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Weichel

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[54] **APPARATUS FOR UNIFORMLY DISTRIBUTING MATERIAL DISCHARGED FROM A BLOWER PIPE LINE**

[76] Inventor: **Ernst Weichel**, Postfach 30, 7326 Heiningen, Germany

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[51] **Int. Cl.** **B65g 65/32**

[58] **Field of Search** ..... 214/17 CB; 198/128; 239/665; 302/60

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Primary Examiner—Robert G. Sheridan

Attorney, Agent, or Firm—Toren & McGeady

[57] **ABSTRACT**

In an apparatus for directing material from a blower pipe line onto a stove surface or into an enclosed space, a rotating deflecting flap is positioned in the path of the material issuing from the discharge end of the pipe line for distributing it in a uniform manner. The deflecting flap is positioned outwardly from the discharge end of the pipe line and extends in a downwardly inclined fashion so that its surface extends into the path of the material flowing from the pipe line. Further, the deflecting flap is not only rotatable about the axis of the discharge end of the pipe line but is angularly displaceable relative to the pipe line axis for varying the manner in which the material is directed from the flap. To provide the desired movement of the deflecting flap, a pair of wind wheels are provided in the path of the discharge end of the pipe line on opposite sides of the discharge axis, and motion transmission means are connected between the wind wheels and the deflecting flap. The wind wheels are pivotally supported so that they can be arcuately displaced outwardly from the axis of the discharge end of the pipe line.

27 Claims, 6 Drawing Figures

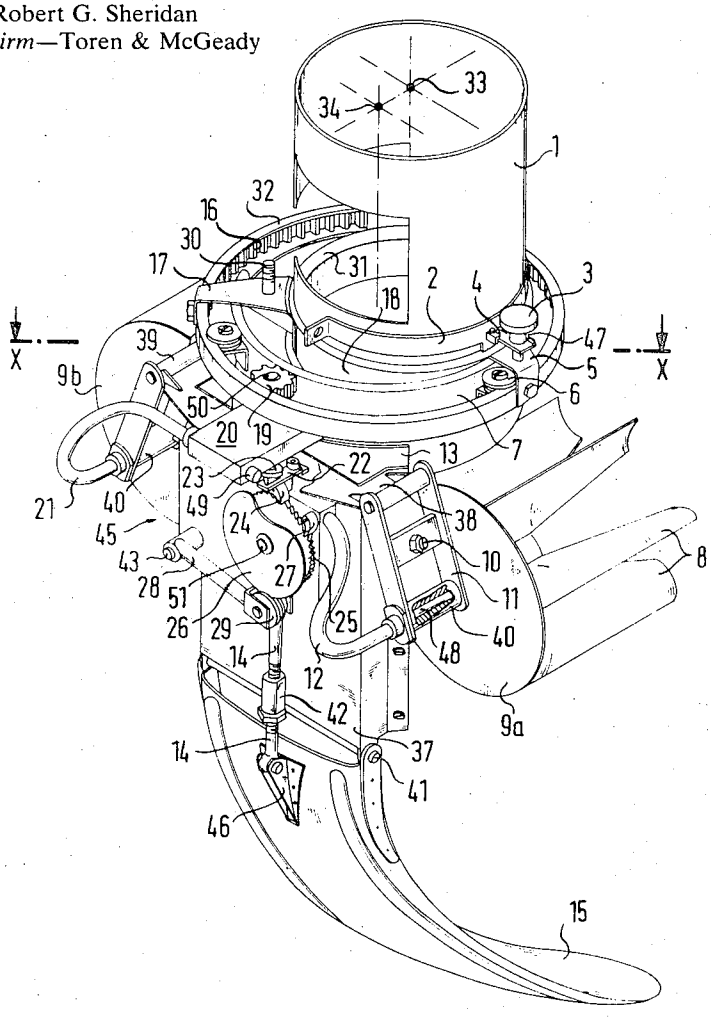

Fig.1

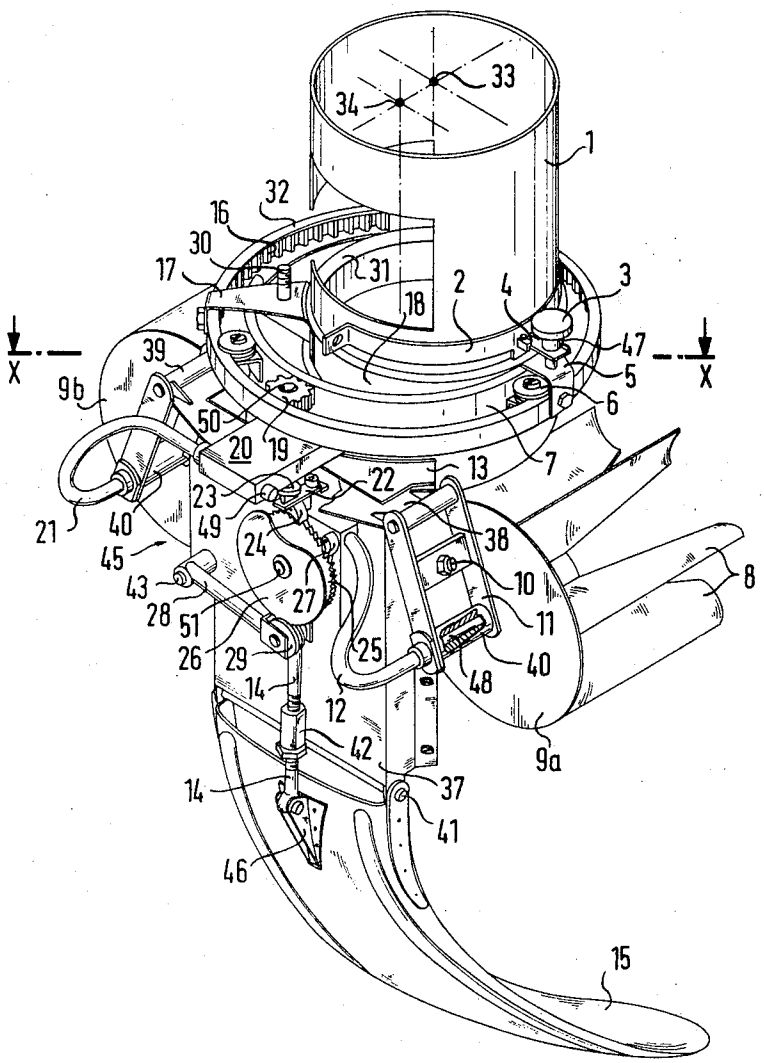

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Fig.2

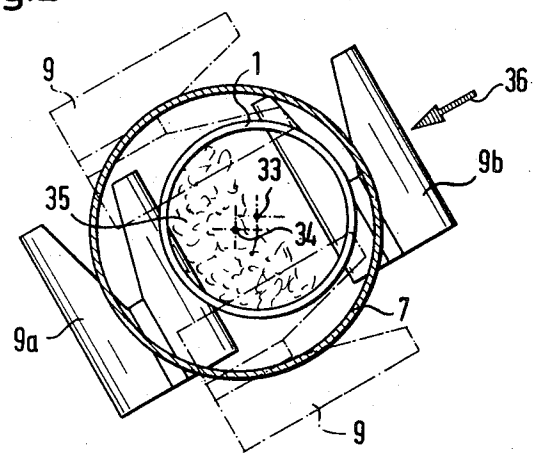

Fig.3

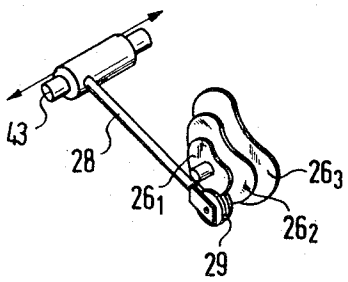

Fig.4

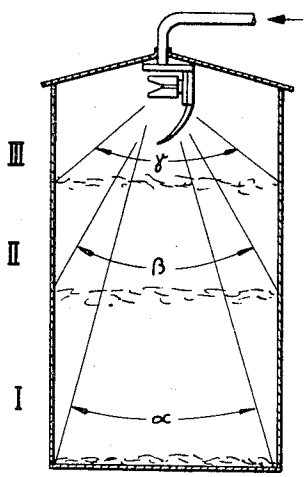

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Fig.5

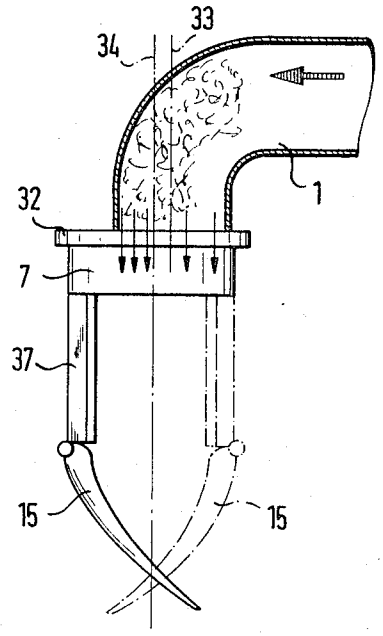
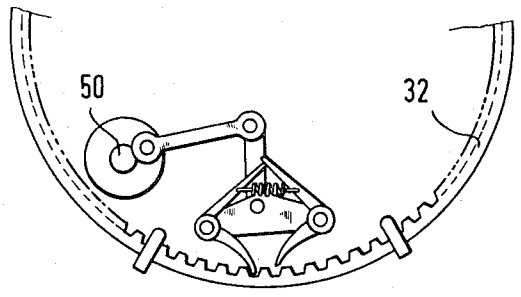


Fig.6



INVENTOR:

BY:

APPARATUS FOR UNIFORMLY DISTRIBUTING MATERIAL DISCHARGED FROM A BLOWER PIPE LINE

SUMMARY OF THE INVENTION

The present invention is directed to an apparatus for uniformly distributing the material flowing from the discharge end of a blower pipe line and, more particularly, it concerns an arrangement where at least one wind wheel is pivotally mounted in the path of the discharge from the pipe line and is operatively connected to a deflecting flap for rotating the flap about the discharge axis of the pipe line and also for displacing the flap angularly with respect to the discharge axis.

Apparatus for distributing the material from a pipe line are known and are available under the name of "End Distributors." One such device is disclosed in Austrian Pat. No. 227,165. In the disclosed device, the rotation of the deflecting flap about the axis of the blower pipe line is effected by a wind wheel which revolves about an axis of rotation disposed parallel to the flow from the pipe line and, further, the wind wheel is in operative connection with the reduction gear which, in turn, drives friction rollers in engagement with a rim member.

The type of end distributors presently available have the disadvantage that the blades of the wind wheel enter from the side into the space beneath the discharge end of the blower pipe line, that is, in a direction transverse to the direction of flow from the pipe line and, similarly, leave the space below the discharge end in the same manner. Due to this arrangement of the wind wheels, they cannot yield to the material being distributed and they obstruct the passage of large quantities of the material from the pipe line. Since the wind wheel blades must be designed so that no material can be deposited on the blades, the utilization of the energy of the flow of air or material from the pipe line is too low to ensure an adequate movement of the deflecting flap under all conditions experienced in the operation of the apparatus.

In the known arrangements, another disadvantage exists in that the wind wheel is positioned directly in front of the deflecting flap onto which the material is discharged and the wheel is directly connected to its reduction gear. Accordingly, this arrangement causes at least a partial interference, by the wind wheel, of the discharge of the material from the deflecting flap. Further, the transmission means between the reduction gear and the deflecting flap, which are designed as traction ropes or cables with turn-buckles, interfere with the flow of the material from the deflecting flap when it is located in certain positions.

When a single wind wheel of the type mentioned above is used, as well as in other types of wind wheels where their axes are arranged perpendicular to the axis of the blower pipe line, there is the particular disadvantage that the wind wheel is inadequately or at least irregularly driven because the material and air current in the pipe line is irregularly distributed at the discharge bend. As a result of the irregular distribution of the material, the wind wheel does not provide the proper movement to the end distributor. This phenomenon of irregular distribution occurs because the centrifugal force in the range of the outer surface of the bend in the pipe line is greater and conveys greater amounts of air and material than the corresponding inner range of the bend.

Accordingly, as the wind wheel revolves below the discharge opening and passes beneath the outside of the bend at the discharge end of the pipe line, the wind wheel is rotated at a very high rate and, as a result, transmits driving power at a relatively high level. However, when the wind wheel is located below the inside of the discharge bend, the amount of air and material cause it to be driven at a relatively slow rate and to transmit relatively little driving power. Therefore, in practice the end distributor frequently stops when the wind wheel is in the position corresponding to the inside of the discharge bend in the pipe line. With the deflecting flap stopped in this position it is difficult for the deflector flap to commence working again when the wind wheel is located in the same position relative to the discharge bend. When very powerful blowers are used in combination with the pipe line it is possible to continue the movement of the deflecting flap even when the wind wheel is exposed to the lower driving rate of the discharge from the pipe line, but there is still the disadvantage that the speed of rotation of the end distributor varies considerably during one revolution about the axis of the pipe line with the result that the material is distributed irregularly onto the support surface or into the enclosed space.

Another disadvantage which occurs in presently known devices is that, even if a uniform revolution can be achieved by very extensive and complicated control mechanisms, though the discharge through the bend in the outlet of the pipe line is irregular, the material will continue to be distributed irregularly since the deflection provided by the flap results in non-uniform controlling ranges.

If the hinge of the deflecting flap is positioned under the outside of the bend in the discharge end of the pipe line, the major part of the material strikes the upper end of the flaps and, as a result, is deflected in an aerodynamically favorable manner in the desired direction along the entire deflecting space without experiencing major deceleration. However, if the hinge of the deflecting flap is positioned, for example, under the inside of the bend of the discharge end of the pipe line, the mass of the material being conveyed strikes the center on the portion of the deflecting flap which is especially curved with the result that the material is deflected in an aerodynamically unfavorable manner and is also decelerated to a greater degree. Such an arrangement results in a reduced throwing range for the deflector.

Accordingly, it is the primary object of the present invention to provide an arrangement where the above-mentioned disadvantages are avoided and a uniform distribution is afforded to the material flowing from the discharge end of a blower pipe line. It is important that the end distributor should be light weight and easy to handle, so that it can be operated reliably and uniformly by one person under all operating conditions by the driving action obtained from the material flow and air current passing from the discharge end of the pipe line. Furthermore, the end distributor of the present invention should disperse the material in a uniform manner between the center and edge of the stone surface even when the discharge end is located adjacent a bend in the pipe line.

Therefore, in accordance with the present invention, a pair of wind wheels are arranged in front of the de-

flecting flap and extend into the path of flow from the discharge end of the pipe line for distributing the material in a uniform manner. In operation, the deflecting flap is rotated about the axis of the discharge opening from the pipe line by at least one of the wind wheels. The transmission of the driving action of the wind wheels is transmitted to the deflecting flap through a reduction gear and, while rotating, the flap can be displaced into various positions relative to the discharge axis of the pipe line. Both of the wind wheels are arranged in operative connection with the reduction gear.

By means of the arrangement proposed by the present invention, a uniform driving action is imparted to the mechanical reduction gear even when there is an irregular distribution of the material and its carrier medium through the blower pipe line, because at least one of the wind wheels is always located in a sector below the discharge end of the pipe line where sufficient air velocity is available to assure that the deflecting flap is adequately operated.

For operation over the range of material flow from the pipe line it is preferable for the wind wheels to be mounted on pivotally arranged pendulum arms.

Another characteristic of the present arrangement is the rotation of the wind wheels in opposite directions with one wind wheel each being connected to one end of an inlet shaft for the reduction gear.

Preferably, the wind wheels are connected over flexible drive shafts so they are each connected to an opposite end of a drive shaft for the reduction gear.

It is desirable to position the reduction gear on the outside of the support for the deflecting flap relative to the path of flow from the pipe line.

Preferably, the axes of rotation of the wind wheels are substantially parallel to one another and are positioned perpendicularly to the axis of the discharge from the pipe line.

Furthermore, the hinge axis for the deflecting flap is, desirably, arranged substantially normally to the axes of rotation of the wind wheels.

Another characteristic feature of the invention is the spring loading on the pendulum arms so that they are biased in the direction of the axis of the discharge from the pipe line and are provided with adjustable stops for varying the distance between the wind wheels and the discharge axis. Yet another favorable feature of the invention is the arrangement of the driving pinion for the rotation of the deflecting flap so that it can be selectively engaged and disengaged.

When the pinion is used for driving the deflecting flap it provides for the rotation of the flap through 360°, however, it can be replaced by a feed pawl assembly which effects a reciprocating swivel movement of the deflecting flap about the axis of rotation with the range of movement being, for example, 90°, 180°, or 255°. Still another feature of the invention is the manner in which the deflecting flap is shaped as a curved trough with its lower or free end located outside of the downward projection of the path from the discharge end of the pipe line so that only those portions of the deflecting flap which are sharply inclined to the discharge axis are aligned below the discharge outlet from the pipeline.

Yet another important characteristic of the invention is the eccentric arrangement of the support for the deflecting flap relative to the discharge axis from the pipe line. The axis of rotation for the deflecting flap and the discharge axis from the pipe line are disposed in parallel relationship and the axis of rotation is positioned between the discharge axis and a plane parallel to the discharge axis and passing through the outer surface of the bend at the discharge from the pipe line. Due to the eccentric arrangement mentioned above, it is possible to uniformly distribute the material from the pipe line even though it is irregularly distributed from the pipe line discharge. Because of the arrangement of the deflecting flap, the material strikes the flap in approximately the same position as it rotates so that equal throwing ranges for the material are achieved in all directions. To afford this particular feature several brackets are secured on a fastening arrangement positioned at the discharge end of the pipe line and one of the brackets is longer than the other so that with the outer ends of the brackets connected to the gear rim on which the support arrangement rotates it is possible to maintain the eccentricity between the discharge axis of the pipe line and the axis of rotation of support means for the deflector flap.

Preferably, at least two brackets are provided each with an upwardly directed bolt having a knurled member at its upper end and the bolts are engageable within slots in suspension straps secured to the retaining clamp at the outlet end of the pipe line so that the support arrangement can be easily and simply adjusted relative to the diameter of the pipe line.

The various features of novelty which characterize the invention are pointed out with particularity in the claims annexed to and forming a part of this disclosure. For a better understanding of the invention, its operating advantages and specific objects attained by its use, reference should be had to the accompanying drawings and descriptive matter in which there is illustrated and described a preferred embodiment of the invention.

BRIEF DESCRIPTION OF THE DRAWING

In the drawing:

FIG. 1 is a perspective view, partly cut away, of a distributing apparatus embodying the present invention;

FIG. 2 is a partial schematic view taken along the line x — x in FIG. 1;

FIG. 3 is a partial perspective view of an alternate arrangement of a portion of the apparatus shown in FIG. 1;

FIG. 4 is a schematic showing of a silo with a blower pipe line and a distributing apparatus embodying the present invention located at the discharge end from the pipe line;

FIG. 5 is a vertical sectional view through a blower pipe line with the distributor apparatus in accordance with the present invention positioned at the outlet from the pipe line; and

FIG. 6 is a partial plan view of an alternative device for use in the present invention for providing an adjustable reciprocating drive with a double-action feed pawl drive.

DETAILED DESCRIPTION OF THE INVENTION

In FIG. 1 an end distributor **45** is secured to the outlet or discharge end of a blower pipe line **1**, which directs material substantially vertically downward toward a stone surface or into a laterally enclosed space or chamber.

Secured to the discharge end of the pipe line **1**, is a retaining clamp **2**, only half of the clamp is shown, and a pair of suspension straps **4**, only one of which is displayed, are adjustably mounted on the clamp **2**. Each of the straps **4** has a slot **47** into which a bolt **30** is fitted for securing the end distributor **45** onto the end of the pipe line **1**. Knurled caps **3** are threaded onto the heads of the bolts **30**, so that it is not necessary to completely remove the caps in mounting the distributor on the pipe line. Further, because of the adjustable nature of the suspension straps, the end distributor **45** can be securely and rapidly attached to blower pipe lines which are of other than standard diameters.

One of the bolts **30** is rigidly mounted on a bracket **5** and the other one on a bracket **17**. The bolts can be easily inserted into the slots **47** in the suspension straps so that the end distributor **45** can be attached by one person to the retaining clamp **2**, previously mounted on the end of the pipe line. After the bolts **30** have been positioned in the slots **47** in the suspension straps **4** a centering conical extension **31** on a fastening ring **18**, to which the brackets **5** and **17** are connected, is centrally secured to the pipe line by tightening the knurled threaded caps **3**. Though not shown in FIG. **1**, an elastic packing can be placed between the conical extension **31** and the end of the pipe line **1**.

Encircling the fastening ring **18** is a ring mount **7** on which three rollers **6** are angularly spaced with each roller containing a groove. The rollers are formed of a maintenance-free plastic material or any other material with a low coefficient of friction. Outwardly from the ring mount **7** is a gear rim **16** having an inwardly projecting bearing surface **32** which extends into the grooves in the rollers. Due to their engagement with the bearing surface **32**, the rollers roll along the rear rim and hold the end distributor **45** in position in both the axial direction, that is against movement in the upward and downward direction, as well as in the radial direction so that the end distributor can rotate easily about its axis of rotation **34**. As can be seen in FIG. **1**, the end distributor is ecentrically mounted about the discharge end of the pipe line and its axis of rotation **34** is offset from the discharge axis **33** of the pipe line.

The entire revolving assembly of the end distributor **45** is supported from the ring mount **7** and a guide trough **13** embraces a part of the circumference of the ring mount. The side of the guide trough **13** remote from the axis of rotation **34**, is attached to a downwardly extending bridge or support member **37** which acts as reinforcing for the guide trough and also serves as an attachment member for the driving and control elements of the end distributor **45**.

On a gusset plate **38** and secured to and extending outwardly from the bridge **37**, a pair of oppositely spaced bearing blocks **39** are provided for pivotally mounting pendulum arms **11** which support, at their ends remote from the bearing blocks **39**, wind wheels **9***a*, **9***b*. Though not shown in the drawing, biasing means are in operative engagement with the pendulum arms **11** which tend to turn the pendulum arms about the axes of the bearing blocks in the direction inwardly toward the axis of rotation **34**.

Adjustable stops or screws **10** are provided on the pendulum arms **11** for limiting the range of movement of the pendulum arms through an arc inwardly toward and outwardly from the axis of rotation **34**. By this arrangement it is possible to set the maximum extent to which the wind wheels **9***a*, **9***b* extend into the discharge of air and material from the end of the pipe line **1**. Due to this adjustment the circumferential speed of the wind wheels **9***a*, **9***b* can be regulated which, in turn, effects a control on the means driven by the wind wheels. The rotation of the wind wheels **9***a*, **9***b* drives the rotating parts of the end distributor about the axis of rotation **34**. Bearings **40** and supporting shafts **48** are located at the ends of the pendulum arms spaced outwardly from their pivotal attachment on the bearing blocks **39**. Each of the wind wheels **9***a*, **9***b* is mounted on one of the shafts **48** so that it rotates about an axis disposed at right angles to the axis of rotation **34**. Further, the axis of the wind wheels and the shafts **48** are arranged perpendicularly to a pivot axis **41** located at the lower end of the bridge **37** about which a deflecting flap **15** is angularly displaceable. By the rotation of the flap **15** with the bridge **37** and its angular displacement relative to the vertical axis of the bridge, material issuing downwardly from the pipe line can be directed to a stone surface or into a chamber. Due to the pivotal and elastically biased suspension of the wind wheels **9***a*, **9***b* the blades on the wind wheel can extend for a relatively great depth under the cross-section of the ring mount **7** so that they are driven by the air current flowing from the end of the pipe line **1**. When large amounts of material pass through the ring mount from the pipe line, the wind wheels **9***a*, **9***b* are deflected outwardly by the material **35**, note FIG. **2**, so that the entire cross-section under the ring mount is clear. By this arrangement, any blockages in the pipe line **1** or in the ring mount **7** are positively avoided. The shafts **48** extending from the wind arms **9***a*, **9***b* are connected over flexible shafts **12**, **21** each to a free end of a drive shaft **49** for a totally enclosed worm gear **20** supported on the gusset plate **38**.

Though the wind wheels **9***a*, **9***b* rotate in opposite directions due to the air current flowing past them, they combine in driving shaft **49** in a single direction. Accordingly, additional gears for rectifying the direction of rotation of the gear driven by the wind wheels are avoided. Extending upwardly from the worm gear **20** is a shaft **50** at the upper end of which is positioned a pinion **19** which meshes with the teeth formed in the stationary rim gear **16**. By the rotation of the pinion **19** of the shaft **50**, the ring mount **7** and the parts secured to it, particularly the wind wheels **9***a*, **9***b* and deflecting flap **15**, rotate about the axis **34**.

Preferably, the pinion is formed of a maintenance-free plastic material. Though not shown in the drawing, the pinion **19** can be detachably coupled to the shaft **50**. In special cases the rotary movement of the deflecting flap can be temporarily arrested.

An axle **51** is rigidly mounted on the support member or bridge **37** and a cam **26** is rotatably mounted on the axle, further the cam is non-rotatably connected to a ratchet wheel **25**. Ratchet wheel **25** is moved in a stepwise fashion by a feed pawl **24** secured on a swivel member **22** which is rotatably mounted on one end and provided with a slot which is engaged by an eccentric pin **23** connected to the lower end of the worm gear shaft **50** which moves the swivel member **22** back and forth during its revolution.

The return of ratchet wheel **25** and cam **26** is prevented by a stationary pawl **27**. A control arm **28** is pivotally mounted on bridge **27** and a sensing roller **29** is positioned at its free end. The roller is maintained in

contact with the cam **26** at all times since one end of a pressure bar **14** is articulated to the axis of the sensing roller while the other end of the bar **14** is articulated to a bracket **46** mounted on the upper end of the deflecting flap adjacent its pivot axis **41.** Therefore, with this arrangement the sensing roller **29** is always maintained in contact with the cam **26** so that no additional biasing means are required, at least not in the represented position of the end distributor **45.** The cam acts against the roller deflecting it downwardly and, as a result, the pressure bar is also deflected downwardly pushing against the bracket **46** of the deflecting flap with the results that the flap **15** is pivoted about its axis **41** so that its outer free end tends to move upwardly. The pressure bar **14** is preferably formed as a known longitudinally adjustable turn-buckle **42.** With such a device for the bar **14,** the range of traverse or angular swing of the deflecting flap relative to the vertically extending axis of the bridge **37** can be adjusted as required.

The control cam **26** can be arranged on its axis **51** for easy detachment if it is desired to use another cam. By employing different cams, it is possible to vary the range or extent to which the deflecting flap is angularly displaced and also to arrange the order of the different inclined positions of the deflecting flap. As a result, the scattering range of the end distributor can be adjusted to the area and configuration of the stone surface or chamber into which the material is directed.

In FIG. **3,** several cams **26-1, 26-2,** and **26-3** of different sizes or forms are arranged on a bearing bush so that the sensing roller **29** on the control arm **28** can be easily lifted from one cam to the next if the control arm is mounted for axial displacement along it axis **43.**

As can be noted in FIG. **1,** the bracket **17** is longer, that is in the direction extending from the fastening ring outward to the gear rim. By making bracket **17** longer than bracket **5,** the gear rim **16** supported by these brackets and its bearing surface **32** for the rollers **6** while disposed concentrically to one another are positioned eccentriclly relative to the discharge axis **33** from the pipe line. The difference in lengths of the brackets **5, 17** determines the eccentric position of the axis of rotation **34** of the end distributor relative to the discharge axis **33** from the pipe line. Further, the end distributor **45** is constructed so that with the discharge end of the pipe line **1** located at a bend in the pipe line, the axis of rotation **34** is located between the discharge axis **33** and the surface of the pipe line forming the outer side of its bend, note FIG. **5.** The material **35** conveyed through the pipe line, due to the acceleration of its mass, is introduced approximately centrally into the ring mount **7** revolving within the gear rim **16.** This function of the device, in accordance with the invention, is displayed in the schematic showing of FIG. **2** and **5,** which show the accumulation of the material **35** on the outer wall of the plate bend.

Due to the eccentric position of the axis of rotation **34** relative to the discharge axis **33,** the bulk of the material **35** flows at a substantially constant distance past the two wind wheels **9***a*, **9***b* so that the wind wheels are driven at a more uniform rate by the feed or blower air current and also by the material **35.** Each of the wind wheels is provided with a number of blades **8** which preferably are designed as known curve blades.

In FIG. **4,** a schematic representation of a tall silo is provided with an end distributor of the form described above, located centrally of its upper end. Three different scattering ranges are designated by the angles α, β, and γ as indicated in FIG. **4.** Angle α indicates the scattering range I when the silo is empty. After the material charged into the silo has reached a certain height, a wider scattering range II is provided by utilizing the cam arrangement shown in FIG. **3** and switching from cam 26_1 to cam 26_2. As the level of the material in the silo moves upwardly and approaches its upper end, an even wider scattering range III as shown by the angle α is necessary and is achieved by the switching of the sensing roller to the largest one of the cams 26_3. The control arm **28** with its scanning or sensing roller **29** is mounted on the bridge **37** so that the axis of both the roller **29** and the upper end of the pressure bar **14** are disposed vertically below the axis of rotation **51** of the cam **26.** In this position the roller **29** rolls on the edge of cam **26.**

Roller **29** is provided with a circumferentially extending groove which engages the edge of cam **26** and prevents the roller from being laterally displaced from the cam.

As is illustrated in FIG. **1,** the deflecting flap has the shape of a curved trough extending downwardly and across the path of the material as it flows from the discharge end of the pipe line. By means of the bar **14,** acting with the roller **29** traveling on the cam **26,** the deflecting flap is pivoted angularly relative to the vertical axis of the bridge **37** and it can be retained in any angular position as long as the position of the pressure bar remains unchanged. Since the deflecting flap rotates about the axis **34** and is also angularly displaceable it distributes the material selectively about a circle determined by the position of the flap.

When the cam disk **26** has performed a half revolution from the position represented in FIG. **1,** the roller **29** falls into the recess on the cam disk and the axis of the roller **29** along with the pressure bar **14** is displaced upwardly and the deflecting flap is displaced toward the vertical axis of the bridge **37.** When the flap is in this position the material is not deflected outwardly but is deposited generally in the center of the surface onto which it is directed. By selecting the configuration of the cam disk **26** it is possible to fix not only the two end positions of the deflecting flap but also to determine exactly the time in which these end positions and other intermediate positions are assumed by the flap. This arrangement affords a uniform distribution of the material from the center to the peripheral edge of the stone surface on which it is deposited.

As disclosed in FIG. **1,** the deflecting flap is formed so that it extends below the entire cross sectional area of the discharge end of the pipe line **1,** additionally its lowermost end, that is its free end, projects beyond the downward extension of the discharge end of the pipe line. In other words, from its hinged connection to the bridge **37,** the deflecting flap extends transversely across the path downward from the pipe line so that its free end is located on the opposite side of the downward path from the hinge and it extends laterally outwardly from the downward path.

Due to this arrangement of the deflecting flap, the material flowing from the pipe line **1** strikes the surface of the deflecting flap **15** along an inclined portion of its surface and thus slides along the flap in an aerodynamically favorable manner, that is, without any excessive deceleration. Therefore, with this configuration of the deflecting flap, with an inclined portion of its surface

always located below the outlet from the pipe line and its free end projecting beyond the normal downward path of the material, a maximum throwing range for the material is achieved.

As a replacement for the embodiment shown in the drawing where a one-piece deflecting flap **15** is used, it is possible to construct the deflecting flap of several segments, for example two segments with the lower segment bent more or less over a known linkage in dependence on a position of the upper segment. Therefore, in accordance with the invention, the length of the upper segment of this alternate embodiment is dimensioned so that it extends across the full cross section of the downward path from the pipe line, so that the material issuing from the pipe line first contacts the upper segment before it flows over the lower segment which is configured so that it extends toward the horizontal.

The trough-shaped deflecting flap **15** can be formed in a smooth aerodynamically favorable shape either of sheet metal or a plastic, such as a glass-fiber reinforced polyester. Other parts of the end distributor can be made of a very light material, for instance aluminum, to provide a minimum weight which will assure ease in handling and operation of the distributor.

Due to the uniform and trouble-free distribution of stalk and leaf material which can be achieved with the end distributor, by the uniform rotation of its trough-like deflecting flap **15** combined with the pivotal angular movement of the flap adapted to the area and form of the stone surface or chamber, considerable savings in manual work are assured and an increase in the quality of the fodder or material distributed is provided. Accordingly, the above described end distributor represents a considerable technical improvement over previous distributing apparatus.

In FIG. **6** in place of the pinion **19** a feed pawl assembly is articulated to the shaft **50.** The feed pawl assembly engages the gear rim **16** and effects a reciprocating swivel movement of the trough-like deflecting flap **15** about the axis of rotation **34** through adjustable sectors, such as 90°, 180° or 255°.

While a specific embodiment of the invention has been shown and described in detail to illustrate the application of the inventive principles, it will be understood that the invention may be embodied otherwise without departing from such principles.

What is claimed is:

1. Apparatus for uniformly distributing material issuing from a blower pipe line onto a storage surface, including support means arranged to be detachably connected to the discharge end of the pipe line, a deflecting flap connected to said support means and arranged to be positioned below and in the path of the material discharged from the pipe line, at lest one wind wheel arranged to be located in the path of the material discharged from the pipe line and driven by the discharge from the pipe line, means associated with said deflecting flap and said wind wheel and arranged for rotating said deflecting flap about the downward projection of the axis of the discharge end of the pipe line, said means including a cam disc for angularly displacing said deflecting flap about an axis transverse to the axis of the discharge end of said pipe line, wherein the improvement comprises that said support means depend downwardly from the discharge end of said pipe line, said deflecting flap having its upper end connected to said support means at a position spaced below the discharge end of said pipe line, a pair of said wind wheels arranged with their axes of rotation extending transversely of the axis of the discharge end of said pipe line and disposed in laterally spaced relationship and positioned on opposite sides of the axis of the discharge end of said pipe line, so that the radially outer peripheries of said wind wheels are spaced apart, said wnd wheels mounted on said support means for rotation in an annular path located in a plane below the discharge end of said pipe line and approximately perpendicular to the axis of the discharge end of said pipe line, said wind wheels extending forwardly from the upright plane containing the upper end of said deflecting flap toward the axis of the discharge end of the pipe line, and each of said wind wheels being in operative connection with said means for rotating said deflecting flap.

2. Apparatus, as set forth in claim **1,** characterized in that said support means includes a pivotally mounted pendulum arm for each said wind wheel for pivotally supporting said wind wheel for displacement through an arc toward and away from the axis of the discharge end of the pipe line.

3. Apparatus, as set forth in claim **2,** characterized in that each said pendulum arm has a free end spaced from its point of pivotal attachment to said support means, a shaft rotatably mounted at the free end of said pendulum arm and one said wind wheel being positioned on said shaft for imparting rotation thereto as said wind wheel is rotated by the discharge from the pipe line.

4. Apparatus, as set forth in claim **3,** characterized in that means are operatively connected to said pendulum arms for spring biasing said pendulum arms toward the axis of the discharge end of the blower pipe line, and said means including adjustable stops for varying the distance between said pendulum arm and the axis of the pipe line at its discharge end.

5. Apparatus, as set forth in claim **3,** characterized in that said wind wheels being rotatable in opposite directions, said means for rotating said deflecting flap comprising a gear member, an inlet shaft connected to said gear member, and means connecting said wind wheels each to a different end of said inlet shaft.

6. Apparatus, as set forth in claim **5,** characterized in that said means connecting said wind wheels and said inlet shaft comprising a pair of flexible drive shafts each connected at one end to one of said wind wheels and at its other end to said inlet shaft.

7. Apparatus, as set forth in claim **1,** characterized in that the axes of rotation of said wind wheels being arranged in parallel relationship to one another and disposed substantially perpendicularly to the axis of the discharge end of the blower pipe line.

8. Apparatus, as set forth in claim **1,** characterized in that support means comprises a ring mount arranged to encircle the discharge end of the blower pipe line, a guide trough secured to said ring mount, a bridge secured at its upper end to said guide trough and extending downwardly therefrom positioned outwardly from the downward projection of the discharge end of the pipe line.

9. Apparatus, as set forth in claim **8,** characterized in that said means for rotating said deflecting flap including a gear member supported on the upper end of said bridge.

10. Apparatus, as set forth in claim 8, characterized in that a hinge is positioned transversely of the axis of the discharge end of the blower pipe line and is located at the end of said bridge remote from said ring mount, said deflecting flap being secured at its upper end to said hinge and having a trough-like configuration, said deflecting flap extending downwardly from said hinge and having a curved configuration so that it projects from the end of said bridge outwardly into the path of discharge end of the blower pipe line and has its free end opposite the end connected to said hinge being positioned on the opposite side of and outwardly from the path from the discharge end of the pipe line.

11. Apparatus, as set forth in claim 10, characterized in that said wind wheels extending at right angles to the axis of said hinge connecting said deflecting flap to said bridge.

12. Apparatus, as set forth in claim 8, characterized in that said support means includes an annular gear rim laterally disposed about said ring mount, said ring mount, bridge, and deflecting flap being arranged to rotate about the axis of the pipe line at its discharge end for rotation relative to said gear rim, said means for rotating said deflecting flap including a reduction gear driven by said wind wheels.

13. Apparatus, as set forth in claim 12, characterized in that said reduction gear comprises a worm gear including a worm gear shaft, a pinion located at one end of said worm gear shaft and arranged in engagement with said gear rim for effecting the rotation of said ring mount, bridge and deflecting flap.

14. Apparatus, as set forth in claim 13, characterized in that said pinion being disengageably mounted on said worm gear shaft.

15. Apparatus, as set forth in claim 13, characterized in that an eccentric pin being secured to one end of said worm gear shaft, said support means including a swivel place having a slot therein arranged to receive said eccentric pin, a feed pawl secured to said swivel piece, a ratchet wheel arranged to drive said cam disk, and said feed pawl arranged to engage said ratchet wheel for driving said cam disk.

16. Apparatus, as set forth in claim 15, characterized in that said cam disk being detachably connected to said ratchet wheel.

17. Apparatus, as set forth in claim 16, characterized in that said support means includes a pivotally mounted control arm, a roller secured to the end of said control arm remote from its pivotal attachment, said roller being arranged in contact with said cam disk for following the movement of said cam disk as it rotates, a bracket secured to the end of said deflecting flap adjacent its hinge, an adjustable pressure bar articulated to the said bracket at one end and secured to said roller at its other end for following the movement of said roller on said cam disk and deflecting said flap in relationship thereto.

18. Apparatus, as set forth in claim 16, characterized in that said cam disk comprises a plurality of cams axially spaced on the axis of said cam disk, said cams being of different configuration for varying the angular displacement of said deflecting flap relative to the pipe line axis at its discharge end.

19. Apparatus, as set forth in claim 18, characterized in that said control arm being axially displaceable relative to its point of pivotal attachment for axially displacing said roller on the opposite end of said control arm relative to said cams forming said cam disk.

20. Apparatus, as set forth in claim 12, characterized in that a feed pawl being positioned on said gear and said pawl being engageable with said gear rim for effecting reciprocal pivotal movement of said deflecting flap about the pipe line axis at its discharge end within adjustable sectors.

21. Apparatus, as set forth in claim 1, characterized in that a pressure bar being articulated to said deflecting flap at one end and arranged to follow the movement of said cam disk at its other end for effecting the angular displacement of said deflecting flap, and said pressure bar comprising a longitudinally variable turnbuckle.

22. Apparatus, as set forth in claim 1, characterized in that said deflecting flap being hinged to said support means, said deflecting flap being elongated and having a trough-like configuration transverse to its elongated direction, said deflecting flap being curved in its elongated direction so that the end of said flap adjacent its end hinged to said support means extends transversely across the path from the discharge end of the pipe line and is inclined to the discharge path and the end of the said flap spaced from the hinged connection projects laterally beyond the path of flow from the discharge end of the pipe line.

23. Apparatus for uniformly distributing material issuing from a blower pipe line onto a stone surface where the blower pipe line has a bend immediately adjacent its discharge end, a deflecting flap, support means for mounting said deflecting flap on the discharge end of the blower pipe line, said support means including drive means for rotating said deflecting flap about the pipe line axis at its discharge end and for angularly displacing said deflecting flap relative to the pipe line axis at its discharge end, wherein the improvement comprises said support means being mounted on the pipe line so that the axis of rotation of the deflecting flap is eccentrically arranged with respect to the pipe line axis at its discharge end and the axis of rotation of said deflecting flap being located between the pipe line axis at its discharge end and the projection of the surface of the pipe line forming the outer surface of its bend adjacent the discharge end.

24. Apparatus, as set forth in claim 23, characterized therein by a concentric fastening ring arranged to be secured to the discharge end of the pipe line, a plurality of brackets secured to said fastening ring and arranged in angularly spaced relationship to one another, at least one of said brackets being longer than the others in the direction extending outwardly from said supporting ring, an annular gear rim laterally disposed about said fastening ring, and the outer ends of said brackets being secured to said gear rim so that due to the difference in length of said brackets said gear rim is eccentrically disposed about said fastening ring and the discharge end of the pipe line.

25. Apparatus, as set forth in claim 24, characterized in that a detachable coupling is connected to said fastening ring for affording rapid attachment and detachment to the discharge end of the pipe line.

26. Apparatus, as set forth in claim 25, characterized in that a bolt extends from at least two of said brackets in parallel relationship with the pipe line axis at its discharge end, said bolts arranged to extend toward the discharge end of said pipe line, and a knurled cap being

threaded to each of said bolts at its end spaced outwardly from said bracket.

27. Apparatus, as set forth in claim **26,** characterized therein by two suspension straps extending outwardly from said detachable clamp, each said strap having a slot therein, and said bolts being engageable within the slots in said straps for adjustment to the diameter of the pipeline.

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