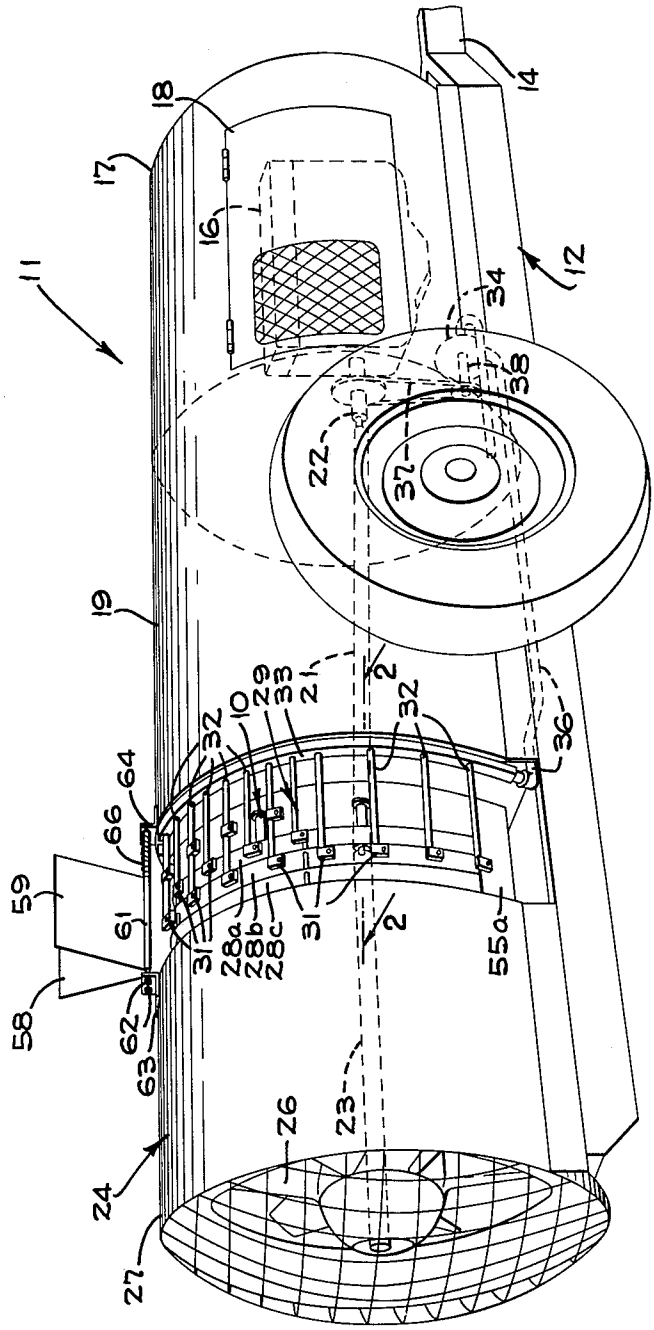
Feb. 2, 1965 T. CARRIGAN 3,168,238

CHEMICAL DISTRIBUTING MACHINE

Filed Oct. 19, 1962 4 Sheets-Sheet 1

FIG. 1



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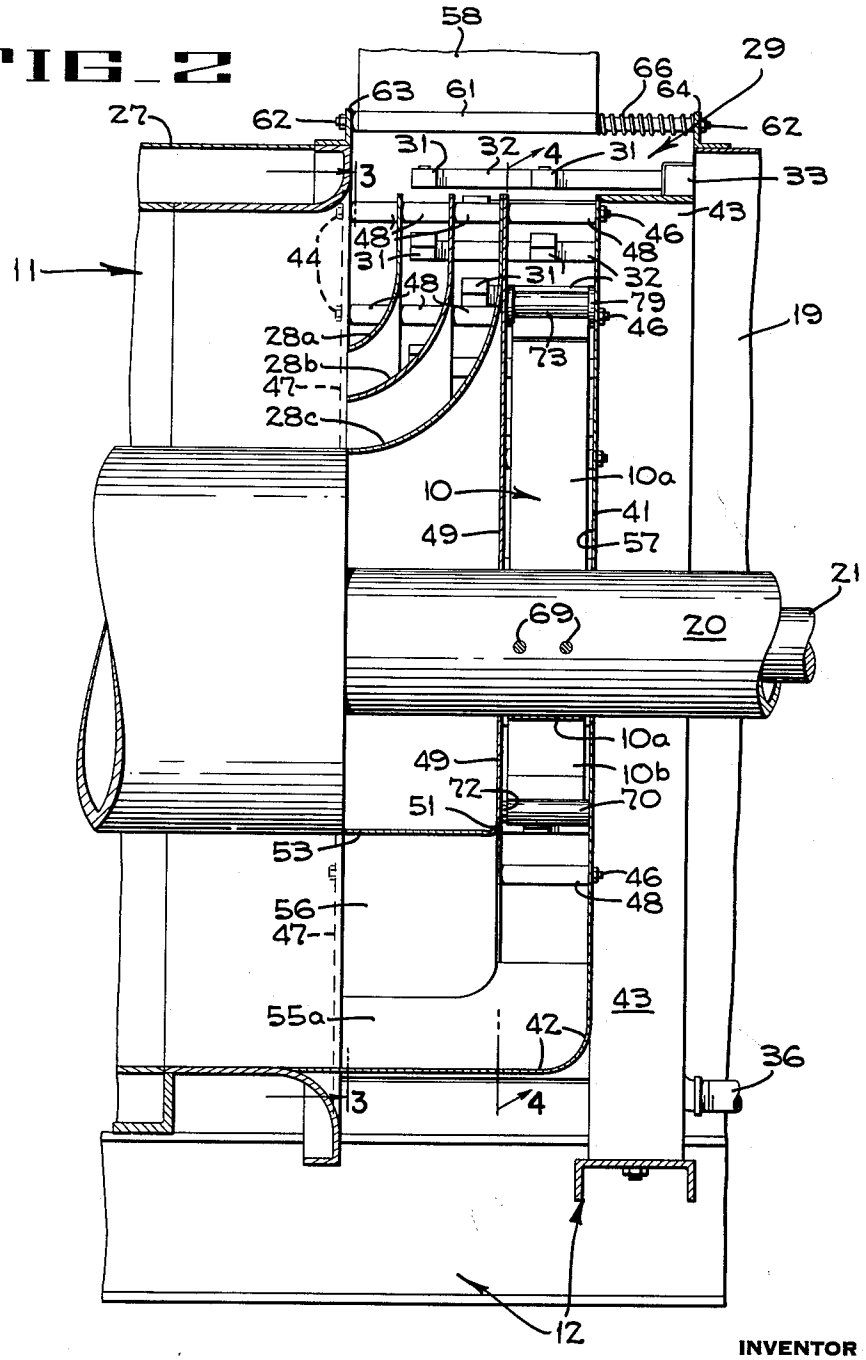
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FIG_2



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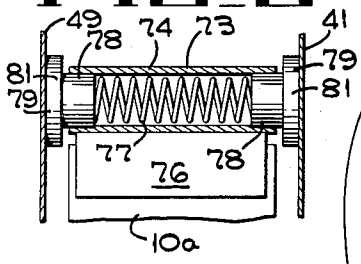
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FIG_5



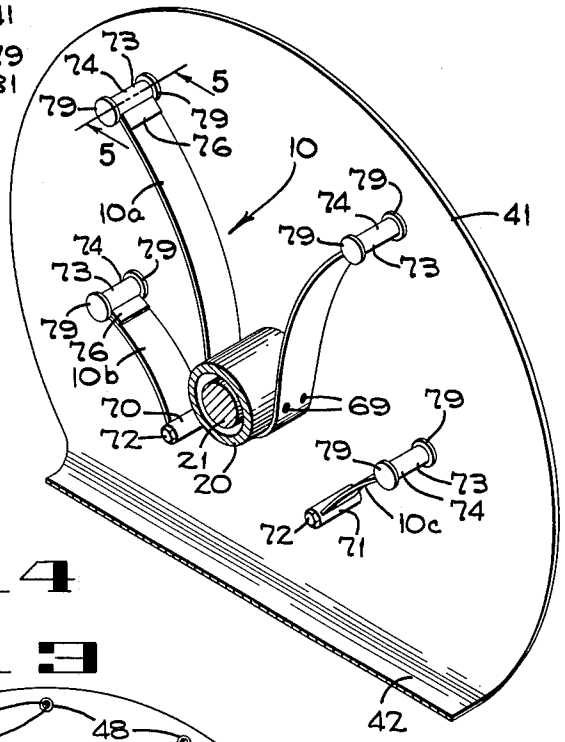
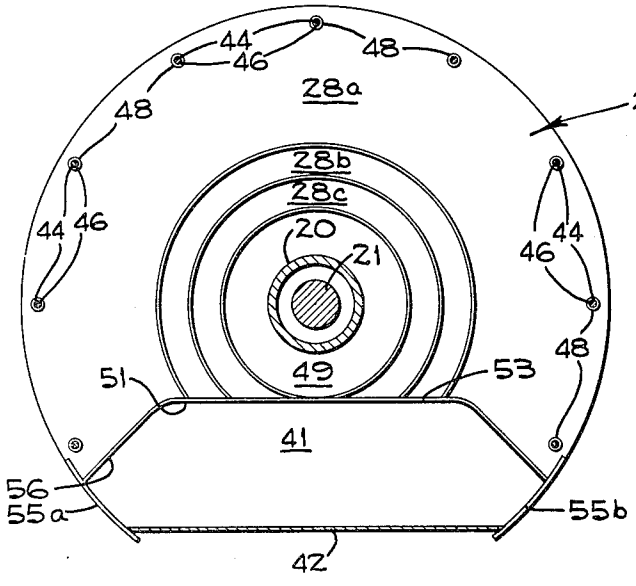


FIG_4

FIG_3



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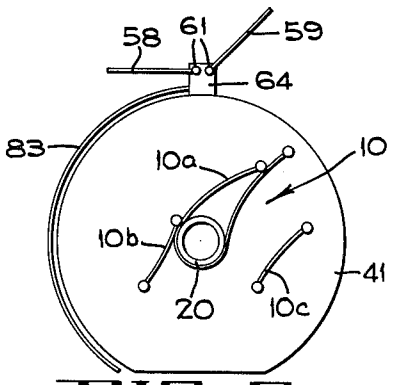


FIG_6

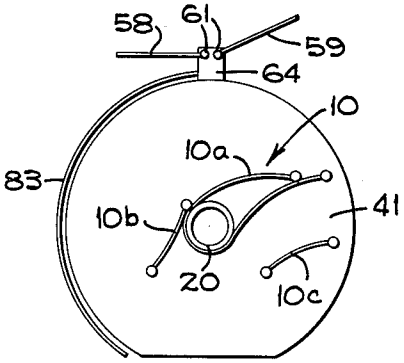


FIG_7

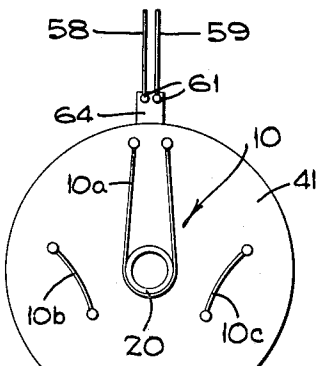


FIG_8

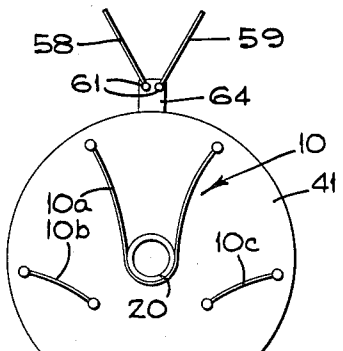


FIG_9

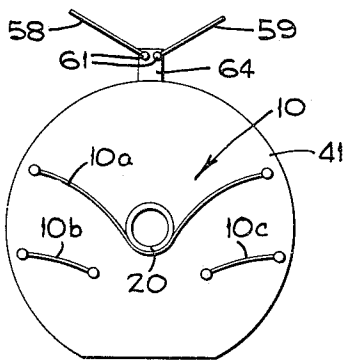


FIG_10

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United States Patent Office 3,168,238 Patented Feb. 2, 1965

3,168,238

CHEMICAL DISTRIBUTING MACHINE

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Filed Oct. 19, 1962, Ser. No. 231,811
9 Claims. (Cl. 230—274)

The present invention pertains to spraying and dusting machines and relates more particularly to adjustable deflectors for controlling the distribution of chemical laden air from such machines.

Heretofore, deflecting vanes for controlling the distribution of air from a sprayer have usually been of rigid construction and each vane has been pivoted at one end so that the other end could be moved in an arcuate path to any one of a number of optional positions and there fastened. The use of rigid vanes of this type has been found to create undue turbulence when the vanes are swung to certain positions wherein the angle between the direction of movement of the incoming air and the plane of the deflecting face of the vane is excessive.

In accordance with the present invention this situation is corrected by providing flexible deflectors which may be curved as desired so that the above referred to angle of attack is never excessive and accordingly turbulence is minimized.

It is, therefore, one object of the present invention to provide a plurality of cooperating flexible deflectors for a spraying machine arranged to be selectively positioned in a plurality of different curved deflecting positions to deflect air with a minimum of turbulence.

Another object is to provide an improved connector for securing the movable end of a flexible deflector in any one of an unlimited number of positions.

Another object is to provide an improved flexible deflector capable of being placed into a plurality of curved deflecting positions in each of which positions the air flow past the deflector conforms to the laws of streamlined air flow.

These and other objects and advantages of the present invention will become apparent from the following description and the accompanying drawings, in which:

FIGURE 1 is a perspective of an air blast spraying machine incorporating the deflectors of the present invention.

FIGURE 2 is an enlarged, vertical axial section taken along lines 2—2 of FIGURE 1 and showing the discharge section of the spraying machine with the flexible deflectors therein.

FIGURE 3 is a transverse section taken along lines 3—3 of FIGURE 2 and showing the air passages leading into the discharge section.

FIGURE 4 is a perspective showing the flexible deflectors in one operating position, viewed as indicated by the arrows 4—4 in FIGURE 2.

FIGURE 5 is an enlarged section taken along lines 5—5 of FIGURE 4 showing a connector on the free end of one of the flexible deflectors.

FIGURES 6–10 are operational views showing the flexible deflectors in several different operating positions.

The flexible deflectors (FIG. 4) of the present invention are referred to collectively herein as the deflectors **10**. They are shown in the drawings in connection with a pesticide spraying machine **11** (FIG. 1) which comprises a frame **12** mounted on rubber tired wheels (only one of which is shown) and having a tongue **14** at its forward end by which the machine can be hitched to a tractor (not shown) to be drawn thereby between rows of plants, such as trees in an orchard.

An internal combustion engine **16**, indicated in dotted lines in FIGURE 1, is mounted in an compartment **17** at the forward end of the spraying machine **11**. A screened door **18** is provided in the curved wall of the engine compartment to admit cooling and combustion air to the engine and to allow for easy access thereto. A liquid pesticide supply tank **19** is mounted on the frame **12** behind the compartment **17**. The tank is provided with an open ended tube **20** (FIG. 2) extending longitudinally therethrough to house a shaft **21** (FIG. 1) which is connected by flexible couplings (not shown) between the drive shaft **22** of the engine **16** and the shaft **23** of an air blast creating, shaping and discharging mechanism **24** supported on the rear of the frame **12**.

The air blast mechanism **24** is similar to that shown and described in United States Patent No. 2,476,960 for a "Spraying and Dusting Machine," granted to E. W. Daugherty on July 26, 1949. The mechanism **24** comprises an axial flow propeller **26** (FIG. 1) rigidly mounted on the shaft **23** at the open rear end of a hollow cylindrical housing **27**. Rotation of the propeller **26** generates a longitudinal, forwardly moving air blast within the housing **27**, which is deflected radially thereof by a nested series of stationary frusto-conical deflectors **28***a*, **28***b* and **28***c* (FIGS. 1, 2 and 3) mounted at the forward end of the housing **27**. The air blast is ejected from a discharge section **29** either in a sector shaped pattern directed upward and outward from one side of the machine **11** or in two such patterns directed upward and outward from both sides of the spraying machine **11**.

Liquid pesticide is fed to the sector shaped air blast in any suitable manner, for example, by upwardly and outwardly directed spray nozzles **31** (FIG. 1) provided in longitudinal pipes **32** that are arranged along the circumference of the discharge section **29**. The pipes **32** are spaced equal angular distances apart and extend rearwardly over the discharge section **29** from an arched header pipe or manifold **33** mounted on the rear portion of the tank **19**. Pesticidal liquid from the tank **19** is supplied under pressure to the header pipe **33** and to the nozzles **31** by a liquid pump **34** and a flexible hose **36**. In the present embodiment, the pump **34** is driven by the engine **16** through a V-belt and pulley drive **37** operatively connecting the engine drive shaft **22** with the pump shaft **38**. As the pesticidal liquid is forced from the spray nozzles **31** it is broken into a great number of extremely small particles which immediately become entrained in the air blast whereby there is formed a voluminous, sector shaped, pesticidal fog suitable for application to most types of trees.

As best illustrated in FIGURES 2 and 3, the discharge section **29** comprises the generally frusto-conical deflectors **28***a*, **28***b* and **28***c* and an end plate **41** having a rearwardly curved air deflector **42** at the lower part thereof. The end plate **41** is rigidly connected, as by welding, to vertically extending members **43** (one shown in FIGURE 2) of the frame **12**. The three generally frusto-conical deflectors **28***a*, **28***b* and **28***c* are held in spaced relation from each other and from the end plate **41** by circumferentially spaced tie bars **44**. Each tie bar comprises a bolt **46** which extends through an annular rim **47** of the housing **27**, through spacers **48**, through the deflectors **28***a*, **28***b* and **28***c*, and through the end plate **41** to clamp these parts firmly in position.

The deflector **28***c* includes a vertically extending back plate **49** which is in the form of a disc with a truncated V-shaped notch, or opening **51** (FIG. 3) in the lower part thereof. A baffle **53** is connected to the back plate **49** and to the lower edges of the generally frusto-conical deflectors **28***a*, **28***b* and **28***c* at the edges of the opening **51** and cooperates with the deflector **42** of the end plate **41** and with arcuate side plates **55***a* and **55***b* secured to the housing **29**, to define a tunnel **56** of truncated V-shaped cross section. Air received from the lower por-

tion of the air blast creating mechanism **24** flows through the tunnel **56** and against the curved deflector **42** which directs this air upward through a passage **57** (FIG. 2) defined by the adjacent parallel surfaces of the end plate **41** and back plate **49**. The rest of the air received from the mechanism **24** is ejected from the discharge section **29** by the frusto-conical deflectors **28***a*, **28***b* and **28***c*.

A pair of rigid, externally projecting vanes **58** and **59** (FIGS. 1 and 2) are adjustably mounted over the discharge section **29** above the longitudinal axis thereof for exercising further control over the air and entrained pesticide which is ejected from the discharge section **29**.

Each of the vanes **58** and **59** includes a tubular hub **61** which is rotatable on a bolt **62**. Both bolts **62** are secured to and extend between two angle brackets **63** and **64**. A compression spring **66** is mounted on each bolt and is engaged between the bracket **64** and one edge of the associated hub **61** and exerts sufficient force to hold the associated vane in adjusted position against the blast of air being discharged upward from the discharge section **29**. It will be understood that the positions of the vanes **58** and **59** may be individually changed by overcoming the frictional locking force exerted by the respective compression spring **66**, thus to place the vanes in optimum position for most effective spraying of the particular plants to be treated.

The flexible deflectors **10** of the present invention are mounted in the passage **57** defined by the end plate **41** and the back plate **49**, to control the direction of flow of air issuing therefrom. Three of the flexible deflectors **10** are employed, these being individually indicated at **10***a*, **10***b*, and **10***c*, respectively. As illustrated in FIGURES 4 to 10, each deflector **10***a*, **10***b*, and **10***c* is subject to individual adjustment, not only to alter its position, i.e., the direction in which it extends, but also to alter its degree of curvature, thus to attain the most efficiently streamlined air flow as well as to exercise control over the direction in which the jet of air is directed from the discharge section **29**.

In order to make the deflectors **10** subject to variation of their curvature, each of them is made of thin, resiliently flexible sheet material, such as sheet plastic or spring steel. A light gauge stainless steel has been found particularly advantageous for this use, due to the fact that this material is highly resistant to the corrosive action of spray chemicals.

The deflector **10***a* is connected adjacent its midpoint to the tube **20** (FIGS. 3 and 4) by screws **69**. The deflectors **10***b* and **10***c* have sleeves **70** and **71**, respectively, welded thereon and pivoted on shouldered bolts **72** which are rigidly mounted on and project from the end plate **41**.

In order to fasten the free end or ends of each deflector in adjusted position, a resilient connector **73** is secured to each of said free ends. Each connector **73** (FIG. 5) comprises a sleeve **74** which is welded to a tongue **76** that is rigidly secured to associated free end of a deflector. A compression spring **77** within the sleeve **74** engages small diameter portions **78** of friction shoes **79**. The small diameter portions **78** of the shoes **79** are slidably received in opposite ends of the sleeve **74**. The spring **77** of each connector **73** is of sufficient strength to urge the end faces of large diameter portions **81** of the shoes outward against the plates **41** and **49** with enough force to resist the forces exerted against the associated deflector by the blast of air impurging thereagainst, thus to retain the free end of the associated flexible deflector in selected position until such time that he deflector is intentionally readjusted.

FIGURES 6–10 illustrate five operating positions of the flexible deflectors **10***a*, **10***b* and **10***c* and the vanes **58** and **59** which cooperate with each other to control the direction in which the air is ejected from the discharge section **29**. In FIGURE 6, the flexible deflectors **10***a*, **10***b*, and **10***c* and the vanes **58** and **59** are fastened

in selected position of arcuate adjustment about their inner ends so as to direct all the air emitted from the discharge section **29** outward and upward from one side of the spraying machine **11**. With the vanes and flexible deflectors set in this manner, a blast of air is directed outward and steeply upward to treat relatively tall trees. Due to the fact that the deflectors **10** are flexible each can be fastened with its outer end at selected radial distance from its inner end, thus to attain and retain the optimum degree of curvature of the deflector which increases to the greatest practical value the angle of incidence between any part of the deflector and the direction of movement of the particular part of the air blast which impinges against that part of the deflector. In this manner, the deflectors are enabled to control the direction in which the air blast is discharged, and yet to minimize the turbulence created in the flow of air as it moves over and past the surfaces of the deflectors, so that the flow of discharged air is not only at high velocity, but also is smooth, or streamlined, with the result that the spray pattern is better able to penetrate heavily foliated trees or other plants. A removable baffle **83** is clamped on the other side of the spraying machine **11** to close the discharge housing **29** on this side of the machine.

The vane and flexible deflector positions shown in FIGURE 7 are somewhat similar to those shown in FIGURE 6 in that all the air is discharged from one side of the machine **11**. It will be noted that the baffle **83** still closes the discharge passages of the section **29** on the other side of the machine. In FIGURE 7 the free ends of the flexible deflectors **10***a* and **10***c* are held in lower positions than in FIGURE 6 for causing the air flowing therepast to be directed upward and laterally, but at a lower elevation. The vane **59** is also positioned so that its free end is lower than shown in FIGURE 6. Thus, the arrangement shown in FIGURE 7 is adapted to direct a streamlined flow of air at relatively short trees.

In FIGURE 8 the flexible deflectors **10***a*, **10***b* and **10***c* and the vanes **58** and **59** are arranged to deflect air upward and outward from both sides of the discharge section **29** to treat relatively tall trees as the spraying machine **11** is drawn between two rows thereof. The vane and deflector positions shown in FIGURES 9 and 10 are similar to those shown in FIGURE 8 in that the air is directed from both sides of the spraying machine **11**. The arrangement shown in FIGURE 9 is best suited for directing a streamlined flow of air at medium sized trees, while the arrangement shown in FIGURE 10 is suited for directing air at short trees or other plants such as bushes or vines.

It will be understood that the baffle **83** may be removed from the left side of the discharge housing **29** in FIGURES 6 and 7, and such a baffle may be mounted on the right side of the housing if it is desired to spray plants only on the left side of the machine.

From the foregoing description it will be apparent that the flexible deflectors of the present invention may have their free ends in any of an infinite number of positions and may be bent so that the air flowing therepast will flow in a streamlined manner with little turbulence, thus to attain efficient application of pesticide to the plants being treated. Moreover, external vanes **58** and **59** can be pivoted to different positions so as to cooperate with the flexible deflectors **10** to better control the angle at which the air is discharged from the spraying machine.

While one embodiment of the present invention has been shown and described, it will be understood that various changes and modifications may be made without departing from the spirit of the invention or the scope of the appended claims.

Having thus described the present invention and the manner in which the same is to be used, what is claimed as new and desired to be protected by Letters Patent is:

1. In a chemical distributing machine, the combination of means for creating an air blast, means for di-

recting the air blast through a passage defined by spaced apart walls having a curved periphery generated about a central axis, a flexible deflector, means for anchoring one end of said deflector at a predetermined location in said passage and immediately adjacent said axis, and means for selectively securing the other end of said flexible deflector in any one of a plurality of positions in said passage adjacent the outer periphery thereof and for retaining the deflector in selected degree of curvature for deflecting air out of said passage in selected direction and for minimizing turbulence in the flow of the deflected air.

2. In a chemical distributing machine, the combination of means for creating an air blast, means for directing the air blast through a passage defined by spaced apart walls, a resiliently flexible deflector, means for anchoring one end of said deflector at a certain location in said passage, and a connector secured to the other end of said flexible deflector, said connector including movable wall engaging means and resilient means urging said wall engaging means outwardly into frictional engagement with said walls for releasably clamping said other end between said walls to retain said other end of said flexible deflector in selected position in said passage and for retaining the deflector in selected curvature for deflecting air at a selected angle and for streamlining the flow of the deflected air.

3. In a chemical distributing machine, the combination of means for creating an air blast, means for directing the air blast through a passage defined by parallel walls, a flexible deflector, means for anchoring one end of said deflector at a predetermined location in said passage, a sleeve secured to the other end of the flexible deflector, a friction shoe slidable in each end of said sleeve, and resilient means in said sleeve urging said friction shoes into gripping engagement with said parallel walls to secure said other end of said flexible deflector in said passage a selected radial distance from said predetermined location to retain the deflector in a selected curved shape to minimize turbulence created in the air flowing over the surface of the deflector.

4. In a chemical distributing machine, the combination of means for creating an air blast, means for directing the air blast through a passage defined by spaced apart walls having a curved outer periphery generated about a central axis, a plurality of flexible deflectors in said passage, means for anchoring one part of each deflector at a predetermined location in said passage at an elevation even with or below said axis, and means for securing another part of each of said flexible deflectors in predetermined position in said passage so as to define flow passages between the deflectors through which a streamlined flow of air is guided in a selected direction, said other part of at least one of said deflectors being secured adjacent said curved outer periphery of said walls.

5. In a chemical distributing machine, the combination of means for creating an air blast, means for directing the air blast through a passage defined by spaced apart walls, anchoring means extending transversely of said passage, an elongate deflector secured intermediate its ends to said anchoring means, and means for fastening each end of said deflector in said passage in a selected radial direction and at a selected radial distance from said anchoring means so as to direct the air out of said passage in a selected direction and to hold the deflector in selected curved form for causing the deflected air to flow in a streamlined pattern, each of said fastening means being secured to and movable with the associated end of said deflector and being movable between a position spaced from the deflector portion near the other fastening means and a position contacting said deflector portion.

6. In a chemical distributing machine, the combination of means for creating an air blast, means for directing the air blast through a passage defined by spaced apart walls, a pair of vanes adjustably mounted externally of said passage, means for releasably retaining said vanes in selected positions, anchoring means extending transversely of said passage, an elongate flexible deflector in said passage secured intermediate its ends to said anchoring means, and means for fastening each end of said flexible deflector between said walls in a selected direction from said anchoring means and at a selected radial distance from said anchoring means to cooperate with said vanes in directing air in a selected direction out of said passage and to control the curvature of the associated end of the deflector for causing the deflected air to flow in a streamlined pattern.

7. In a chemical distributing machine, the combination of means for creating an air blast, means for directing the air blast upward through a passage defined by spaced apart walls, anchoring means rigid with one of said walls and projecting therefrom transversely of said passage, a flexible deflector within said passage secured intermediate its ends to said anchoring means, a pair of auxiliary flexible deflectors within said passage, means anchoring one end of each of said auxiliary deflectors to one of said walls below and laterally of said anchoring means, and releasable means carried by said deflectors for adjustably clamping them in positions extending in selected radial directions from their respective anchoring means and in selected degree of longitudinal curvature whereby the deflectors are enabled to direct a streamlined flow of air from the machine in a selected direction.

8. In a chemical distributing machine, the combination of spaced apart walls defining therebetween a transverse air passage, means for creating an air blast, means for directing the air blast through said passage and laterally from both sides of said machine comprising a pair of vanes pivotally mounted on said housing externally of said passages for selective adjustment into one of a plurality of deflecting positions, means for releasably retaining said vanes in selected positions for deflecting air discharged from said passage in selected directions, anchoring means rigidly mounted in said passage, a flexible deflector secured intermediate its ends to said anchoring means, and means for securing the ends of said deflector in positions selectively spaced apart to cooperate with said vanes in determining direction of the air blast to both sides of the machine and at selected radial distances from said anchoring means to maintain said deflector in selected degree of curvature to control creation of turbulence in the deflected air.

9. In a chemical distributing machine, the combination of spaced apart walls defining a transverse air passage opening both upward and laterally of the machine, means for creating an air blast, means for directing the air blast upward within said passage, anchoring means rigid with one of said walls and extending transversely of said passage, an elongate flexible deflector in said passage secured intermediate its ends to said anchoring means, a pair of auxiliary flexible deflectors in said passage, means anchoring one end of each of said auxiliary deflectors in said passage below and laterally of the anchoring means for said elongate deflector, means secured to each of said deflectors for clamping it in a selected radial direction and at a selected radial distance from its associated anchoring means whereby said deflectors are curved so as to present streamlined deflecting surfaces to the air blast.

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