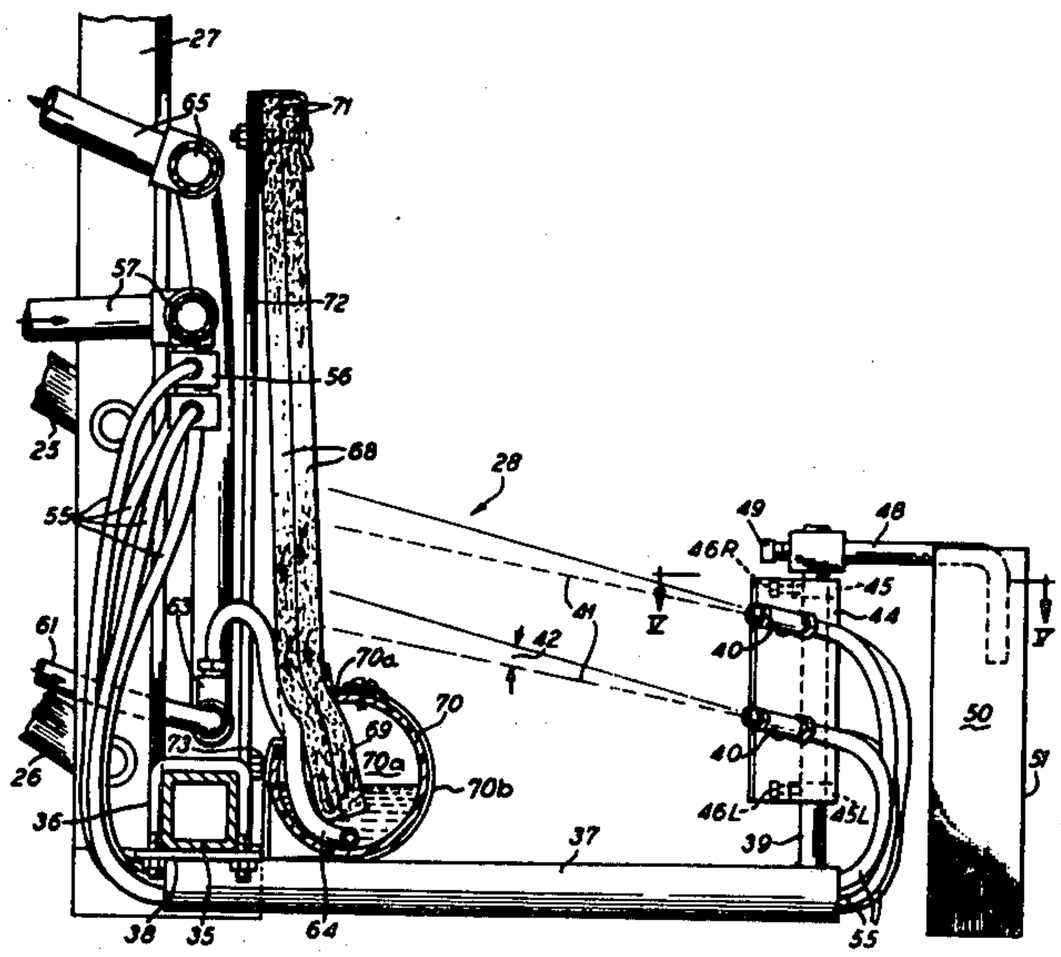


Fig. 1

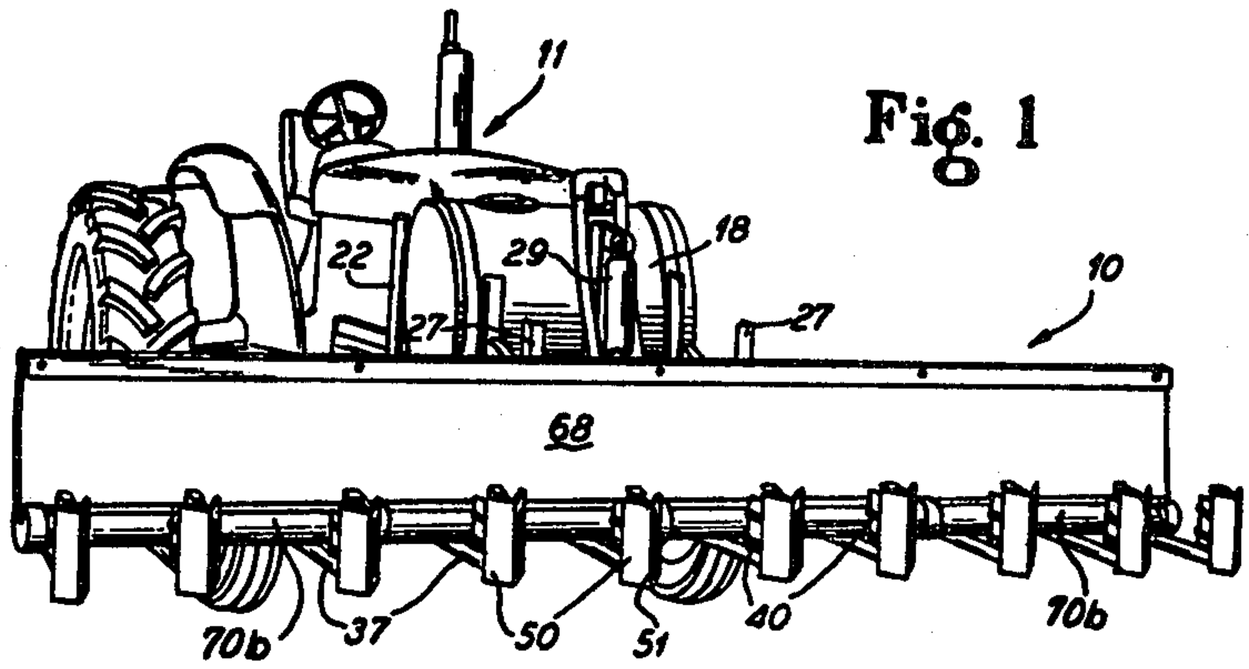


Fig. 4

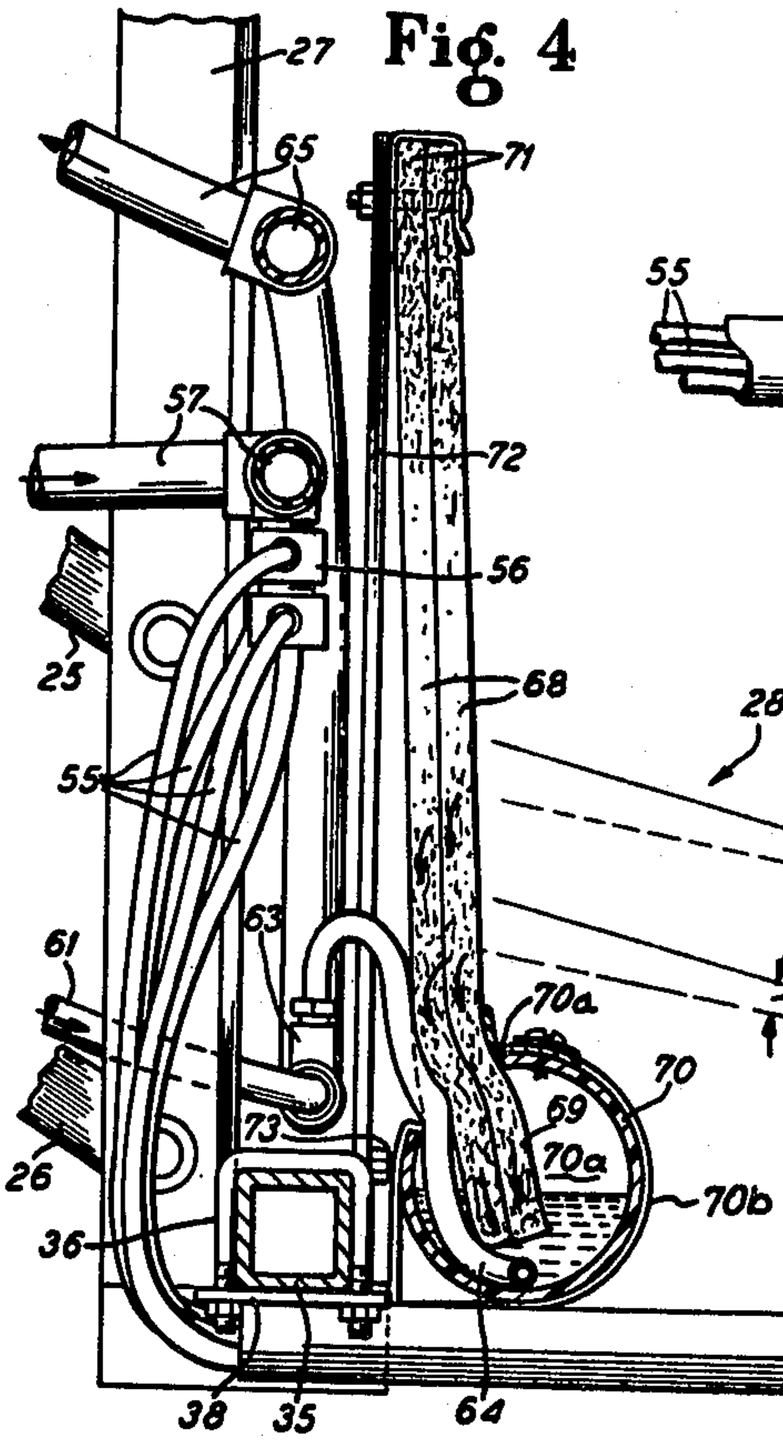
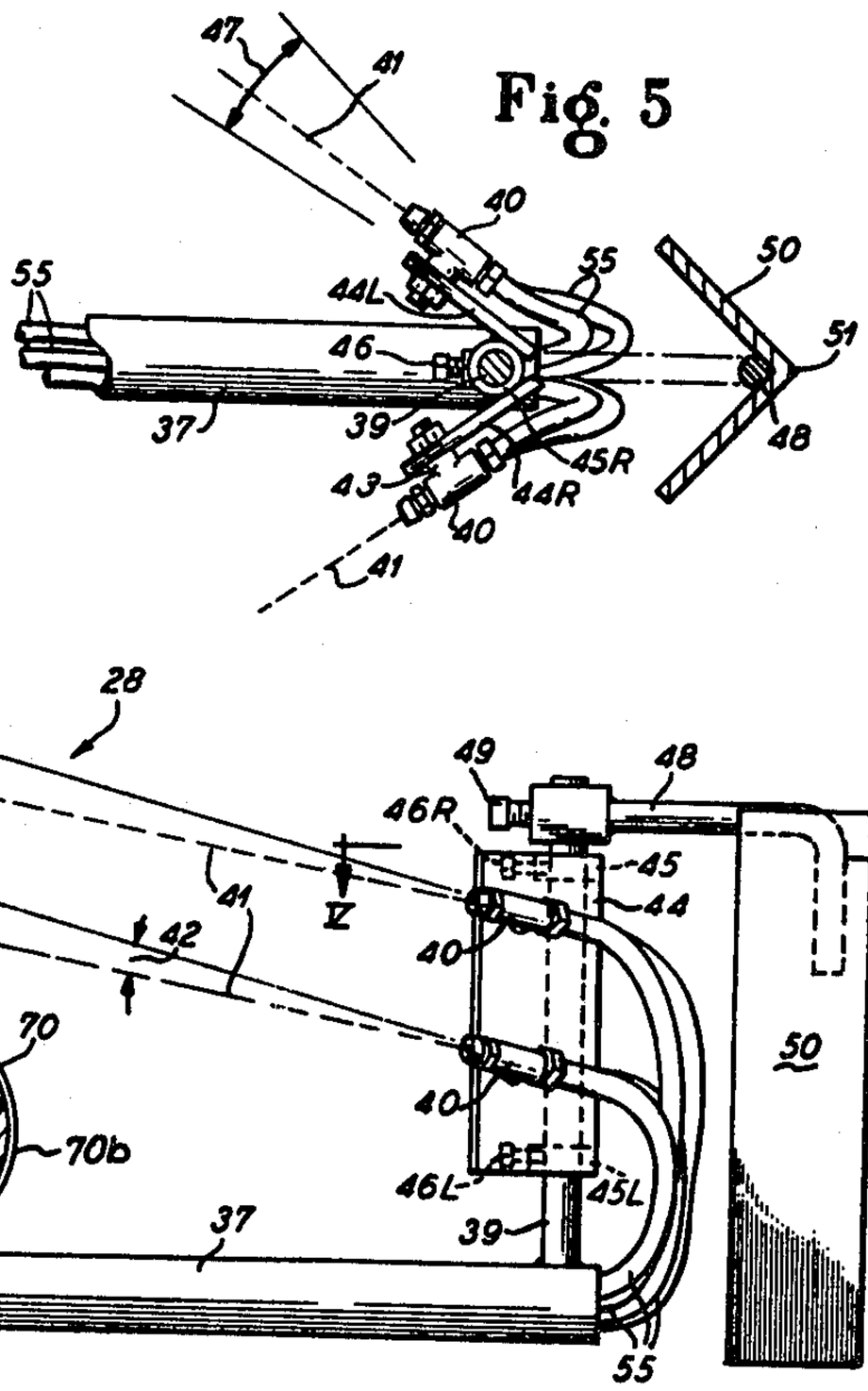


Fig. 5



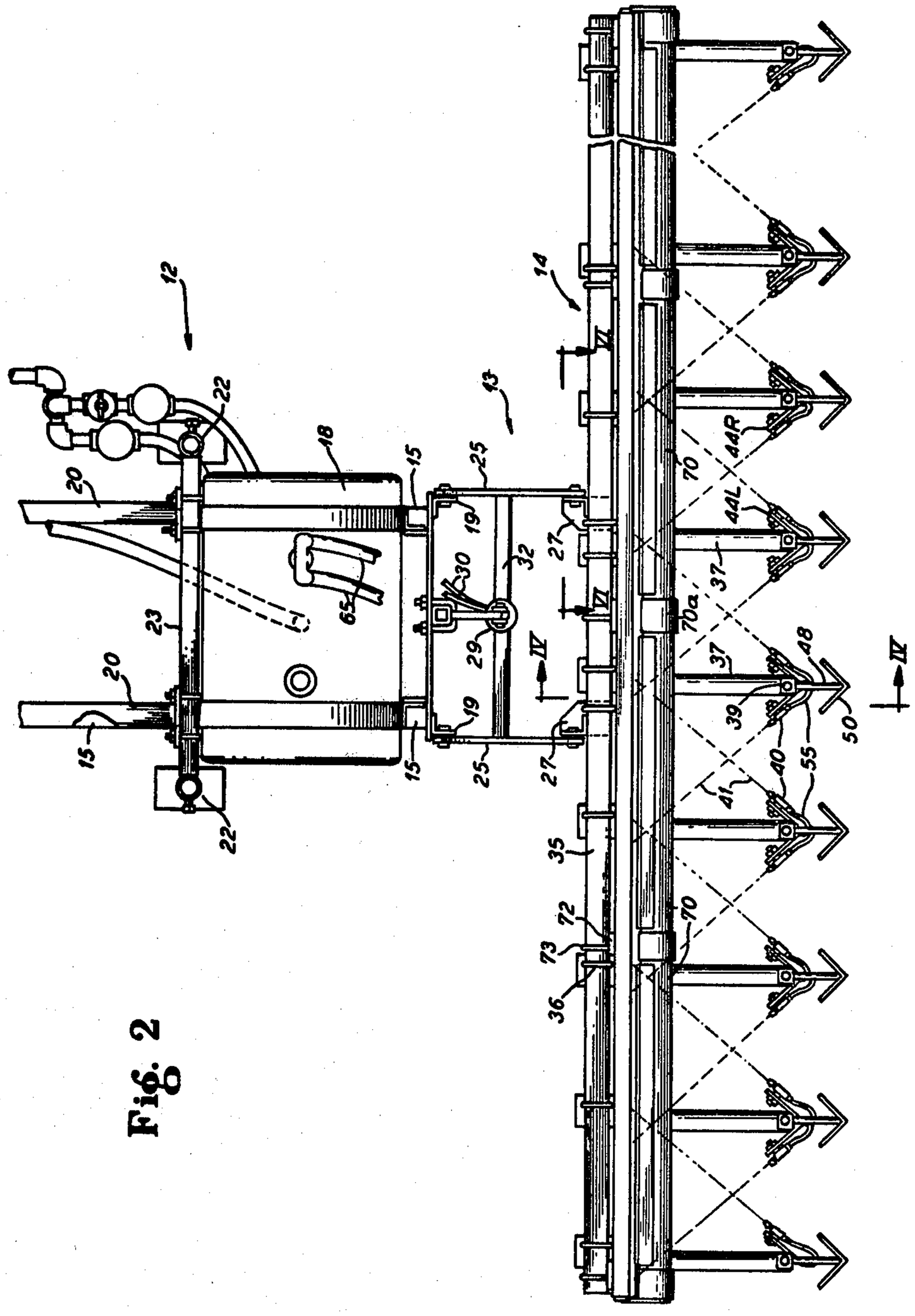

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Fig. 2

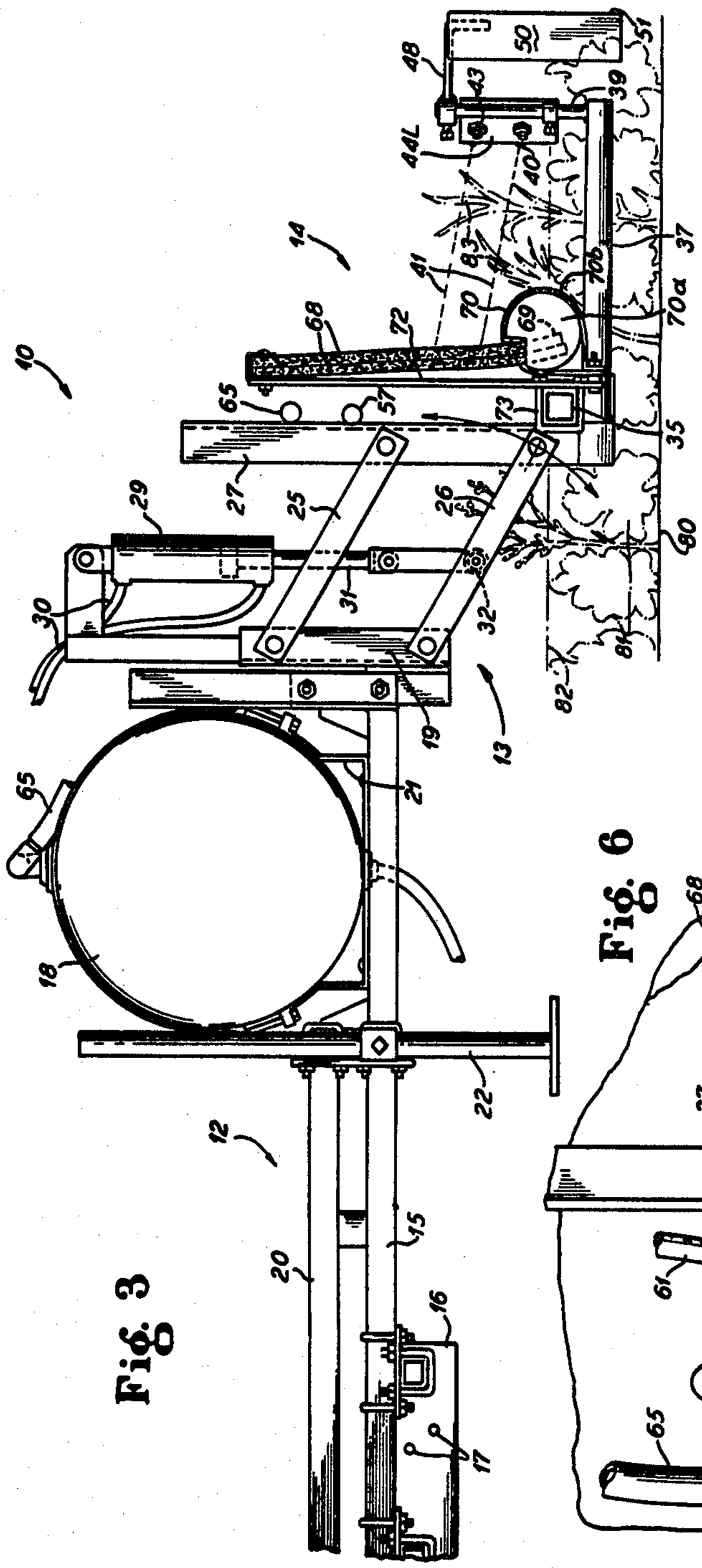


Fig. 3

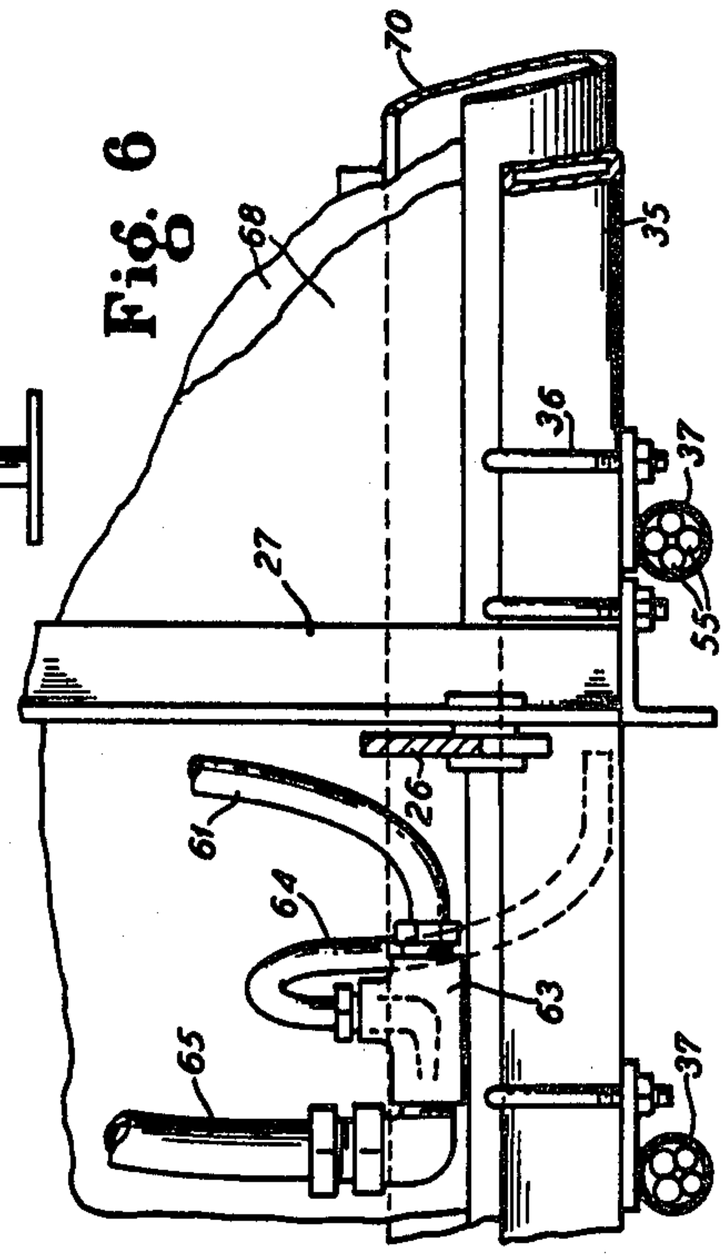


Fig. 6

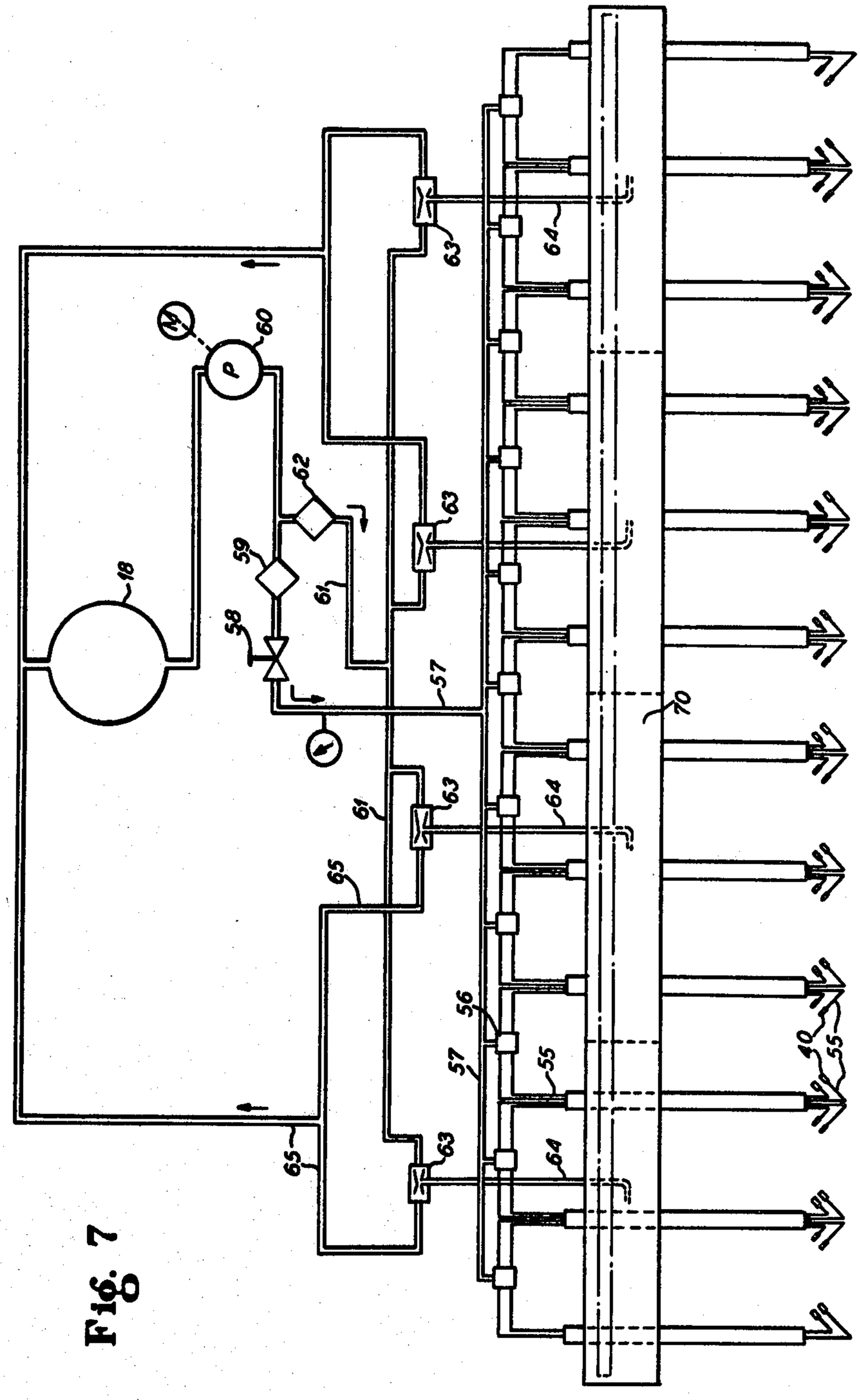


Fig. 7

Fig. 8

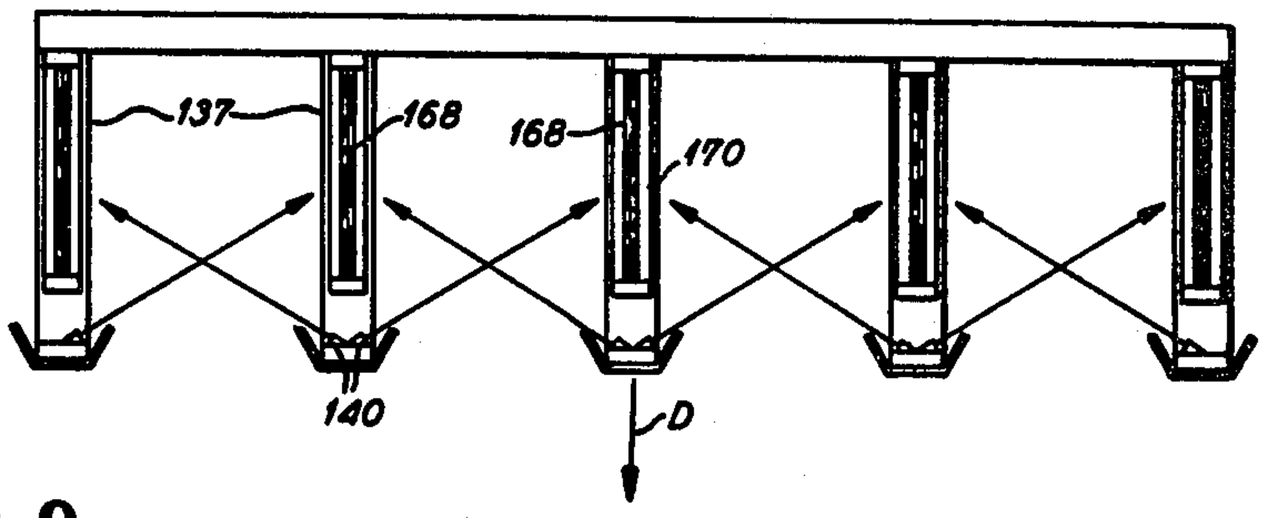


Fig. 9

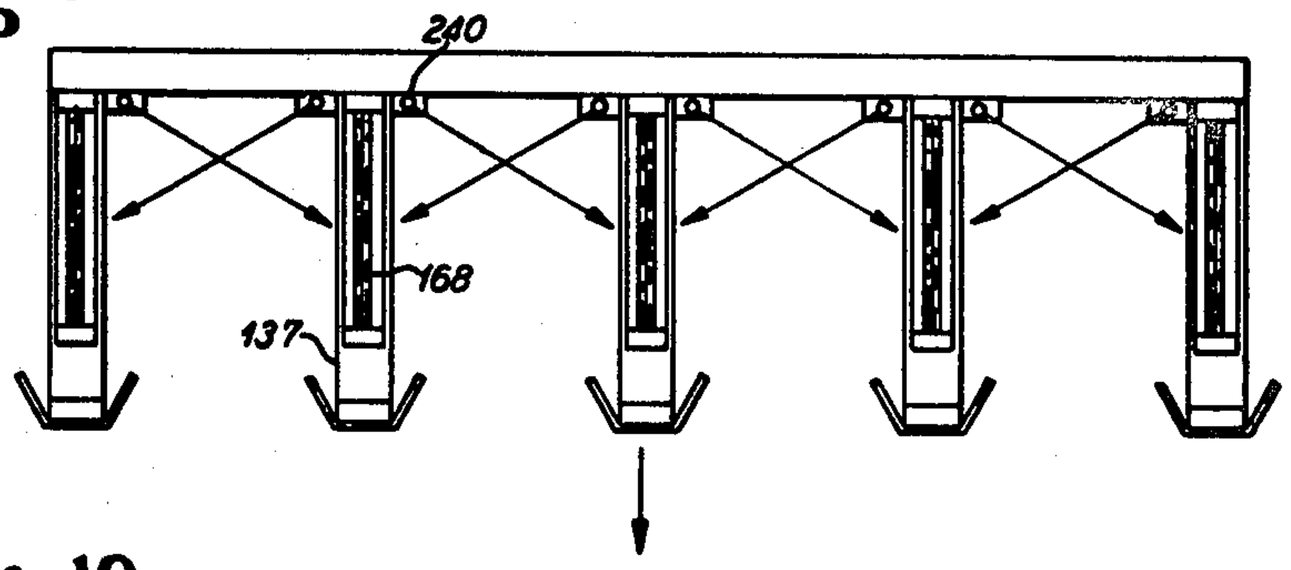


Fig. 10

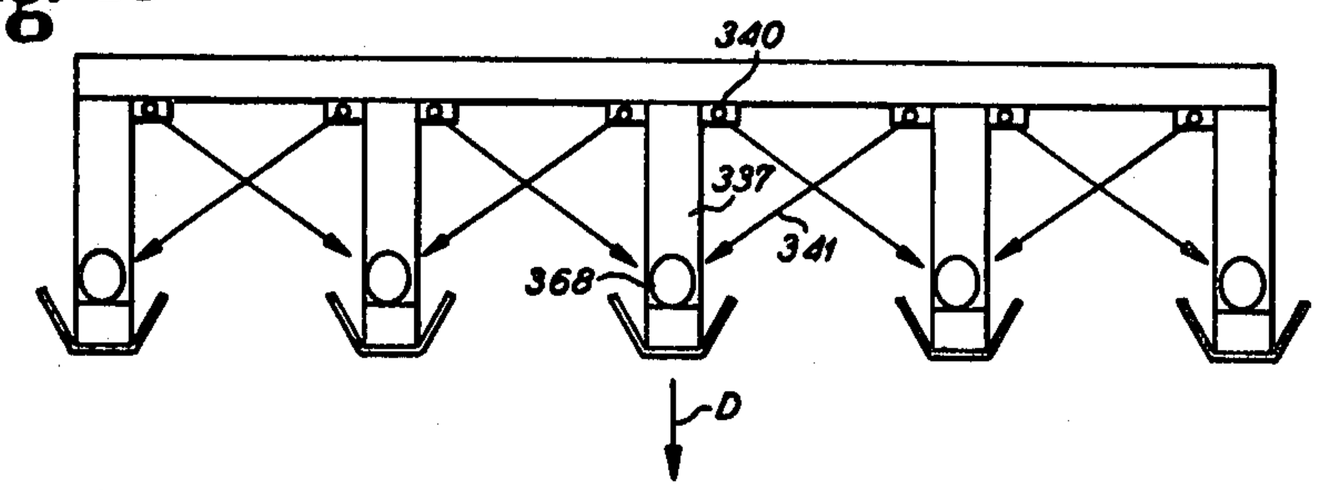
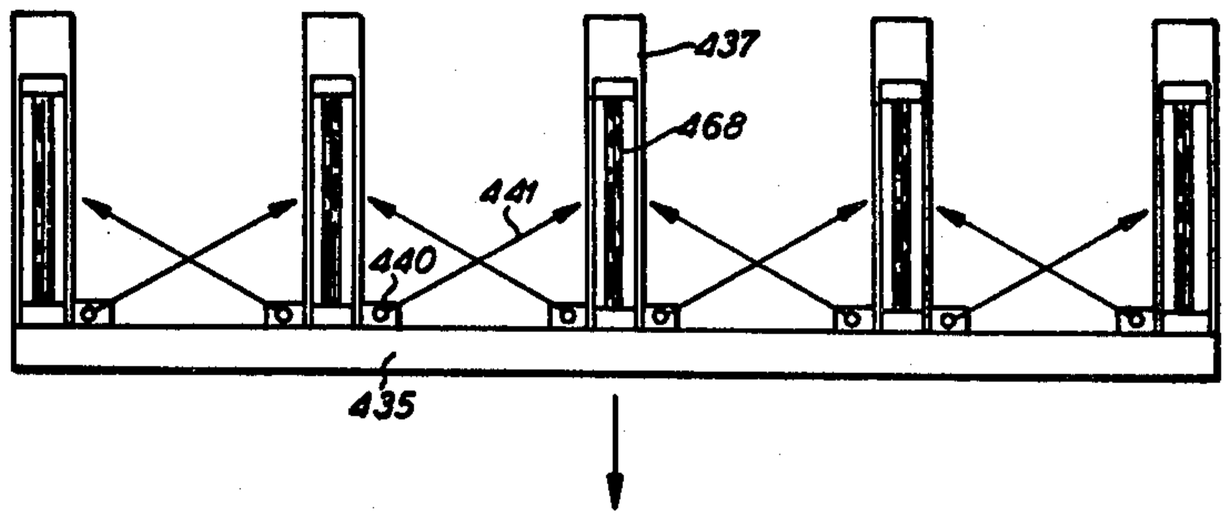


Fig. 11



FULL COVERAGE RECIRCULATING SPRAYER

Matter enclosed in heavy brackets [ ] appears in the original patent but forms no part of this reissue specification; matter printed in italics indicates the additions made by reissue.

BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to herbicide and/or insecticide application devices for farm crops and pastures, the devices reclaiming and reusing spray material which has not contacted target weeds or other plant material.

2. The Prior Art

Prior methods of herbicide application have lost 100% of all chemical material exiting a spray nozzle orifice, onto target plants, crops, and the soil. All herbicide material not actually contacting the target weed plants constitutes an economic loss, decreases weed control efficiency, and also increases concentration of herbicides in the soil and on the useful crop plants.

Recirculating sprayers have been developed within the last several years by the Delta branch Experiment Station at Stoneville, Mississippi. The device, commercialized in several forms, is substantially limited to application with row-planted crops only. Solid streams sprayed substantially transversely to the direction of sprayer travel are directed into fairly wide collector boxes. Areas beneath the collector boxes and between the spray nozzles are not traversed by any herbicide sprays, leaving ribbons of untreated weeds. Also, such prior art devices are limited in their travel speed capabilities and their operating characteristics in higher winds.

SUMMARY OF THE INVENTION

An improved recirculating sprayer wherein solid spray streams are angled rearwardly or forwardly in opposed pairs with respect to a direction transverse to the travel direction of the vehicle carrying the sprayer. The opposed streams form criss-cross patterns for double-contact coverage of weeds standing above the crop. Adjacent stream patterns abut or overlap one another for substantially 100% contact with all weeds traversed by the sprayer. Fibrous collector panels for capturing and recirculating unused spray may be arranged either transversely to or parallel to the travel direction.

THE DRAWINGS

FIG. **1** is a front side view in perspective of a farm tractor with the spray assembly of the present invention mounted on the front thereof.

FIG. **2** is a top plan view of the sprayer assembly of the present invention, in operation.

FIG. **3** is a side elevational view of the apparatus of the invention.

FIG. **4** is a detail, side-sectional view taken on line IV—IV of FIG. **2**.

FIG. **5** is a top plan view, partly in section, taken on line V—V of FIG. **4**.

FIG. **6** is a rear elevational view, partly in section, taken on line VI—VI of FIG. **2**.

FIG. **7** is a schematic diagram of the plumbing and control systems for the sprayer assembly.

FIGS. **8** through **11** are top plan views, partly schematic, of sprayer assemblies employing collector panels arranged parallel to the direction of travel, and with various spray patterns and collector features.

THE PREFERRED EMBODIMENTS

A sprayer assembly **10** is carried for traversal of an agricultural area by a tractor **11** or other vehicle, as in FIG. **1**. The sprayer assembly **10** comprises a support framework **12**, a height adjustment mechanism **13**, and an application and collector section **14**. As shown in FIGS. **2** and **3**, the support framework **12** comprises longitudinal struts **15** which are carried by a bracket **16** connected as by means of bolts **17** to the main frame of the tractor **11**. The longitudinal struts **15** extend forwardly of the tractor **11** and support there a herbicide tank **18** and a rearward, vertical member **19** of the height adjustment mechanism **[14]** *13*. Upper stringers **20** are connected to the rear part of the longitudinal struts **15** as shown to support same against excess bending stresses. A bracket **21** attached to the forward part of each of the struts **15** supports the tank **18**. A pair of vertically adjustable feet **22** are positioned at either end of a cross member **23** affixed to the struts **15** for selective ground support for storage of the sprayer assembly **10** between uses.

The height adjustment mechanism **13** comprises a pair of parallel links **25, 26** on either side of a center line of the assembly. The links **25, 26** together with the fixed rearward vertical members **19, 19** and forward members **27, 27** provide for parallel lifting of the spray applicator and collector section **14** with respect to the tractor **11** and frame support **15**. An hydraulic cylinder **29** is remotely controllable from the tractor seat via fluid lines **30**. An actuating rod **31** of the hydraulic cylinder **29** engages and actuates the lower parallel lines **26** by a horizontal link **32**.

The spray applicator and collector section **14** in a first embodiment of the invention is constructed about a horizontal bar **35** connected to the front uprights **27** of the height adjustment mechanism **13**. The bar **35** is thus carried transversely to the direction of travel of the tractor **11** and establishes a firm support for the spray mechanism **14** across its entire operating width. Such width may be greater for applications where fields are relatively flat, but must be smaller where fields are more uneven.

Attached by means of U-bolts **36** to the horizontal bar **35** are a plurality of projecting spray booms **37**, each attached to a plate **38** receiving the U-bolt **36** therethrough. Each spray boom **37** is thus adjustable laterally along the horizontal bar **35** to effect any selected spacing between them. Carried on a front end of each bar **37** is an upstanding pin **39** connected irrotatably thereto. Each pin **39** carries a plurality of spray nozzles **40**. Each nozzle **40** creates a solid stream of liquid **41**, rather than a cone or mist of spray, to avoid loss of liquid which would drift onto the top and the soil.

Each nozzle **40** is adjustable as at **42** in FIG. **4** in a vertical plane from about 10° above the horizontal to about 30°, by means of an adjustable coupling **42** between each nozzle **40** and a nozzle carrier plate **44** connected to the upstanding pin **39**. Adjustment of the rotational position of the plate **44** is effected by means of a collar **45** thereon engaging about the pin **39** and having a set screw **46**. Left and right side nozzle plates **44L** and **44R** have collars at opposite vertical ends thereof to avoid interfering with one another. In accordance with the invention, adjustment of the spray **41** rearwardly or

forwardly from the direction transverse to the direction of travel is accomplished through the arc **47**, in FIG. **5**; angles between about 15° and 45° from scuh transverse direction have been found most effective. At the top of the pin **39** a shield boom **48** is carried and is secured by means of a further set screw **49**. The shield boom **48** carries at its forward end an angled shield **50** having a sharp leading edge **51** for diverting tall weeds to either side of the spray boom **37** and the components carried thereon.

The spray nozzles **40** are supplied with pressurized herbicide or other spray fluid by means of plastic tubes **55** passing through the spray boom **37** and connecting to a distributor head **56**. The head **56** is supplied with pressurized fluid from a large diameter line **57** extending forwardly to and along the horizontal bar **35**. As developed in the schematic diagram of FIG. **7**, the line **57** is supplied with fluid from the tank **18** through a throttling valve **58** and a filter **59** by a pump **60** driven by the tractor **11** in a conventional manner not shown. A second distributor line **61** is supplied by the pump **60** through a filter **62**. The line **61** supplies a plurality of venturi suction heads **63** which communicate via lines **64** to the bottoms of collector reservoirs **70**, as described below. The venturi heads **63** reduce pressure in the lines **64**, drawing collected liquid from the reservoirs **70** and into output lines **65** connecting together and leading back to the tank **18**. Because of the presence of the throttling valve **58** only in the spray line **57**, the venturi heads **63** get full flow at all times, while the pressure and volume of flow to the spray nozzles **40** is under control of the operator of the tractor **11**.

In further accordance with the principles of the present invention, the solid spray streams **41** are directed by the nozzles **40** to impact upon a collector mat **68** arranged generally vertically to form an absorptive collector surface and, in this embodiment, transverse to the direction of movement of the tractor **11**. As shown in FIG. **2**, each spray **41** [should intersect or overlap] *preferably intersects or overlaps* at least two other sprays before striking the mat **68**, to assure full coverage of the field being traversed. Such is readily accomplished by selection of the boom **37** spacing and the rearward spray angle of the nozzles. The collector **68** preferably comprises one or two thicknesses of matted, fibrous material in which liquid gravitates by capillarity flow. The liquid of the streams **41** impacting upon the material trickles down gravitationally and by capillarity flow through the fibrous material to a lower edge **69** of the mats **68** enclosed within the reservoir **70**. Walls of the reservoir **70** closely abut the mat(s) **68** to limit admission of foreign particles thereinto. The mat of fibrous material **68** also fulfills a secondary function since it tends to operate as a filter, thereby separating contaminants and impurities so that the liquid to be recirculated is relatively clean. The reservoir **70** is segmented along its lateral length as at **70A**, so that side-to-side changes in elevation or attitude of the tractor **11** do not cause all the collected liquid to pass to the lower end of the entire assembly. Upper ends **71** of the mats **68** are attached together and supported by spaced vertical bars **72** connected to the horizontal bar **35**, where they are adjustably retained as by further U-bolts **73**. The mats **68**, being substantially continuous across the entire width of the spray assembly **14** and extending relatively far above the horizontal bar **35**, shield the sprays **41** somewhat from wind.

The reservoir **70** is shown sectioned for plastic material and may conveniently comprise a generally tubular member of polyvinyl chloride (PVC) or some similar chemically resistant material, and which is slotted as at **70a** to admit the fibrous mat **68**. It will be understood that the reservoir **70** could be made of metal, for example, stainless steel. The tubular configuration provides a surface rounded about a vertical axis, thereby forming an abutment surface **70b** which will impact against vegetation and bend it over towards the spray nozzles **40** into the spray pattern **41**. The reservoir also prevents the vegetation from directly engaging the mat **68** of fibrous material.

In operation, the tractor **11** with the sprayer assembly **10** mounted thereon is driven through an agricultural area **80** as in FIG. **3** having desired crops **81** growing thereon to a height **82**. Noxious weeds **83** extending above such crop height **82** may be destroyed by spraying thereon a herbicidal chemical from the tank **18**. The height of the spray section **14** is adjusted by the hydraulic actuator **29** and the parallel links **25, 26**, to a selected height in relation to the crop height **82**. The pump **60** is actuated, sending fluid coursing through the lines **57** and **61**. Throttling valve **58** supplies about 10 psi pressure to the distributor heads **56** and the supply lines **55** going to the spray nozzles **40**. Solid streams **41** ejected from the nozzles **40** contact upper parts of each weed **83** from both left and right sides, due to the criss-cross pattern of spray of the present invention. As shown in FIG. **2**, the spray streams **41** cover with double sprays the entire area traversed by the sprayer assembly **10**, insuring that even those weeds which are aligned with one of the spray booms **37** will receive direct spray from at least one of the nozzles as it is bent to one side or other by the shield **50** and then forwardly by the reservoir tube **70** and bar **35**.

Spray streams **41** not contacting a weed **83** will pass unobstructed to the collector mat **68** and will be collected with minimal splashing and trickle therein to the lower edge **69** thereof for collecting in the reservoir **70**. The herbicide collected from the reservoir **70** is passed through the suction tube **64** to the venturi **63** and back to tank **18** from the line **65**. Thus, when the paths of the streams **41** of the spray assembly **10** are unobstructed, there will be substantially no loss of fluid from the system.

In the embodiment shown, the spray streams **41** are directed rearwardly, opposite to the direction of movement of the tractor **11**. When the reservoir abutment surface **70b** bends vegetation over, the spray nozzles **40** being arranged to project liquid streams above the level of the reservoir **70** will spray directly into the bent over vegetation. This is highly desirable, for example, in treating corn. Moreover, in a weeding process the rounded abutment surface **70b** will not cut or break the vegetation and thereby interfere with the action of a systematic chemical. An important advantage is created by the rearward component of velocity of the spray stream **41**, since the net impact speed of the stream upon the weed material **83** will be somewhat reduced. Thus, the spray assembly of the present invention is able to traverse the ground at speeds substantially double that of known prior art recirculating spray devices. Also, the large collector mats **68** serve to screen the sprays **41** somewhat from wind, enabling the device of the present invention to operate in wind conditions up to three times that of the known prior art. Because the sprayer apparatus **10** is suspended well in front of the tractor **11**,

dust kicked up by the wheels of the tractor cannot generally get into the herbicide system. Further, the fibrous matted material of the collector mats **68** filter any such dust and prevent most of it from passing through the mat to the lower end **69** thereof and into the reservoir **70**.

Other embodiments of the structure of the present invention are shown in FIGS. **8** through **11**. In FIG. **8**, collector mats **168** are arranged parallel to the direction D of travel. Spray nozzles **140** mounted on each spray boom **137** each create one or more solid sprays of liquid herbicide directed toward adjacent collection mats **168**. The sprays of each pair of nozzles between each pair of mats contact each other at or through the collector mats on which they are directed. Reservoirs **170** at the bottoms of the mats **168** collect the fluid as before for siphoning back to the tank.

In the apparatus of FIG. **9**, the spray nozzles **240** are mounted at the rear of the spray booms **137** and spray forwardly rather than rearwardly. In FIG. **10**, the substantially flat mats have been replaced by mats **368** rounded and arranged about vertical axes, for receiving sprays **341** from the rear-mounted spray nozzles **340**. Finally, in FIG. **11**, the horizontal bar **435** is arranged at the front end of the spray apparatus, with spray nozzles **440** directing sprays **441** rearwardly *towards the mats 468*.

Each of the alternate embodiments is useful under different circumstances. Having the collection mats **68** arranged parallel to the direction of travel permits the sprayer to be used on greatly-inclined surfaces, where the sidewardly-mounted reservoirs of the first embodiment would not be useable. In each case, the transverse portion of the apparatus can be closed off, so that the wind shielding effects of the first embodiment can be preserved and enhanced.

Although various minor modifications may be suggested by those versed in the art, it should be understood that we wish to embody within the scope of the patent warranted hereon all such modifications as reasonably and properly come within the scope of our contribution to the art.

We claim as our invention:

1. A full-coverage recirculating sprayer assembly for application of herbicidal and other liquids via [solid] *spray* streams selectively to standing vegetation with recapture of liquid not contacting the vegetation, the sprayer assembly being carried on a vehicle for traversing an agricultural area in a direction; the assembly comprising a source of pressurized liquid carried on said vehicle, a horizontal bar carried on said vehicle and extending laterally of said direction; and a plurality of [solid-stream] *spray-stream* spray nozzles communicating to said source of pressurized liquid, a collector means placed to intercept said streams, and at least one reservoir located below said collector, all carried by said bar, and wherein:

the spray nozzles direct said streams at an angle to the direction of travel of at least 15°;

the spray nozzles are arranged in opposed pairs to provide [complete, criss-cross coverage to] *criss-cross spray patterns covering* all parts of the area traversed;

said collector means comprising *vertically disposed support means and collector mat means formed of* a [mat] *fibrous* material *and* having a vertical orientation *with a connection at the upper end with said support means* and a lower edge; [and]

said reservoir *being disposed* enclosing said lower edge of the collector mat and adapted to collect liquid flowing from the collector[, whereby to reduce wind and travel speed effects on the solid streams of liquid and splashing of said streams as they strike said weeds] *and said reservoir having an abutment surface projecting forwardly in the direction of travel of the vehicle to impact against vegetation and bend it over towards and into said spray patterns.*

2. A full-coverage recirculating sprayer assembly as defined in claim **1**, wherein the sprayers direct said streams at up to about a 45° angle to the travel direction.

3. A full-coverage recirculating sprayer assembly as defined in claim **1**, wherein the streams are directed rearwardly of the direction of travel of the vehicle.

4. A full-coverage recirculating sprayer assembly as defined in claim **1**, wherein the streams are directed forwardly of the direction of travel of the vehicle.

5. A full-coverage recirculating sprayer assembly as defined in claim **1**, wherein the collector means and reservoir extend laterally of the vehicle travel direction.

6. A full-coverage recirculating sprayer assembly as defined in claim **5**, wherein the sprayer assembly is carried on a front part of the vehicle for first contact with vegetation as yet not passed over by said vehicle.

[**7**. A full-coverage recirculating sprayer assembly as defined in claim **6**, wherein the reservoir is arranged below the height of the vegetation to be sprayed, thereby to contact said vegetation and bend at least some of them over and through at least one of said streams.]

8. A full-coverage recirculating sprayer assembly as defined in claim **5**, wherein the reservoir is laterally segmented into compartments having no liquid communication therebetween.

9. A full-coverage recirculating sprayer assembly as defined in claim **1**, wherein the collector means and the reservoir extend in the direction of travel of the vehicle.

10. A full-coverage recirculating sprayer assembly as defined in claim **1**, wherein the collector means comprises a member rounded about a vertical axis and adapted and positioned to receive spray streams thereupon.

11. In a recirculating sprayer assembly for application of liquid to vegetation rising above the ground, the assembly adapted to be carried by a vehicle in a travel direction and comprising a plurality of spray nozzles each forming a solid stream of liquid, a collector means for intercepting the streams after passage among the weeds and a reservoir means for collecting unused liquid from the streams, the improvement comprising:

means for aligning the spray nozzles in opposed pairs to create criss-cross stream patterns,

the patterns contacting one another across the width of the spray assembly normal to the travel direction to assure treatment of substantially all vegetation and the streams each having an angle of at least about 15° from the direction transverse to the vehicle travel direction, thereby to reduce wind and travel speed effects on the streams,

the collector means comprises a fibrous matting material extending across the entire sprayer assembly width; and

the storing means encloses a lower edge of the matting material and is located at a vertical height below the tops of vegetation to be sprayed.

12. In a recirculating agricultural sprayer assembly as defined in claim **11** the improvement thereof wherein

the spray nozzles direct the streams rearwardly of a direction normal to the travel direction.

13. In a recirculating agricultural sprayer assembly for application of liquid to vegetation, the assembly adapted to be carried by a vehicle in a travel direction and comprising a plurality of spray nozzles each forming a [solid] *spray* stream of liquid, a collector means for intercepting the streams after passage among the vegetation and a reservoir means for collecting unused liquid from the streams, the improvement comprising:

means for aligning the spray nozzles in opposed pairs to create criss-cross stream patterns,

the patterns contacting one another across the width of the spray assembly normal to the travel direction to assure treatment of substantially all vegetation, and

the streams each having an angle of at least about 15° from the direction transverse to the vehicle travel direction, thereby to reduce wind and travel speed effects on the streams,

the collector means comprise a plurality of fibrous mats [in which liquid gravitates by capillarity flow and] arranged parallel to the travel direction of the vehicle to form vertically upright absorptive collective surfaces, at least one spray stream of each adjacent pair of nozzles contacting opposite sides of each mat, *and*

the reservoir means [encloses] *having a slotted opening receiving and closely confining* a lower edge of the matting material *to seal out foreign particles from said reservoir means* and is located at a vertical height below the tops of vegetation to be sprayed.

14. In a recirculating agricultural sprayer assembly as defined in claim **13**, the improvement thereof wherein the spray nozzles direct the streams rearwardly of a direction normal to the travel direction.

15. In a recirculating agricultural sprayer assembly as defined in claim **13**, the improvement thereof wherein the spray nozzles direct the streams forwardly of a direction normal to the travel direction.

16. A recirculating sprayer for treating vegetation adapted for use with a tractor comprising,

means including a mat of fibrous material [in which liquid gravitates by capillarity flow and] disposed to form an upright [absorbent] collector and filter surface,

spray means spaced from said mat and arranged to direct a spray of treatment liquid towards said [absorbent] surface for impact therewith,

means for guiding vegetation to be treated through the spray as the sprayer is advanced so that spray not impacted against the vegetation will be recovered by impacting against said [absorbent] collector and filter surface with minimal splashing [and will gravitate by capillarity flow in the fibrous mat towards a lower edge of said mat],

a reservoir *subjacent said mat and having a slotted opening receiving and closely confining* the lower edge of said mat *to seal out foreign particles from said reservoir means* into which the recovered and filtered liquid is discharged by the mat for collection [in the reservoir],

and means to exhaust the recovered liquid from said reservoir for recirculation to said spray means.

17. A recirculating sprayer as defined in claim **16** wherein there are a plurality of mats and a plurality of reservoirs.

18. A recirculating sprayer as defined in claim **17** where each of said plurality of mats and each said plurality of reservoirs are disposed in the direction of travel and are arranged in spaced parallel planes.

19. A recirculating sprayer as defined in claim **17** where each of said plurality of mats and each of said plurality of reservoirs are disposed transversely of the direction of travel in substantially coplanar relationship with one another.

[**20**. A tractor-propelled spray mechanism for treating vegetation comprising,

means forming a recirculating liquid circuit through which a treatment liquid is directed,

a pump at one point in said circuit for pressurizing a supply of liquid and for directing the liquid in the circuit in the form of a pressurized stream,

a spray means at a second point in said circuit downstream of said first point for projecting the pressurized stream in the form of a directionalized spray pattern to form a treatment zone through which vegetation under treatment may be guided,

collector means including a fibrous mat in which liquid gravitates by capillarity flow and disposed to form a vertically upright absorptive collector surface spaced oppositely from said spray means on the other side of said treatment zone to recover the excess liquid not impacted against the vegetation, said fibrous mat having a lower edge to which the liquid flows for discharge,

a reservoir means receiving and confining said lower edge of said fibrous mat and into which recovered liquid is discharged by said lower edge,

and means for recirculating the recovered liquid from said reservoir means to the pump.]

21. [A recirculating sprayer as defined in claim **16**,] *A recirculating sprayer for treating vegetation adapted for use with a tractor comprising:*

means including a mat of fibrous material disposed to form an upright collector and filter surface,

spray means spaced from said mat and arranged to direct a spray of treatment liquid towards said surface for impact therewith,

means for guiding vegetation to be treated through the spray as the sprayer is advanced so that spray not impacted against the vegetation will be recovered by impacting against said collector and filter surface with minimal splashing,

a reservoir subjacent said mat and having a slotted opening receiving and closely confining the lower edge of said mat to seal out foreign particles from said reservoir means into which the recovered and filtered liquid is discharged by the mat for collection, said reservoir extending transversely of the direction of travel and being disposed at a level to bend vegetation downwardly and forwardly towards the spray means as the sprayer is advanced, said spray means being disposed to spray liquid streams at a level higher than said reservoir and forwardly of said reservoir to direct a spray stream rearwardly directly into the bent-over vegetation[.], *and means to exhaust the recovered liquid from said reservoir for recirculation to said spray means.*

22. A recirculating sprayer as defined in claim **21** and further characterized by said reservoir comprising a tubular component slotted to receive the edge of the mat and forming a rounded abutment surface for engaging vegetation extending above the level of the reservoir.

23. The method of liquid spraying with a recirculating spray liquid for treating vegetation which includes the steps of

directing a treatment *liquid* through a closed circuit,

at one point in the circuit pressurizing the liquid to drive the liquid in the form of a stream,

at a second point in the circuit throttling the pressurized stream to form [a directionalized] *criss-cross* spray [pattern] *patterns* through which vegetation under treatment may be guided,

at a third point in the circuit [absorptively] intercepting the [directionalized] *criss-cross* spray [pattern] *patterns* with a *substantially continuous* fibrous collector surface to recover and filter the excess liquid not impacted against the vegetation,

[gravitationally and by capillarity flow] directing the intercepted and recovered clarified liquid at said surface towards a reservoir receiving the lower edge of said fibrous collector surface at a fourth point in the circuit,

screening the spray patterns from wind effects by spanning the entire width of said criss-cross spray patterns with said fibrous collector surface,

and recirculating the collected filtered liquid from the reservoir back to said one point in the circuit.

24. A full-coverage recirculating sprayer assembly as defined in claim 1, wherein each said opposed pair of spray nozzles are disposed to direct their streams in patterns contacting one another before being intercepted by said collector means.

25. A full-coverage recirculating sprayer assembly as defined in claim 1, wherein the reservoir has a slotted opening receiving and closely confining said lower edge of the collector mat to seal out foreign particles from said reservoir.

26. A recirculating sprayer assembly as defined in claim 16, wherein said means including said mat is disposed to reduce wind effects on the spray of treatment liquid.

27. A recirculating sprayer as defined in claim 16, wherein said reservoir includes an abutment surface spaced forwardly of said mat to impact against vegetation.

28. In a recirculating sprayer assembly for application of herbicidal and other liquid to vegetation rising above the ground, the assembly adapted to be carried by a vehicle in a travel direction and comprising a source of pressurized

liquid carried on said vehicle, a plurality of spray nozzles each forming a stream of liquid and communicating with said source of pressurized liquid, a collector means for intercepting unused liquid of said streams, and a reservoir means receiving a lower portion of said collector means for collecting intercepted unused liquid, the improvement comprising:

means for arranging said spray nozzles so as to direct said streams at an angle to the travel direction of at least 15° and in opposed pairs to provide intersecting criss-cross spray patterns in areas traversed by said assembly and

said reservoir means having an abutment surface substantially spanning said assembly in a direction transverse to said travel direction for impacting against said vegetation and bending it over towards said spray patterns.

29. In a recirculating sprayer assembly as defined in claim 28, the improvement, wherein said collector means comprises a substantially continuous fibrous matting material extending across the transverse width of said assembly and said reservoir means comprises a tubular member disposed beneath said matting having an opening means for receiving a lower edge thereof.

30. In a recirculating sprayer assembly as defined in claim 29, the improvement, wherein said collector means further comprises a vertically disposed support means behind said matting and connected with an upper end of said matting.

31. In a recirculating sprayer assembly as defined in claim 28, the improvement, wherein said collector means comprises a plurality of fibrous mats disposed parallel to said travel direction and spaced apart from one another by said spray patterns.

32. In a recirculating sprayer assembly as defined in claim 31, the improvement, wherein said spray nozzles are positioned spaced apart from said abutment surface in said travel direction with said spray patterns being between said abutment surface and said spray nozzles.

33. In a recirculating sprayer assembly as defined in claim 28, the improvement, wherein said spray nozzles are positioned spaced apart from said abutment surface in said travel direction with said spray patterns being between said abutment surface and said spray nozzles.

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